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Global, Regional and Local Perspectives on the Economies of Southeastern Europe

Proceedings of the 14th International
Conference on the Economies
of the Balkan and Eastern European
Countries (EBEEC) in Florence, Italy,
2022

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Preface

This book sheds new light on the micro- and macroeconomic developments in the Eastern European and Balkan countries, taking into account also the broader regional and global factors influencing these developments. In particular it includes latest theoretical and empirical research studies and policy insights from Central and Southeastern Europe and presents new ideas on how to resolve economic problems, also generated by the pandemic, in the Balkan and Eastern European economies in a pan-European context. By examining how the decisions and the performance of economic, social and political actors in the area are intertwined with wider events, also at a global level, the papers highlight the dynamic development in Eastern Europe and the Balkans region. Further, the book demonstrates how the area is evolving within the framework of European economic integration and the global effervescent economy’.

The book includes papers presented at the *14th International Conference “Economies of the Balkan and Eastern European Countries” (EBEEC), held in Florence, Italy, in May 2022.*

The first part of the book analyses macroeconomic trends and monetary policy issues.

The second part explores the development trends of Eastern Europe and the Balkans region markets, also taking into account the COVID-19 pandemic effect.

The international conference “Economies of the Balkan and Eastern European Countries (EBEEC)”, through its thirteen previous editions, has become a recognized forum where the knowledge and experiences gained by academics specialized in Economics and Business in the region of Central and Southeastern Europe are exchanged, debated, and validated. Besides that, the results of the EBEEC conference are numerous publications disseminated to the scientific public and practitioners all over the world. In this effort, substantial assistance and contribution comes from renowned publishers such as Springer.

The 14th International Conference “Economies of the Balkan and Eastern European Countries” was organized jointly in Florence (Italy) by University of Florence and *Department of Experimental and Clinical Medicine* of the University of Florence, in May 20–22, 2022. Aim of the conference was to gather scientists and practitioners

that will present academic papers and to exchange theoretical and empirical results on contemporary issues in economy with specific focus in business development and economic governance in Central and Southeastern European countries. Due to the pandemic situation with COVID-19 and numerous restrictions regarding traveling, the conference was conducted in dual mode (both online and in-person). The conference brought together more than 130 manuscripts and by more than 150 authors from 20 countries from Europe and all over the world. A broad range of issues—Greek Political Economy; Recession; generalised trust; Sustainability; Emerging Economies; Multinational Enterprises; Statistical Arbitrage; Entrepreneurship Education; Innovation Policy; Social Cooperative Enterprise (SCE); etc.—have been discussed at the conference and in the resulting published manuscripts.

This volume as one of the publications resulting from the *14th International Conference “Economies of the Balkan and Eastern European Countries” (EBEEC)—Florence, Italy, May 2022* has goal to presented to the worldwide audience new and original research and conclusions in a specific field of business development and economic governance in Europe. The volume includes 18 selected manuscripts based on their quality and originality arranged and presented at the *14th EBEEC Conference in Florence, Italy*. The book consists of two parts. The first part focuses on macroeconomic trends and monetary policy issues. The second part explores the development trends of Eastern Europe and the Balkans region markets, also taking into account the COVID-19 pandemic effect. The entire manuscript selection process was managed by the Board of Editors in compliance with the highest standards and best practice guidelines on publishing ethics, paying special attention to issues regarding plagiarism, peer-review, objectivity, funding, privacy, and conflict of interest. All selected manuscripts have gone through the peer-review process and carefully edited certainly making a significant contribution to the broader field of economy. Research ideas and applied quantitative methods indicate that scientists emerging from Central and Southeastern Europe are developing new worthy of attention knowledge and conclusions in this field. This is the result of changing the nature of the economy thus in Central and Southeastern European countries and merits attention increase of the scientific quality work. Selected papers are independent and do not constitute joint research and their appearance in the volume is aimed to present analogue topics in the field of economy and business and to attract the attention of scientific public and also practitioners.

The **first part** of the edited volume opens with a paper written by Victoria Pistikou and Anastasios Ketsetsidis (both of them from the *Democritus University of Thrace, Greece*), which focuses on the analyses of recent evidence on anti-dumping duties as a tool of protectionism. It aims to quote recent data concerning the use of the anti-dumping mechanism among the member countries of the WTO.

The next paper of the volume, authored by Dominika Gajdosikova and Katarina Valaskova (both of them from the *University of Zilina, Slovakia*) includes a bibliometric analysis of debt financing semiotics. It aims to clarify the basic concepts associated with the issue of corporate debt. Prior to the analysis presented, a review of the publications was carried out by locating the most pertinent authors, nations, and articles in the Web of Science database. The VOS Viewer, a tool for building

and displaying bibliometric networks, was used to evaluate all the keywords required to build a bibliometric map in the field of indebtedness. A study of the regularity of collaboration between authors and countries was also conducted. According to the findings of the keyword co-occurrence study, debt and capital structure are the two terms that are most closely related, and China and the United States are the two countries with whom co-author relationships are most important.

The paper prepared by Spyros Roukanas (*University of Piraeus, Greece*) focuses on measuring the trade performance of States and on indicators which reveal the productive model of each national economy, as well as the competitiveness of the countries' exports at the international level.

Authors Zhaklina Dhamo, Iris Beleraj and Vasilika Kume (all of them from the *University of Tirana, Albania*) analyse the business improvement districts with a comparative analysis of the legal framework and economic/social impact among different countries.

In the following manuscript prepared by Dimitra Ntertsou, Theophanis Petropoulos, Konstantinos Liapis (all of them from the *Panteion University of Social and Political Sciences, Greece*), a framework for the Tax Effort in Eurozone Countries after the outbreak of the global economic crisis is provided. Tax effort is measured by relating actual tax collections to some indicator of taxable capacity. Some countries are more favorably placed to levy taxes and can be said to have a greater taxable capacity than others. Regression analysis is used on cross-section data, to quantify the influence of Eurozone countries' specific economic and institutional features on the tax ratio.

Authors Nikolaos Zisoudis (*Democritus University of Thrace, Greece*), Eleni Zafeiriou (*Democritus University of Thrace, Greece*), Alexandros Garefalakis (*Hellenic Mediterranean University, Greece*), Fragiskos Gonidakis (*University of West Attica, Greece*) analyse the perceived micro and macroeconomic impacts of a health management crisis in Greece. It aims to unveil the determinants of macro and microeconomic perceptions of a small economy—like Greece—in post pandemics era.

The next paper, written by Antonios Kostas (*International Hellenic University, Greece*), Ioannis Tsoukalidis (*Domi Development PC, Greece*), Georgia Karavangeli (*Asamblea de Cooperación Por la Paz, Spain*), Anastasios Karasavoglou (*International Hellenic University, Greece*), examines social economy entities and social enterprises in the Greece-Bulgaria cross-border area. It also illustrates public support policies in terms of legal framework and support measures, by showcasing selected results of a recent study in Greece and Bulgaria.

The paper provided by Murat Sadiku, Luljeta Sadiku, and Gonul Sare-Kaprolli (all of them from the *South East European University, North Macedonia*) explores the effects of COVID-19 pandemic on economic development of Western Balkan countries. In particular it estimates the pandemic effects on the main economic indicators through an empirical investigation, using annual data for the period 2001–2020.

The article co-authored by Ioannis Tsoukalidis (*Domi Development PC, Greece*), Antonios Kostas (*International Hellenic University, Greece*) and Anastasios Karasavoglou (*International Hellenic University, Greece*) is on the importance of

monitoring contagious diseases in cross-border areas. It approaches the preparation of a Joint Cross-Border Action Plan, which will contribute to the improvement of the health status in the intervention area.

The study by Stavros Kalogiannidis, Stamatis Kontsas, George Konteos and Fotios Chatzitheodoridis (all of them from the *University of Western Macedonia, Greece*) investigates the impact of the COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies.

The **second part** of the edited volume opens with a paper written by Ermelinda Toska (*University of Western Macedonia, Greece*), Fotios Chatzitheodoridis (*University of Western Macedonia, Greece*), Efstratios Loizou (*University of Western Macedonia, Greece*), Achilleas Kontogeorgos (*International Hellenic University, Greece*). The study attempts to illustrate the international academic research in the field of decarbonization and especially of lignite avoidance as a raw fuel in the energy supply sector and the challenges of the energy transition. It attempts to review scientific literature by the use and analysis of specific terms through bibliometric analysis using the software VOSviewer.

The second paper of this part of the volume, authored by Maria Tsampra and Maria Katsigianni (both of them from the *University of Patras, Greece*) explores the employability in the post-COVID labour market in Greece. In particular, it analyses the impact of a digitally lagging labour market on the Greek economy, which ranks very low in digital competitiveness and is below the EU average in business and human capital integration of digital technology.

The manuscript prepared by Georges Sarafopoulos and Despoina Terzopoulou (both from the *Democritus University of Thrace, Greece*) investigates the dynamics of a heterogeneous duopoly game in R&D efforts, showing that the speed of adjustment of the bounded rational player may change the stability of the Nash equilibrium and cause a structure to behave chaotically.

The following paper arranged by Sergaki Panagiota (*Aristotle University of Thessaloniki, Greece*), Manousakis Tilemachos (*Mediterranean Agronomic Institute of Chania (M.A.I.Ch), Greece*) and Mylona Ifigeneia (*International Hellenic University, Greece*) explores gamification in Greek social enterprises. They examine whether gamification can reduce opportunistic behaviour that creates obstacles in interpersonal communication, enhancing the cooperative culture among members.

Authors Georgios A. Deirmentzoglou (*Neapolis University Pafos, Cyprus*), Eirini Vlassi (*University of Aegean, Greece*) and Konstantina K. Agoraki (*University of Piraeus, Greece*) examine the effect of the hotel attributes on guest satisfaction due to the COVID-19 pandemic crisis with a focus on the Greek tourism and hospitality sector.

Starting from the assumption that in Greece the tourism sector is one of the key factors of economic growth, it attempts to reveal the change in the effect of the hotel attributes on guests' satisfaction due to the COVID-19 pandemic crisis.

The next paper by Lambros Tsourgiannis (*International Hellenic University, Greece*), Stavros Valsamidis (*International Hellenic University, Greece*), Gian-noula Florou (*International Hellenic University, Greece*), George Drosatos (*Athena Research Centre, Greece*) explores the potential attitudes of Greek tourists that will

not go for holidays due to COVID-19 and classifies them into groups according to their attitudes.

Dionisia Tzavara (*University of London Worldwide, UK*), Persefoni Polychronidou (*International Hellenic University, Greece*), Joshua Makinson (*University of Liverpool, UK*) and Christos Crose (*International Hellenic University, Greece*) investigate the the travel intentions of Generation Z consumers living in the UK, in light of COVID-19 and to understand their travel risk profile.

The last manuscript of part one, authored by Theofanis Papadopoulos, Ioannis-John Kosmas, Mara Nikolaidou and Christos Michalakelis (all of them from the *Harokopio University of Athens, Greece*) focuses on the forecasting consumer service prices during the COVID-19 pandemic using neural networks. It analyses the case of transportation, accommodation and food service sections across E.U. over the next period utilizing Machine Learning.

Hoping that the paper selection included in the volume confirms the research quality standards needed for addressing the complex issue of the *Business Development and Economic Governance in Southeastern Europe* and offers insightful look at the changing economic and business landscape, we leave to the readers the final assessment of their quality, as well as of their ability to disseminate new approaches and ideas that may be further used by academics, practitioners and public decision-makers alike.

Firenze, Italy
 Firenze, Italy
 Firenze, Italy
 Kavala, Greece
 Serres, Greece

Niccolò Persiani
 Ilaria Elisa Vannini
 Martina Giusti
 Anastasios Karasavvoglou
 Persefoni Polychronidou

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Macroeconomic Trends and Monetary Policy Issues

Recent Evidence on Anti-Dumping Duties as a Tool of Protectionism



Victoria Pistikou and Anastasios Ketsetsidis

Abstract The main purpose of the present paper is to quote recent data concerning the use of the anti-dumping mechanism among the member countries of the WTO. We focus on some quality parameters as the frequency of the use of the mechanism on behalf of the WTO members, the differences among acting and targeted countries, the high concentration on specific sectors of industrial activity, the rejection possibility of an initiation and the possible use of the mechanism as a mean of retaliation among neighboring or competing countries. Finally, we examine the correlation between acting and targeted countries with some basic macroeconomic factors. Even though in the post WTO period the number of anti-dumping initiations and measures increased sharply, the anti-dumping mechanism is still utilized only by a limited number of developed or industrial countries and it is disproportionately concentrated in a few industry sectors (Aggarwal Aggarwal A (2008) Anti-dumping protection: who gets it? An exploratory analysis of anti-dumping use in the most active user countries. Working Paper. Copenhagen Business School). Critics support that anti-dumping mechanism is a barrier which protects the domestic industries from import competition and that it is the most often used form of contingent protection, (Tharakan Tharakan PKM (2000) The problem of Anti-dumping protection and developing country exports. The U.N. University, WIDER, Working Paper No 198). The international literature also suggest that trade policy is inevitable designed to protect domestic industries. Although trade protectionism has never been dissipated in the past decades, the forms of trade protection are showing new trend and characteristics and are becoming increasingly subtle and diversified, (Prusa Prusa TJ (1997) Trade effects of U.S. antidumping actions. National Bureau of Economic Research. working paper 5540, Prusa TJ (2021) The trade effects of US antidumping actions. In Economic Effects of Antidumping (pp. 21–43); Prusa and Skeath Prusa TJ, Skeath S (2001) The economic and strategic motives for antidumping filings. NBER Working Paper no 8424). Under this notion anti-dumping mechanism has gradually become a tool of protection for the domestic industries against competition posed by imports, (Bloningen and Bown Bloningen and Bown, J Intern Eco

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e-mail: ketsetsidis@yahoo.gr

60:249–273, 2001). There is evidence that anti-dumping duties often have nothing to do with protecting the competition and only high-level economies can initiate a procedure in a regular basis, (Finger et al. Finger MJ, Ng F, Wanhchuk S (2001) Anti-dumping as Safeguard Policy. Policy Research working paper Series 2730. The World Bank). Most findings supported by the researchers are based on statistical data concerning at most the first 10 years after the WTO establishment. We focus on resent data covering the post WTO period until 2021 to give further support to the topics mentioned above. All country members are obligated to submit in a regular basis data about the use of this mechanism. These data are available in WTO's database in a year-by-year basis for all member counties and offers an opportunity for a wide range of statistical analysis. Furthermore, we examine the correlation of the initiations and measure with some macroeconomic factors that are of decisive importance for the use of the mechanism. It is concluded that, resent quantitative data, offer further support to empirical evidence mentioned above, regarding the use of anti-dumping as a tool of protectionism. Firstly, it is confirmed that there is high concentration among developed and industrial countries and secondly, as for the sectoral distribution we observe that there is a high concentration in a few industrial sectors. Also, we assume that neighboring and competitive countries are targeted mutually, as a form of retaliation. Finally, the result of the statistical analysis suggests strong correlation between Merchandise Exports and the frequent use of the Anti-dumping mechanism.

Keywords Anti-dumping · Protectionism · Trade policy · International trade

Jel Classification F13 · F14 · L5

1 Introduction

The international literature suggests a dozen of possible definition of dumping, which are quite similar and describe the same practice with little differences one of each other. In this study we quote the definition given by the World Trade Organization (W.T.O.) as described according to the Agreement on the implementation of Article VI of the General Agreement on Tariffs and Trade (1994). In accordance with the W.T.O. dumping is defined as a procedure of introducing a product into the commerce of another country at less than its normal value. On the other hand, if there is evidence of injury, or even threat of material injury on the domestic industry, anti-dumping measures can be applied to offset the price advantage enjoyed by the exporter and bring a new equilibrium in the market.

From a legal point of view, the mechanism of anti -dumping is a legal tool that has the sole purpose to eliminate the potential damage, or the harm caused by dumping to a domestic industry. It can be seen as a remedy against the unfair trade practices of exporters that tries to smooth the economic harm to industries caused by the foreign exporters and to discourage the spread of dumping.

In recent past, especially after the establishment of the W.T.O. the use of the Anti-dumping mechanism has emerged as one of the most controversial trade issues in the international literature. The reason is that, against the common belief that it is the institutional counterweight against the uncompetitive behavior of foreign exporters, nevertheless there is severe criticism against the current use of the mechanism and their proposed manipulation (Aggarwal 2003, 2004, 2008; Davis 2009a, b). Result of this criticism is the increasing conviction that the anti-dumping mechanism is not about free trade protection and healthy competition ensure, but on the contrary acts as a tool of protectionism in favor of the domestic industries, against imports competition (Nelson 2004; Feinberg 1989; Araujo et al. 2001; Knetter and Prusa 2003). The increasing use of the mechanism and the deliberate abuse of Anti-dumping measures exiled the W.T.O. to request revision and reconsideration of the Anti-dumping agreement in the Doha round of negotiations.

Anti-dumping legislation is available to all member states of the W.T.O. as the most effective trade defense instrument (TDI) against unfair trade practices such as dumping. The W.T.O. encourages free trade, under the notion that it creates new jobs and wealth for the society. However, when commodity production is unjustifiably subsidized, or the idle productive capability is utilized to direct the surplus in foreign markets at reduced prices, then free trade can be seriously disrupted. This is a quite an uncomfortable situation for domestic companies as their inability to compete fairly can lead to redundancies or even to bankruptcy and the shutdown of production facilities. Anti-dumping and Anti-subsidiary mechanism emerges as a haven for countries that try to ensure jobs and company sustainability.

The Anti-dumping legislation counts for more than a century as a commonly accepted mechanism in the service of states to protect domestic producers. Canada is reported as one of the first countries to legislate an Anti-dumping mechanism (1904) and soon after other countries followed. It gradually became a popular measure and especially after the formation of W.T.O. (1995) it has been established as the main trade defense instrument available to all 165 member states of the organization.

Despite the criticism, the advocates of the Anti-dumping mechanism underline the fact that sole purpose of the Anti-dumping measures is to restore free trade and restrict the injurious effects of dumping by securing the fair competition in the domestic market. On the other hand, there is evidence supporting that in fact Anti-dumping itself is anti-competitive (Zanardi 2004, 2006; Theuringen and Weiss 2001). The consumer's welfare stays in the hand of the competition laws and it is necessary to make it clear that the main objective of the mechanism is to keep domestic market away from predatory pricing by companies trying to establish a monopoly (Shin 1998). The most common way to archive this goal is to dump. Low prices will drive domestic competitors out of the market and then the rise of the prices after the elimination of the competition seems inevitable.

It is a fact that because of the effective reduction of tariffs after the end of WWII and the implementation of the General Agreement on Tariffs and Trade (GATT), a new kind of protection emerged. These type of protection measures are described as

non-tariff barriers (NTB). These were largely used during the decades followed the end of the war. Gradually the Anti-dumping mechanism becomes the most popular NTB type in use at the time.

2 Literature Review

Anti-dumping is the legal framework countries use to place extra tariffs, or import surcharges, on products determined to be dumped. Even though we should not forget that the argument for industry protection in the form of Anti-dumping is pretty straightforward. The threat of losing jobs and companies is a matter of high priority of national economic security for every country. Under this notion Blonigen said that Anti-dumping is an open door for everyone to use (Blonigen 2006). Broad applicability has made the Anti-dumping mechanism popular among industries facing stiff competition from foreign trade partners. Eventually the Anti-dumping legislation has been used as a substitute for other kinds of protection (Cheng et al. 2001). Much of the flourish of Anti-dumping can be traced to the spirit of compromise. Free trade negotiations often introduced amendments that made Anti-dumping requirements ambiguous and open to interpretation. Major trade laws have been amended at least a half-dozen times in the last 25 years, creating a legal definition of dumping that is almost completely divorced from any economic notion of dumping, (Blonigen and Prusa 2001; Blonigen and Prusa 2003; Blonigen and Prusa 2015).

Many researchers state that the Anti-dumping mechanism is used more for protection than for avoiding unfair-trade, (Nelson 2004). According to them, Anti-dumping legislation, which is obscure and extensively detailed, in many cases allows applicants to obtain a better protection that if they had sought other legal means. Anti-dumping has little to do with unfair trade and suspicions are high that industries are turning to Anti-dumping as a form of protectionism, (Davis 2009a,b).

Another possible explanation for the frequent use of this mechanism is that these measures end up turning the attention away from the lack of competitiveness of the domestic companies, (Araujo et al. 2001). Despite the controversy regarding the use of Anti-dumping as an instrument of protection, there is another hypothesis that goes beyond. (Theuringen and Weiss 2001) raised a hypothesis that this mechanism could be used not only to favor less competitive companies, but also those companies that already have a prominent level of competitiveness. Under these circumstances the use of the Anti-dumping mechanism could lead to opposite effect than expected (Lasagni 2000). Eventually, it will not inhibit unfair trade by protecting the less competitive countries, in contrary it will function as a trade barrier against new competitors and finally it will contribute to the strengthening of the already consolidated industries (Dulleck 2005).

Blonigen and Prusa (2001) argue that the last two decades the use of the mechanism had emerged as one of the main tools of trade protection, whereas traditional barriers, such as tariffs and quotas were eliminated. As for the distribution among the countries (Davis 2009a,b) supports, that in the last decades there is a turnabout,

especially after the end of Uruguay Round in 1994. In terms of use the countries using Anti-dumping is often divided in two groups. On the one side the so-called traditional users such as United States, European Union, Canada, and Australia and on the other side the leading new users like Argentina, Brazil, China, India and Turkey. The emergence of Anti-dumping use by the developing countries according to researchers is the most significant development concerning the mechanism in the post WTO period and remains a topic needed additional study, (Bown 2011; Firms and Vasconcelos 2015).

Aggarwal (2004) states that developing countries are not yet fully familiarized with the mechanism and they mainly use the Anti-dumping as a form of retaliation against the traditional users due to their excessive number of cases opened against developing countries. Additionally, (Vandenbussche and Zanardi 2008) are mentioning a contagion effect, suggesting that some countries start using the mechanism just by seeing other neighboring countries using it. These two effects could help to explain the proliferation of this tool after the establishment of WTO.

As for the sectoral concentration, there is evidence that large and concentrated industries facing import competition are more likely to seek Anti-dumping protection, (Bown 2007). Also, (Aggarwal 2003) has shown that most plaintiffs are large monopolists holding up a significant percentage of the market share (Miyagiwa et al. 2016). These evidence find support by (Singh 2005) also (Felbermayr and Sandkamp 2020) finds that the international market of the three most targeted sectors (base metals, chemicals, and plastic) are highly cyclical. For this reason, when the companies are at the bottom of the cycle may turn to pricing sales below cost. There is also evidence that the framework of the theory of competitive advantage could be an explanation to the recent trends (Eckhardt 2011).

Finally, there are studies that strongly support that Anti-dumping mechanism is highly correlated with some key macroeconomic factors. (Ahn and Shin 2011) offer support to the hypothesis that the overall trend of Anti-dumping investigations clearly shows a cyclical movement highly correlated to the global economic recession. (Bown 2011) offers further support suggesting that the use of Anti-dumping frequently rises when there is an economic crisis. Also, a number of studies cite the overall health of economy as a key determinant factor in the use of Anti-dumping mechanism, as it is easier for companies to prove financial injury during periods of economic downturns, (Feinberg 2005, 2010), they suggest that when the chances for successful Anti-dumping petitions are higher, the companies are more likely to proceed and file a petition. In contrary, companies are less likely to file when economic conditions are good and the industry appears to perform well, (Fritz and Wermelinger 2009).

3 Analytical Framework and Methodology

This paper brings new evidence regarding the latest available data from the WTO database. The data from the WTO database are not sufficient for an in-depth analysis in the use of the Anti-dumping mechanism because the organization does not publicize data on the actual product (four digit Harmonized System (HS) code), nor the dates of initiations, the number of notifications, the imposition of the measures, or the names of the firms involved. Nevertheless, the data available are enough to draw conclusions regarding the topics of the paper. The paper does not use econometric techniques to examine the above propositions.

It needs to be emphasized that the WTO database records both Anti-dumping initiation and measures. Although there is a similarity in the results, there are some quality differences among the statistics for initiations and measures that give support to the evidence mentioned above. It must be clear that an initiation does not have anyeconomic impact. It refers to the intention of a country to start a procedure that could end up with a provisional or a final measure. On the other hand, measures are final decisions that lead to adjustments and have an important affect to the purchase price of the product. It is interesting to mention that there is evidence that supports that even the intention to act against a country and the initiation of an investigation could discourage the potential exporters and finally to keep them out of the market. This raises a new issue and worries the involved parties that the high possibility of affirmative decision and acceptance of most investigations could lead to abuse of the Anti-dumping mechanism. It is characteristic that out of 6.422 initiations of the period since the establishment of WTO 4.225 ended up with the imposition of a final measure. This reflects a high rate of 65,79 percent of all cases. The statistics suggest that in almost all the countries, the success rate is well above 50 percent.

Another necessary clarification that must be made is the distinct perspective of a reporting and a targeted country. The reporting county has the initiative to litigate against others utilizing legitimate and unjust means on a case-by-case basis. On the other hand, Targeted countries are usually paying the price for using dumping as a mean of export promotion, but also in many cases, it is supported that they are victims of retaliation because of their success as exporting countries.

The correlation between the number of cases initiated per targeted country and the merchandise exports gives further support to the hypothesis that the mechanism is manipulated to offer protection to domestic industries.

4 Comperatrive Analysis

The first issue under investigation in this paper is the global concentration in use of the Anti-dumping mechanism. It is well documented in the international literature and most of the studies suggest that the use of the mechanism has been proliferating since the establishment of the WTO in 1995. (Prusa 2001), (Zanardi 2004) and (Aggarwal

2007) point out that Anti-dumping was almost exclusively used by large industrial countries, only in the late 80 s and especially after the establishment of the WTO new users emerged.

However, this proliferation seems to be limited. It is characteristic that until 2021, from the 165 member states of the WTO only 53 used the mechanism of initiating an investigation against other countries in order to impose an Anti-dumping duty at least once. As for the measures finally imposed the statistics are even more supportive to recent empirical findings with only 46 member countries to have completed the procedure successfully ending up with an Anti-dumping measure.

Out of these countries only 18 are frequent users utilizing this mechanism on a regular basis. It is interesting to say that these 18 countries represent collectively about 90% of all cases (89,72 percent of all initiations and 90,96 percent of all affirmative cases by all WTO members over the 1995–2021 period).

In Table 1 we can see the share of these 18 countries, and it is evident that the high rate is stable in the year-by-year comparison and has remained almost stable over the period since 1995. It is instructive to note that although the use of Anti-dumping has increased sharply, it has not yet spread widely across the globe.

It is also necessary to make clear that there is a significant difference between reporting and targeted countries. Especially for the reporting countries it is important to mention that it is prerequisite to obtain certain capabilities in order to use the Anti-dumping mechanism effectively. There are a handful of countries in each continent that meet these requirements and can afford the pecuniary and economic cost. Also, many countries may be lacking the legal expertise and skills required to conduct investigations and litigate the cases.

In Table 2 we see that almost three out of four cases (76,94 percent of initiations and 78,89 percent of measures) are targeting the top 18 countries. In this case the criteria are different. Legal expertise and economic strength are both necessary to defend and repel a claim. Even though, countries are targeted as a form of retaliation and the contagion effect as described by other researchers could also be an explanation.

Table 1 Anti-dumping Initiations and Measures—share of Top 18 countries 1995–2021 Reporting Country

Period	Total initiations	Share of Top 18 countries (%)		Total measures	Share of top 18 countries (%)	
1995–1999	1254	1093	87,16	718	636	88,58
2000–2004	1434	1304	90,93	1001	913	91,21
2005–2009	1002	911	90,92	671	619	92,25
2010–2014	1069	971	90,83	674	613	90,95
2015–2019	1193	1074	90,03	894	820	91,72
2020–2021	470	409	87,02	1510	242	90,64
Overall	6422	5762	89,72	4225	3843	90,96

Source Calculations based on the WTO Anti-dumping database

Table 2 Anti-dumping initiations and measures—share of top 18 countries 1995–2021 targeted country

Period	Total initiations	Share of top 18 countries (%)		Total measures	Share of top 18 countries (%)	
1995–1999	1254	867	69,13	718	543	75,63
2000–2004	1434	1047	73,01	1001	759	75,82
2005–2009	1002	848	84,63	671	584	87,03
2010–2014	1069	859	80,35	674	581	86,20
2015–2019	1193	959	80,38	894	745	83,33
2020–2021	470	361	76,82	1510	211	81,79
Overall	6422	4941	76,94	4225	3423	78,89

Source Calculations based on the WTO Anti-dumping database

The following tables (Tables 3 and 4) show the countries from the perspective of the reporting country. In other words, in these tables, we see the countries who take the initiative to initiate an investigation against another country because of solid suspicions that they dump in order to gain share in the domestic market.

Researchers support that the Anti-dumping mechanism is the most ambiguous tool of trade remedy that offers enormous flexibility in the determination of trade injury and causal relationship. It also has specific characteristics that make it extra appealing to prospective users. Under these conditions it has become by far the most frequent used legal trade remedy under the WTO regime.

The statistics shows that India is the leader of the reporting countries representing a share of 17,07 percent. United States follows with a share of 828 initiations against foreign exporters, European Union takes the third place with 538 initiations and Brazil and Argentina follows with 434 and 400 petitions, respectively. These five countries are forming together the group of main users of the mechanism representing more than half of all cases.

Although traditional users are still representing a sizable proportion of all cases, a new group of developed countries emerged and claimed an even larger proportion of initiations and measures, gaining an increasing role in international trade relations.

In the following Tables (Tables 5 and 6) we categorize the countries from the perspective of the Targeted country. In Table 5 the initiations and in Table 6 the measures are depicted. We can see that almost half of all cases (49,03 percent for initiations and 51,12 percent for measures) are against the top six countries. It is not irrelevant that all these countries are large merchandise exporters worldwide. China, South Korea, United States and India are exporting products that cost hundreds of billions of dollars and especially the last two decades are playing an increasingly important role in international trade. Their increasing share in the international exports could be the reason for domestic industries to seek protection as a reaction to increasing competition.

Also, it is not irrelevant that China represents one out of four cases worldwide both for initiations and measures reinforcing the claim that exporting leaders are

Table 3 Anti-dumping initiations—top 18 most frequent users 1995–2021 reporting country

Initiations by reporting country	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019	2020–2021	Total	Accumulated (%)
India	132	268	192	148	239	117	1096	17,07
United States	134	222	84	87	201	100	828	29,96
European Union	186	117	102	63	53	17	538	38,34
Brazil	68	48	64	189	49	16	434	45,09
Argentina	92	92	73	58	73	12	400	51,32
Australia	103	72	35	79	62	24	375	57,16
China	5	104	69	40	70	4	292	61,71
Canada	56	77	18	45	51	29	276	66,01
South Africa	132	45	37	17	3	10	244	69,81
Turkey	13	76	55	36	49	11	240	73,54
Mexico	37	42	18	32	32	7	168	76,16
South Korea	41	36	31	19	25	7	159	78,64
Pakistan	0	7	46	29	53	12	147	80,92
Indonesia	32	28	20	42	20	2	144	83,17
Egypt	28	14	25	15	25	10	117	84,99
Malaysia	16	15	12	27	27	12	109	86,69
Thailand	4	30	7	20	23	15	99	88,23
Colombia	14	11	23	25	19	4	96	89,72
Total	1254	1434	1002	1069	1193	470	6422	

Source: Calculations based on the WTO Anti-dumping database

Table 4 Anti-dumping measures—top 18 most frequent users 1995–2021 reporting country

Initiations by country	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019	2020–2021	Total	Accumulated (%)
India	62	238	119	115	172	38	744	17,61
United States	106	118	65	57	156	71	573	31,17
European Union	107	91	69	32	33	9	341	39,24
Argentina	66	70	41	50	40	17	284	45,97
Brazil	30	34	39	94	69	3	269	52,33
China	5	57	68	46	56	29	261	58,51
Turkey	12	65	56	30	36	2	201	63,27
Canada	34	46	12	27	41	20	180	67,53
Australia	29	39	14	40	46	2	170	71,55
South Africa	77	38	14	7	5	3	144	74,96
Mexico	41	27	14	17	38	6	143	78,34
South Korea	23	20	27	12	19	1	102	80,76
Pakistan	0	7	18	25	38	9	97	83,05
Egypt	19	15	17	3	12	11	77	84,88
Malaysia	9	9	7	13	20	8	66	86,44
Indonesia	13	10	12	19	11	0	65	87,98
Ukraine	0	7	21	10	16	10	64	89,49
Thailand	3	22	6	16	12	3	62	90,96
Total	718	1001	671	674	894	267	4225	

Source: Calculations based on the WTO Anti-dumping database

Table 5 Anti-dumping initiations—top 18 most frequent targets 1995–2021 targeted country

Initiations by exporter	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019	2020–2021	Total	Accumulated (%)
China	165	250	344	294	341	113	1507	23.47
South Korea	103	110	52	85	97	33	480	30.94
Chinese Taipei	62	83	55	66	49	16	331	36.09
United States	78	74	52	62	32	18	316	41.02
India	48	60	37	47	49	18	259	45.05
Thailand	43	57	50	46	43	17	256	49.03
Indonesia	48	59	49	27	35	23	241	52.79
Japan	61	64	28	34	43	7	237	56.48
Russia	47	51	21	17	37	18	191	59.45
Malaysia	21	33	43	28	40	23	188	62.38
Brazil	42	38	28	14	37	6	165	64.95
European Union	14	41	20	33	25	10	143	67.18
Germany	48	27	12	19	13	6	125	69.12
Turkey	14	21	11	26	31	18	121	71.01
Viet Nam	2	11	13	20	41	27	114	72.78
Ukraine	27	26	14	12	15	3	97	74.29
Mexico	23	13	10	20	19	2	87	75.65
Total	1254	1434	1002	1069	1193	470	6422	

Source: Calculations based on the WTO Anti-dumping database

Table 6 Anti-dumping measures—top 18 most frequent targets 1995–2021 targeted country

Measures by exporter	1995–1999	2000–2004	2005–2009	2010–2014	2015–2019	2020–2021	Total	Accumulated (%)
China	122	182	236	221	272	66	1099	26,01
South Korea	44	83	39	48	75	15	304	33,21
Chinese Taipei	33	58	38	45	38	10	222	38,46
United States	41	43	38	40	29	4	195	43,08
Japan	36	53	22	23	33	3	170	47,10
Thailand	21	42	31	34	37	5	170	51,12
India	26	36	27	20	36	9	154	54,77
Indonesia	17	39	33	25	27	9	150	58,32
Russia	41	38	16	11	24	6	136	61,54
Brazil	37	23	17	12	22	3	114	64,23
Malaysia	16	18	23	16	25	11	109	66,81
European Union	6	31	11	26	20	3	97	69,11
Ukraine	21	26	8	8	15	2	80	71,00
Germany	20	18	9	6	16	4	73	72,73
Viet Nam	1	5	14	14	28	10	72	74,44
Turkey	9	13	3	10	23	9	67	76,02
United Kingdom	12	9	3	1	5	33	63	77,51
South Africa	12	22	4	7	10	3	58	78,89
Total	718	1001	671	674	894	267	4225	

Source: Calculations based on the WTO Anti-dumping database

usually the victims of retaliation. 1099 out of 4225 measures are exclusively against exporters from China. The other countries in the top of the list as South Korea, United States and India have also a sizable proportion on the initiations and measures against them.

The concentration, as shown above, remains high for both initiations and measures as for reporting and targeted countries, even though there are differences in the ranking among the most frequent reporting and targeted countries. In the case of reporting countries, India has the lead and together with European Union, Brazil and Argentina represent more than the half initiations and measures. In the case of targeted countries, China is the leader and together with South Korea, United States, Japan, and Thailand represent more than 50 percent of all cases.

In Table 7 the list of countries with positive balance regarding the use of the Anti-dumping mechanism is depicted. Countries are well prepared and ready to undertake the cost and expertise needed to fight against dumping. India is by far the most active user of the mechanism. From the establishment of the WTO in 1995 until 2021 India started an investigation/initiation against another country 1096 times and becomes a target only 259 times. Countries like South Africa, Egypt, Colombia, and Peru are surprisingly remarkably effective in the utilization of the mechanism.

Table 7 Anti-dumping initiations—efficient users

Country		Targeted	Acting	
1	India	259	1096	−837
2	United States	316	828	−512
3	European Union	143	538	−395
4	Argentina	50	400	−350
5	Australia	38	375	−337
6	Brazil	165	434	−269
7	Canada	53	276	−223
8	South Africa	83	244	−161
9	Pakistan	26	147	−121
10	Turkey	121	240	−119
11	Egypt	31	117	−86
12	Colombia	10	96	−86
13	Mexico	87	168	−81
14	Peru	14	80	−66
15	New Zealand	11	68	−57
16	Israel	19	53	−34
17	Venezuela	22	31	−9
18	Philippines	19	21	−2

Source Calculations based on the WTO Anti-dumping database

On the other hand (Table 8) China becomes a target 1507 times whereas acted 292. So, we see that although she uses the mechanism quite frequently, she had to defend a massive number of initiations against Chinese exporters. In the list of countries that are predominantly target belongs also South Korea, Japan, Russia and many south-eastern Asian economies.

Under the same perspective we can see that the same conclusions can be drawn from the Tables 9 and 10 that refer to measures instead of initiation. India is again the country with the highest score if we compare the measures that have been taken with India as a reporting/acting country in comparison to measures that have been taken against Indian exporters. The list is similar with this of initiations, depicting that there is an important level of success for all the initiations. This rate has been established to almost 70 percent of all initiations and even for the most recent users is well above 60 percent.

The second issue under investigation in this paper is the sectoral distribution. The distribution of Anti-dumping, both initiation and measures, reveals a disproportionate concentration in few industry sectors. In the next table (Table 11) we see that the sector of Base metals and articles (XV) represents almost one out of three initiations with a share of 31,63 percent of all Initiations and 33.25 percent of all measures. The second most popular sector is chemicals (VI) with a share of 19,84 percent of Initiations and 21.16 of measures. Resins and plastics (VII) are third in the list with a percentage rate of 13,08 and 12.40, respectively.

These top three rated sectors represent almost 64,00 percent of all initiations for the period under investigation and almost 66,00 percent of all measures. This finding suggests a high concentration in a very narrow list of exporters who must face all this activity against them.

Examining the sectoral distribution, we also have mentioned that despite the high concentration in only few sectors there are some differences concerning the number

Table 8 Anti-dumping Initiations—tail users

Country		Targeted	Acting	
1	China	1507	292	1215
2	Chinese Taipei	331	0	331
3	South Korea	480	159	321
4	Japan	237	17	220
5	Thailand	256	99	157
6	Russia	191	57	134
7	Indonesia	241	144	97
8	Viet Nam	114	32	82
9	Malaysia	188	109	79
10	Singapore	69	0	69

Source Calculations based on the WTO Anti-dumping database

Table 9 Anti-dumping measures—efficient users

Country		Targeted	Acting	
1	India	154	744	-590
2	United States	195	573	-378
3	Argentina	26	284	-258
4	European Union	97	341	-244
5	Brazil	114	269	-155
6	Canada	27	180	-153
7	Australia	19	170	-151
8	Turkey	67	201	-134
9	Mexico	56	143	-87
10	South Africa	58	144	-86
11	Pakistan	14	97	-83
12	Egypt	13	77	-64
13	Peru	3	53	-50
14	Colombia	5	49	-44
15	New Zealand	4	26	-22
16	Israel	11	27	-16
17	Venezuela	13	25	-12
18	Moldova	6	14	-8

Source Calculations based on the WTO Anti-dumping database

Table 10 Anti-dumping measures—tail users

Country		Targeted	Acting	
1	China	261	1099	838
2	South Korea	102	304	202
3	Chinese Taipei	27	222	195
4	Japan	15	170	155
5	Thailand	62	170	108
6	Russia	48	136	88
7	Indonesia	65	150	85
8	Viet Nam	17	72	55
9	Malaysia	66	109	43

Source Calculations based on the WTO Anti-dumping database

Table 11 Anti-dumping sectoral distribution 1995–2021 initiations—measures

Sector		Initiations		Measures	
		Total	Share (%)	Total	Share (%)
XV	Base metals and articles	2031	31,63	1405	33,25
VI	Products of the chemical and allied industries	1274	19,84	894	21,16
VII	Resins, plastics and articles; rubber and articles	840	13,08	524	12,40
XVI	Machinery and electrical equipment	485	7,55	309	7,31
XI	Textiles and articles	452	7,04	294	6,96
X	Paper, paperboard and articles	298	4,64	169	4,00
XIII	Articles of stone, plaster; ceramic prod.; glass	267	4,16	168	3,98
IX	Wood, cork and articles; basketware	123	1,92	64	1,51
XX	Miscellaneous manufactured articles	119	1,85	86	2,04
V	Mineral products	100	1,56	61	1,44
IV	Prepared foodstuff; beverages, spirits, vinegar; tobacco	96	1,49	53	1,25
I	Live animals and products	72	1,12	32	0,76
II	Vegetable products	72	1,12	46	1,09
XVII	Vehicles, aircraft and vessels	71	1,11	50	1,18
XVIII	Instruments, clocks, recorders and reproducers	66	1,03	41	0,97
XII	Footwear, headgear; feathers, artif. flowers, fans	35	0,55	23	0,54
III	Animal and vegetable fats, oils and waxes	15	0,23	3	0,07
VIII	Hides, skins and articles; saddlery and travel goods	5	0,08	3	0,07
XIV	Pearls, precious stones and metals; coin	1	0,02	0	0

(continued)

Table 11 (continued)

Sector		Initiations		Measures	
		Total	Share (%)	Total	Share (%)
XV	Base metals and articles	2031	31,63	1405	33,25
Total		6422	100	4225	100

Source Calculations based on the WTO anti-dumping database

of initiations based on the economic profile of each country and the status of the reporting member.

Firstly, we observe that among the nineteen (19) most frequent users (countries with more than 100 reporting initiation) the sector of base metals has the most cases in twelve (12) countries (Table 12), even though, there are countries that seem to focus on other sectors too. India for example has targeted 460 times another country, reporting companies that belong in the chemical industry (sector VI). The same is observed for China, South Korea, and Pakistan, (four (4) countries) whereas there are countries like Brazil and Egypt who reported mainly companies of the Resins and plastics industry (sector VII), or Turkey which focuses on textile companies (sector XI). The literature suggests that countries try to create obstacles in order to protect the domestic competitive industries. The numbers mentioned to this table give support this hypothesis taking into consideration the economic profile of each country.

On the other hand, according to Table 13 we see that that the most affected sector of all targeted countries is Base metals for the majority of the frequent user countries. In the United States and European Union, the companies of the chemical industry are the most targeted and in Thailand the Resins and Plastics sector. According to the international literature this is highly correlated to the economic strength of each sector. The sector of Base Metals concentrates the majority of Initiations and an explanation to this hypothesis could be the high capitalization of these sectors. So, we can say that large and robust companies are the main target group talking about Anti-dumping Initiations.

The next two tables (Tables 14 and 15) confirm the above findings as for the Measures too.

We could say that countries seek protection especially for their leading economic sectors and the most targeted sectors are those with the strongest economic profile.

We also examine the correlation between the initiations with the merchandising exports of each country. In order to have comparable figures we needed to exclude the services and to accumulate the exports for the period under investigation (1995–2020). This correlation offers further support to the hypothesis that initiations are targeting strong competitive exporters in order to protect domestic industries.

As we see in the next table (Table 16) the correlation among the accumulated initiations targeting specific exporters and the accumulated merchandising exports for the same period (1995–2020) is quite strong ($r = 0.6922$). That practically means, that the most exporting countries are simultaneously the most targeted one also.

Table 12 Anti-dumping sectoral distribution of initiations reporting member

Reporting member	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total
India			1	3	20	460	153		20	28	111	1	36		144	101	8	7		3		1096
Un.States	20	15		11	10	108	76		7	25	23		8		453	45	11			16		828
Eu. Union	8	2	2	2	6	99	38	4	10	3	43	9	17		213	60	11	1		12		538
Brazil	5	1	5	7	82	132			1	13	30	1	25		99	12		6		15		434
Argentina	2		3	1	48	40			11	14	36	1	24		95	85	11	13		16		400
Australia		5	2	12	9	30	68		15	40	7		19		138	18	7	2		3		375
China	2	3		4	4	156	57			19	7		2		25	3	2	8				292
Canada		13		10		15	6		10	5		7	6		185	13	1			5		276
S. Africa	11	2	2	6	1	33	39		2	19	11	1	30		60	15	3	8		1		244
Turkey				2		19	57		7	5	58		15		45	20	1	2		9		240
Mexico	6	5	2	2		23	10	1		5	10		6		75	12	2			9		168
S. Korea			3		1	40	14		19	22	12		2		22	22				2		159
Pakistan				1		47	13			21	17		6		39	1	1			1		147
Indonesia		14				22	15			9	25		1		54	4						144
Egypt	1					11	39			4	5		3		30	15				9		117
Malaysia						6	21			30			4		46		2					109
Thailand						6	5			5	1		5		76	1						99
Colombia				3		6	16		1	1	16	3	7		39	3				1		96
Ukraine	2	1	1	1	5	11	6		8		3		15		15	7	3	7		1		85
Total	72	72	15	96	100	1274	840	5	123	298	452	35	267	1	2031	485	71	66	0	119	0	6422

Source Calculations based on the WTO Anti-dumping database

Table 13 Anti-dumping sectoral distribution of initiations targeted country

Exporter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total
China	2	9		8	17	274	124	5	25	36	119	22	96		468	173	41	19		69		1507
S. Korea				4	2	89	98			26	46		1		161	46	2	4		1		480
Ch. Taipei					1	59	56			8	40	1	7		119	26	5	2		7		331
U. States	9	8	2	6	6	136	65		5	22	5		7		25	10	2	5		3		316
India	2	5		1	1	53	41			3	31	2	8		91	16		3		2		259
Thailand	1	1		6	6	38	64		6	10	31	1	14		51	20	1	2		4		256
Indonesia		3		2	4	34	35		8	35	32	3	23		45	9	1			7		241
Japan					5	70	31			20	2		2		77	24	2	4				237
Russia	1			1	4	48	16		4	6			8		100	1	2					191
Malaysia	1			2	2	22	28		11	4	24		11		59	20	1	1		2		188
Brazil	8		3	3	2	16	18		7	15	10		5		52	22	1	2		1		165
Eu. Union	1	2		2	2	68	26		1	10	5				21	2		3				143
Germany	1	1		3	2	29	17		5	11	3		4		31	9	1	5		3		125
Turkey	1	5		5	4	12	6		1	11	11		3		63	7	1	1		1		121
Viet Nam	3	1		1	2	2	13		4		11	4	2		52	11	2	1		5		114
Ukraine	2				1	14	2				4				72	1	1					97
Mexico	1	3		5	6	8	15		1	1	2		8		32	4				1		87
South Africa				3		17	4			3			2		52	2						83
Italy		1	1	6		3	5		3	5	3		4	1	28	12	2	2		2		78
Spain	1		1	2		9	1		3	4	3		7		33	8		3				75
Singapore						24	23			2	1				11	8						69

(continued)

Table 13 (continued)

Exporter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total
France		1		1		21	7		1	5			1	15	4	1				1		58
Canada	4	3				9	5		4	11				12	3	1		1				53
U.K.	1			1	1	13	4			3	3		2	17	2	1		2		2		52
S. Arabia					1	23	12				6		3	6								51
Argentina	5	7	7	3	1	8	8		1	1			1	7	1							50
U.A.E		3			2	6	13			2			8	15	1							50
Romania					1	6	2						1	28	4							42
Hong Kong						4	8			2	3	1	2	11	7	1				1		40
Belgium		1		4		7	5		3	4	1		1	10	1		2					39
Netherlands	4	1		5	1	8	7			2			1	8	2							39
Poland		1				6	5		5	5	1		1	12	2	1						39
Australia		1	4	1	1	9	3			4	1			13	1							38
Belarus			1		5	5	1		3		8		5	9	1							38
Iran					3	17	7				1		2	6	1							37
Chile	2	4		4	2	3	6		1	2	2		2	7	1							36
Total	72	72	15	96	100	1274	840	5	123	298	452	35	267	1	2031	485	71	66	0	119	0	6422

Source: Calculations based on the WTO Anti-dumping database

Table 14 Anti-dumping sectoral distribution of measures reporting country

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total
India					7	344	110	15	12	75	1	25			72	68	7	6		2		744
U.S	11	10		10	6	73	44	1	5	15	16	6			331	26	4			15		573
E.U	4	2		1	6	66	21	2	9	3	23	7	9		141	32	10	2		3		341
Argentina	1				1	18	26		3	10	26	1	18		78	63	12	7		20		284
Brazil	4	2		5	5	55	65			12	20	1	19		62	11		2		6		269
China	2	3		2	4	134	55			16	6		2		28	1	2	6				261
Turkey						16	54		7	5	45		13		33	17	1	1		9		201
Canada		11		7		4			4	1		2	3		137	9				2		180
Australia		3		8	1	14	17		1	28	5		6		75	8	3	1				170
S. Africa	4	1		2	1	22	28			10	11		17		34	5	1	8				144
Mexico	4	4	2	1		17	7			3	4		4		82	7	1			7		143
S. Korea						26	14		7	12	5		2		14	20				2		102
Pakistan						37	11			13	13		2		20					1		97
Egypt						8	20				3		3		20	15				8		77
Malaysia						3	14			13			3		31		2					66
Indonesia		4				10	6			4	7		1		33							65
Ukraine				1	4	11	3		5		3		11		13	7	1	4		1		64
Thailand						2	1				1		5		52	1						62
Total	32	46	3	53	61	894	524	3	64	169	294	23	168	0	1405	309	50	41	0	86	0	4225

Source: Calculations based on the WTO Anti-dumping database

Table 15 Anti-dumping sectoral distribution of measures targeted country

Exporter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total
China	3	10		5	10	215	88	3	18	20	85	16	68		348	116	28	13		53		1099
S. Korea					2	61	57			14	33		1		107	26	1	1		1		304
Ch. Taipei					1	50	35			4	27	1	1		74	19	3	1		6		222
U.S	6	3	1	4	5	88	33		3	12	4		5		19	8	2	1		1		195
Japan					1	52	25			11	2		2		60	13	1	2		1		170
Thailand	2	1		6	2	26	47		2	4	21	1	8		31	12	2	2		3		170
India	1	2		1	1	33	28			2	18		4		55	7		1		2		154
Indonesia		1			3	28	20		4	19	18	3	14		29	6	2			3		150
Russia				1	3	33	12		2	3			6		75		1					136
Brazil	3			2	2	10	13		1	10	4		4		50	14		1				114
Malaysia						15	17		6	4	16		5		31	11	2	1		1		109
E.U	1	1		1	1	51	21		1	4	2				13			2				97
Ukraine					1	11	2				1				63	1	1					80
Germany	1	1		3	1	16	7		2	8	1		3		20	4	1	3		2		73
Viet Nam	2	1				2	11		2		5	2	1		33	7	2	1		3		72
Turkey		1		3	3	6	3				6		3		36	4	1			1		67
U.K	1	1		1	1	24	8		1	2	4		1		16	1		2				63
S. Africa				2		13	3						1		39							58
Mexico		2		4	4	4	10		1	1	1		6		19	3				1		56
Italy		1		2		3	4		1	2	2		1		24	10	1	1				52
Singapore						18	14			1					5	6						44

(continued)

Table 15 (continued)

Exporter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total
Total	32	46	3	53	61	894	524	3	64	169	294	23	168	0	1405	309	50	41	0	86	0	4225

Source Calculations based on the WTO Anti-dumping database

Table 16 Anti-dumping Initiations and merchandising exports targeted country

Country	Initiations	Merchandise Exports 1995–2020 in U.S. \$
China	1507	32.604.372
Korea, Republic of	480	9.324.348
United States	316	29.184.873
India	259	4.390.549
Thailand	256	3.883.773
Indonesia	241	3.022.668
Japan	237	15.585.752
Russian Federation	191	7.361.697
Malaysia	188	4.179.561
Brazil	165	3.794.346
Germany	125	27.628.125
Turkey	121	2.552.228
Viet Nam	114	2.286.527
Ukraine	97	970.229
Mexico	87	6.924.351
South Africa	83	1.639.753
Italy	78	10.369.376
Spain	75	5.765.269
Singapore	69	6.962.042
France	58	12.037.345
Canada	53	9.118.995
United Kingdom	52	10.095.669
Saudi Arabia, Kingdom of	51	4.890.889
Argentina	50	1.263.671
United Arab Emirates	50	4.955.665
Romania	42	1.037.031
Hong Kong, China	40	9.283.963
Belgium	39	8.140.905
Netherlands	39	12.114.563
Poland	39	3.411.043
Australia	38	3.974.006
Belarus	38	552.548
Iran, Islamic Republic of	37	1.652.094
Chile	36	1.272.449
Egypt	31	446.360

(continued)

Table 16 (continued)

Country	Initiations	Merchandise Exports 1995–2020 in U.S. \$
Kazakhstan	30	1.007.800
Pakistan	26	439.061
Austria	25	3.337.222
Sweden	25	3.413.526
Czech Republic	22	2.778.552
Finland	22	1.622.127
Venezuela, Bolivarian Republic of	22	1.173.789
Oman	20	671.766
Israel	19	1.203.932
Philippines	19	1.196.420
Hungary	17	1.925.167
Bulgaria	15	457.236
Greece	14	612.477
Peru	14	668.979
Slovak Republic	14	1.299.314
Lithuania	13	453.043
Portugal	13	1.163.203
New Zealand	11	683.396
Switzerland	11	4.950.972
Colombia	10	754.349
Denmark	10	2.205.011
North Macedonia	10	84.110
Norway	10	2.561.802
Sri Lanka	10	200.350
Bangladesh	8	464.715
Latvia	8	211.214
Croatia	7	264.756
Ireland	7	2.812.069
Bahrain, Kingdom of	6	309.231
Macao, China	6	47.194
Qatar	6	1.310.783
Uruguay	6	133.064
Bosnia and Herzegovina	5	91.642
Costa Rica	5	214.947
Estonia	5	253.598

(continued)

Table 16 (continued)

Country	Initiations	Merchandise Exports 1995–2020 in U.S. \$
Guatemala	5	178.834
Trinidad and Tobago	5	224.201
Georgia	4	38.377
Kuwait, the State of	4	1.309.097
Serbia	4	200.429
Uzbekistan	4	199.562
Algeria	3	986.382
Dominican Republic	3	187.714
Ecuador	3	354.162
El Salvador	3	105.181
Jordan	3	138.655
Luxembourg	3	370.516
Paraguay	3	137.475
Slovenia	3	636.272
Tunisia	3	307.572
Armenia	2	28.518
Faeroe Islands	2	16.956
Kenya	2	105.408
Libyan Arab Jamahiriya	2	617.093
Zimbabwe	2	71.635
Azerbaijan	1	361.800
Cambodia	1	141.494
Honduras	1	146.363
Iceland	1	96.097
Kyrgyz Republic	1	31.873
Lao People's Democratic Republic	1	49.059
Malawi	1	20.461
Mozambique	1	60.543
Nicaragua	1	70.591
Nigeria	1	1.300.938

Merchandise exports (current US\$) | Data (worldbank.org)

The possible link between the use of the Anti-dumping mechanism and the level of macroeconomic activity has been well documented by researchers. A number of papers link the Anti-dumping action to changes in GDP. In general, the use of Anti-dumping initiations rises during slowdowns in the global economy. This is particular evident in the recession and debt-crisis periods of the last three decades.

5 Conclusion

The use of Anti-dumping mechanism is not a recent phenomenon, it has been used since the beginning of the twentieth century. After the end of WWII, the implementation of the General Agreement on Tariffs and Trade (GATT) lead to a severe reduction of tariffs and a simultaneous increase in the use of the Anti-dumping mechanism. Despite the fluctuations it remains the most popular tool that offers the only accepted and legal form of protection. The late decades new questions arouse concerning the abuse of the mechanism. Lot of researchers examine the possible use of the mechanism in order to offer protection to domestic industries.

This study provides empirical evidence concerning the global concentration especially for acting countries, the sectoral concentration, and the correlation of Initiations with merchandising exports. Our main findings are supportive to the hypothesis that Anti-damping mechanisms become popular as a tool of protection. We do not focus on the intention of the acting country. The protected companies could be infant industries or monopolistic powers and retaliation or the contagion effect should not be excluded.

First, we see that only 18 countries account for more that 90 percent of total Anti-dumping mechanism use and top 5 countries for more than 50 percent. These include the so-called traditional users, Unites States, European Union, Australia and Canada and a set of developing countries. These countries are large and important trade partners that represent a large proposition of global trade. We see that less developed countries are absent from the list of the regular users. The literature review suggests that they are absent because they cannot afford the economic cost and are lucking the legal expertise required for the use of the mechanism.

Second, the sectoral distribution of Anti-dumping initiations and measures is remarkably high. Only three sectors of industrial activity are almost monopolizing the Initiations and Measures. Two out of three cases are concerning to these three sectors of Base Metals, Chemicals and Resins. These three sectors are constituted by large well established companies.

Finally, we can say that there is a correlation between the number of initiations and the merchandise exports of each country. The more exports result to more Anti-dumping Initiation and Measures, respectively.

As a summary we can say that the Anti-dumping mechanism concerns mostly the traditional users and a handful of new users of developed countries that have the legal expertise, the economic strength and the political ties to accomplish the necessary procedure. It focuses mainly on economic sectors where businesses with high

capitalization and large share in the domestic market prevail. The leading exporters seem to concentrate the most cases of initiations and reporting countries mainly target potential competitors trying to reach obstacles to prevent their entry into the domestic market, with main purpose to protecting domestic industries from imported competition.

Research on Anti-dumping has continued to evolve, and the recent literature has both extended to prior literature and taken it to new directions. The majority of the recent literature is responding to how Anti-dumping activity and its role in the world trade policy has evolved.

This study is an introduction in the use of the Anti-dumping mechanism, and an effort to explain the key factors and new issues under investigation. It is a work in progress aiming to give further support to recent evidence and make new propositions for further research. Our intention is to make an in-depth analysis of the correlation of the Anti-dumping mechanism with some key macroeconomic factors. The next step to this effort is to examine possible correlations among the use of the mechanism and the nominal GDP, the rate of GDP and the economic cycles. The correlation between merchandise export on specific group of countries and sectors will be studied.

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Bibliometric Analysis of Debt Financing Semiotics



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Abstract One of the biggest economic issues facing businesses today is indebtedness, which has a direct impact on an organizational performance. The best balance of equity and debt is the most crucial financial choice, and it has a big influence on an enterprise's financial performance. The primary external finance strategy employed by businesses is debt financing. Debt finance has significantly increased in recent years, which shows that businesses are expanding economically. The notion of indebtedness, which is connected to the fact that the firm largely employs foreign money to fund its assets, is tied to the issue of debt financing. Small enterprises often use less outside funding than large enterprises. Small ones have lower levels of debt because they get less foreign funding. The enterprise's attempts to boost cash during tough financial conditions are the reason for the lack of interest in external finance. The likelihood that an enterprise will use outside funding to support its operations increases with size. Despite the fact that these enterprises are more indebted, financial institutions view them as less hazardous, which improves their access to credit. The main aim of the paper is to make clarify the basic concepts associated with the issue of corporate debt. Prior to the actual analysis, a thorough review of the publications was carried out by locating the most pertinent authors, nations, and articles in the Web of Science database. The VOS Viewer, a tool for building and displaying bibliometric networks, was used to evaluate all the keywords that were required to build a bibliometric map in the field of indebtedness. Additionally, a study of the regularity of collaboration between authors and countries was conducted. According to the findings of the keyword co-occurrence study, debt and capital structure are the two terms that are most closely related, and China and the United States are the two countries with whom co-author relationships are most important.

Keywords Indebtedness · Debt financing · Debt management · Bibliometric map

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1 Introduction

The most significant financial choice that has an impact on a financial performance of the enterprise is selecting the appropriate combination of equity to debt. Debt is currently regarded as one of the most significant economic problems for enterprises, which indicates that the company needs foreign resources to finance its assets. In general, the total profitability of the enterprise is decreased if all of its assets are financed by equity. On the contrary, the financing of all corporate assets primarily by the foreign capital is associated with problems in obtaining them. Debt analysis thus deals with finding the optimal relationship between equity and debt. It is difficult to unequivocally state which financial source is ideal for a firm to finance its specific activity. Many professionals in the field of financial management have addressed this idea in the past and have developed a variety of concepts regarding the topic of capital structure. One of the most important managerial choices that indirectly impacts a corporate debt is choosing a suitable capital structure, i.e. choosing between equity, debt, or a combination of these financing forms.

Using bibliometric analysis, the primary aim of the research paper is to define the fundamental concepts connected to the issue of corporate debt. The analysis itself was preceded by a comprehensive review of the literature by identifying the most relevant authors, nations, and articles in the Web of Science database. The VOS Viewer, a software for constructing and visualizing bibliometric networks, was used to analyze all of the keywords that may be used to create a bibliometric map in the field of debt. To determine which countries have the strongest co-author links, an examination of the co-authorship between authors and countries was also conducted. The co-occurrence analysis, which describes the frequency and proximity of keywords occurring as well as the relationship between them, is used to summarize which keywords are most closely linked. Subsequently, co-authorship analysis was performed to identify an author in the collaboration network and to determine which countries developed the most significant international co-author relationships.

The research paper is divided into the following parts: the first section is focused on the literature review, which includes the most relevant and recent resources on the debt issue. The methodological processes of bibliometric analysis are briefly described in the second section, along with the selection of the most important research papers. The description of the results, which are widely discussed, is detailed in the section of this paper that follows. The fourth section summarizes the results in the context of other relevant studies, which have highlighted the importance of monitoring debt relief for enterprises. The conclusion of this paper highlights the limitations and future research in addition to summarizing the results of this research.

2 Literature Review

An essential part of economic and non-economic activities that lead to decisions on the efficient procurement and use of finance in a profitable way is financial management, which is an integral part of the overall management. However, financial management primarily concerns the responsibilities of financial managers in the enterprise. The most popular and acceptable definition of financial management is the definition by Kuchhal (1988), according to which financial management deals with the procurement of funds and their effective use in the enterprise. One of the most crucial parts of financial management is the issue of corporate financing, which is defined as operating activities associated with the obtaining and efficient use of funds necessary for the efficient operation of the enterprise (Kral et al. 2021). Business financing is defined as obtaining financial resources in any form that are very important for the proper management of a business. It is required for carrying out business activities, purchasing goods, and reimbursing expenses associated with the operation of the enterprise (Fernandez 2021). In general, an enterprise receives funding from many sources depending on its availability and its existing capital structure. The financial resources from which the capital comes determines the size and structure of the capital itself (Hussain et al. 2020).

Choosing between equity, debt, or a combination of these forms of financing is one of the most difficult managerial decisions that indirectly affects the debt of the enterprise. It is not possible to say unequivocally which financial source is suitable for an enterprise to finance a particular activity (Goyvaerts and Roggeman 2020). In the past, the basic question of the existence of a unique combination of debt and equity, that would also maximize the value of the enterprise, has become the subject of frequent discussions in professional literature. The optimal ratio of internal and external resources in the enterprise can also help optimize the cost of obtaining additional capital. Foreign resources are generally considered cheaper than their own, and therefore, there is still a tendency to borrow funds to finance the activities of a business unit. The use of foreign capital to finance the business activities of the enterprise is connected primarily with debt financing, which is associated with the use of a loan or bond issue to obtain a sufficient amount of funds for doing business (Valaskova et al. 2021). The main reasons for using debt financing include obtaining additional working capital, the purchase of assets, and the acquisition of other entities. It is true that after obtaining a certain amount of debt, the enterprise is obliged to repay the funds (Durana et al. 2021). Kramolis and Dobes (2020) declared that debt financing in the short term is most often used to raise working capital, while long-term debt financing is mainly associated with obtaining corporate assets. A debt of the enterprise can take many forms, each indicating a commitment to repay the amount due by a pre-agreed date.

If an enterprise uses debt to a greater extent to finance its activities, it needs to use good debt management. Ekhsosueh and Omoregie (2021) stated in their publication that debt management is an approach used to guide an individual or a business organization in the management of corporate debt. This definition of debt management

included primary debt settlement, debt consolidation, personal loans, bankruptcy, and many other techniques that help companies resolve outstanding debts. According to Lindgren (2021), this approach was defined as the undertaking's attempt to bring the debt of the enterprise under control, thereby making it liable for the related liabilities. In general, it can be argued that debt management is a measure taken by an enterprise to reduce its debt burden (Greene et al. 2021) or a strategy aimed at eliminating debt using acceptable payment terms (Chiu et al. 2021). In the results of its study, Subagyo (2021) pointed out that high debts can lead to a decline in the value of the enterprise. Beyer and Dye (2021) added that debt has a positive effect on the growth of the value of the enterprise only if the debt ratio exceeds a certain set level, which can also make it vulnerable. Kukk (2021) stated in his publication that a high level of debt increases the probability associated with the financial problems and indebtedness of the enterprise. Indebtedness is also associated with many indebtedness indicators, which inform about the level of indebtedness of the enterprise and its ability to bear it (Tousek et al. 2021). These indicators are used to monitor the structure of the financial sources of the enterprise because the proper share of equity and debt financing affects its overall financial stability (Krulicky and Horak 2021). A high share of equity financing makes the enterprise stable, and independent, and thus creates a precondition for greater financial independence of the enterprise (Rowland et al. 2021). Conversely, if the equity financing is low, the enterprise is unstable, and market fluctuations can have serious negative consequences. In general, equity is more expensive for a business because the owners expect a higher valuation, and their valuation is paid out in dividends. This is mainly related to the risks they take (Hudakova et al. 2021). Although debt financing is cheaper, its excessive use may jeopardize the overall existence of the business entity in the market (Virglerova et al. 2021).

3 Methods

Due to information and communication technologies, it is possible to observe an increasing interest in bibliometric analysis nowadays. Large amounts of data may be processed using it, and it provides bibliometric maps as a way to visualize the results (Zyoud et al. 2015). Bibliography knowledge is gradually becoming part of the decision-making processes, and this knowledge may be helpful for scientists themselves in carrying out their research activities (De Bellis, 2009). A quantitative examination of bibliographic data is known as bibliometric analysis. It gives a broad overview of the research area, which may be categorized based on articles, authors, and journals (Merigo and Yang 2017). The first science citation index was described by Garfield (2006), and publishing in the online collection of Web of Science databases was taken into consideration. The Web of Science has provided sufficient data for this research paper despite the limitations of using only one database. The Web of Science is still the primary citation database that provides access to the top scientific literature in the world (Gopikuttan and Aswathy 2014),

despite the fact that it is no longer the only database that offers indexation of social science citations and publications (Norris and Oppenheim 2007). Due to its high quality and ability to filter individual searches using various bibliographic criteria, the Web of Science database is the best choice (Tretyakova 2021).

These methodological steps are often used to perform bibliometric analysis. Identifying the primary search parameters, search time, and keywords is the first step. Following this, the appropriate database must be chosen since it is necessary to build the input file and then modify the search criteria. The creation and analysis of the bibliometric map itself, as well as the export of the search results required for the last step, are both necessary (Durana et al. 2020). In a bibliometric map, individual items are represented by an inscription and, by default, a circle. The size of the items is determined by their weight. The size of the inscriptions and circles increases with the item weights. Due to label overlap for some items, the label may not be displayed. A line between items is a link whose strength is a positive numerical value denoting the number of publications in which two keywords appear simultaneously. The color of an item is defined by the cluster to which it belongs, and the lines connecting the items represent linkages. Total Link Strength, which is provided automatically by VOS Viewer during the keyword occurrence mapping, determines how these keywords are linked together (Van Eck et al. 2010). The stronger the relationship between the keywords, the higher this value.

Debt, debt management, and debt financing were the keywords for searching articles published in the database. Subsequently, it was crucial to identify publications from the scientific database. A total of 5,700 documents can be considered the result of a keyword search in the Web of Science database. These results have been further adjusted in accordance with the following defined criteria for this paper, while in the next step, the database generated documents published in the monitored period 2005–2021. The final search results with all available information contained 4,707 documents. This data contained complete information, such as names of individual authors, titles of journals, types of documents, language in which the articles were written, keywords, cited reference counts, countries and publishers, etc. Finally, the bibliometric map was created in the VOS Viewer program using the search results.

On the basis of publications, bibliographic citations, and publications, it was able to evaluate historical developments in the assessment of indebtedness of commercial organizations operating in the market, identify the most common problems with debt analysis in the global context, and reveal hidden relationships between authors and debt analysis and visualize their mutual links.

4 Results

The issue of corporate indebtedness first appeared in the Web of Science database in 1903. Until 2005, up to 50 publications per year have been published in the database, with publications on corporate debt beginning to increase in the database after 2005, which was chosen as the base year for this research paper. The number of published

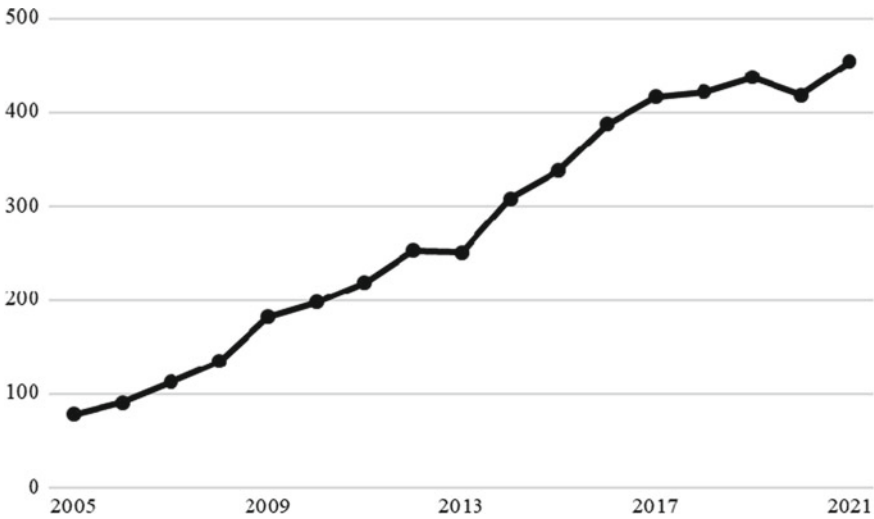


Fig. 1 Annual growth of documents in the monitored period 2005–2021

documents related to debt and debt management issues has been gradually increasing in the Web of Science database since 2005. Figure 1 shows the increase in publications in the professional literature in each year of the monitored period 2005–2021. The number of publications in the database stagnated slightly in 2012, but after 2013, there was a sharp increase in published documents on the issue of corporate debt. There was a slight decrease in 2020, which was probably caused by the outbreak of a coronavirus pandemic, but the following year brought the historically highest number of published documents in the database, reflecting the problem with debt management in enterprises in the post-covid period.

The following types of documents were published in the Web of Science database during the period under review, and the research results are summarized in Table 1. Articles published in a scientific journal represent the largest share (up to 81.6%) of all documents in the period 2005–2021. Articles were followed by proceedings papers, which primarily included contributions in proceedings of conferences, and 14.6% were published in the period under review. One of the least frequent types of published documents are reviews, which include reviews of past literature, editorial materials that provide views of individuals, groups, or organizations, book reviews, and corrections that correct errors found in published articles.

Monitoring the most frequently used keywords in documents related to the issue of debt financing with a minimum occurrence of five publications generated 1012 items in the bibliometric map divided into 8 clusters. The bibliometric map is a part of Fig. 2.

The first cluster (red) contained 317 items and included the keywords accounting, borrowing, capital, credit, debt, economic policy, indebtedness, financial management, loan, savings, risk-factors, share, unemployment, etc. The second cluster

Table 1 Types of documents in the monitored period 2005–2021

Document type	Frequency	Percent
Article	3839	81.6
Proceedings Paper	685	14.6
Review	70	1.5
Editorial Material	68	1.4
Book Review	39	0.8
Correction	6	0.1

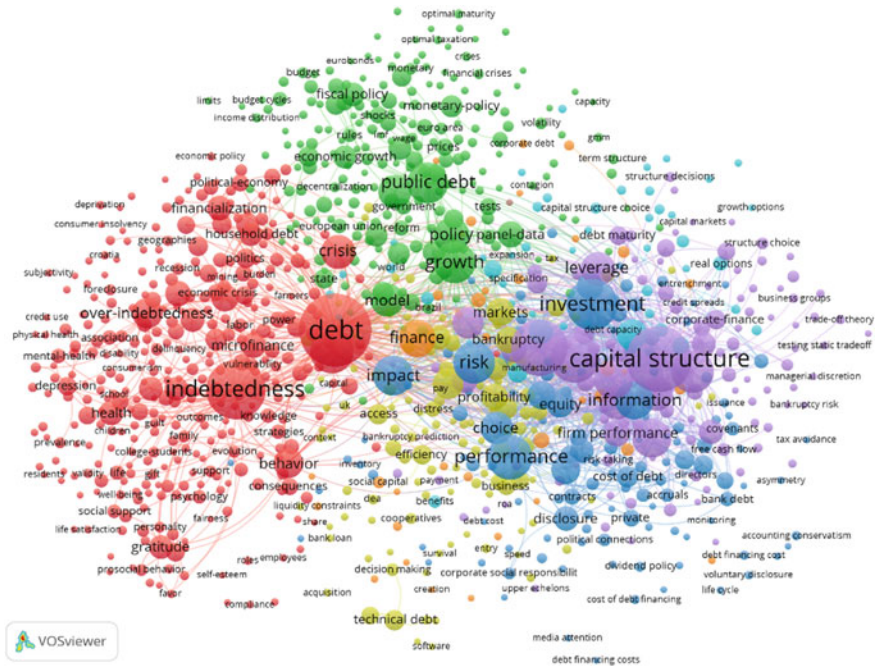


Fig. 2 Network visualization of all keywords related to the issue of corporate debt

(green) contained 235 items, which included balance sheets, capital market, corporate debt, debt crisis, debt management, external debt, globalization, interest rate, leverage ratio, mortgage, risk management, volatility, etc. The third cluster (blue) consisted of 137 items which included keywords such as bankruptcy risk, capital structure, cash flow, corporate performance, debt financing, equity financing, financial analysis, firm performance, firm value, investment, etc. The fourth cluster (yellowish-green) was formed of 127 items and included keywords such as business, cost of debt, credit rating, debt structure, earnings management, intangible assets, long-term debt, market equilibrium, short-term debt, etc. The fifth cluster (purple) was composed of 108 items, including keywords such as bank financing,

bankruptcy prediction, corporate finance, decision making, discriminant analysis, financial indicators, financial ratios, firm age, firm size, logistic regression, small and medium-sized enterprises, solvency, etc. The sixth group (turquoise) consisted of 34 items and included keywords such as acquisition, economic development, financial sustainability, impact, indicators, investments, sector, strategies, vulnerability, etc. The seventh cluster (orange) contained the same number of items as the sixth cluster, and 34 items included keywords such as allocation, choices, corporate financing, private equity, private companies, real estate, property, rating, small business, structure decisions, etc. The last cluster (brown) contained 20 items that included keywords such as discrimination, diversification, entrepreneurs, financial structure, firm growth, internationalization, regression analysis, return on assets, shareholder value, size, specification, etc.

Thus, a large number of keywords were used in published articles related to the issue of indebtedness in the Web of Science database. Table 2 summarizes the most frequently used keywords in publications in the monitored period of 2005–2021, with the minimum keyword occurrence set at one hundred.

In general, in a bibliometric map, individual items are represented by an inscription and a circle. The weight of the items determines their size. The higher the weights of the items, the larger the inscriptions and the circles. The color of an item is determined by the cluster to which the item belongs, and lines between the items represent links whose strength is a positive numerical value representing the number of publications in which two keywords occur at the same time. The higher this value, the stronger the relationship between the keywords. From the bibliometric map created, which is part of Fig. 3, it is clear that the most linked keywords are debt and capital structure.

The issue of debt financing is attractive worldwide, as evidenced by the analysis of published documents by regions of the world, and it is summarized in Table 3. The

Table 2 The most frequently used keywords with the minimum occurrence of one hundred times in the monitored period 2005–2021

Keyword	Number of occurrences	Keyword	Number of occurrences
Debt	516	Impact	161
Capital structure	426	Corporate governance	156
Indebtedness	358	Public debt	155
Determinants	315	Information	148
Investment	261	Finance	132
Debt financing	233	Policy	129
Performance	203	Firms	117
Credit	187	Leverage	114
Risk	178	Crisis	114
Growth	173	Debt management	113

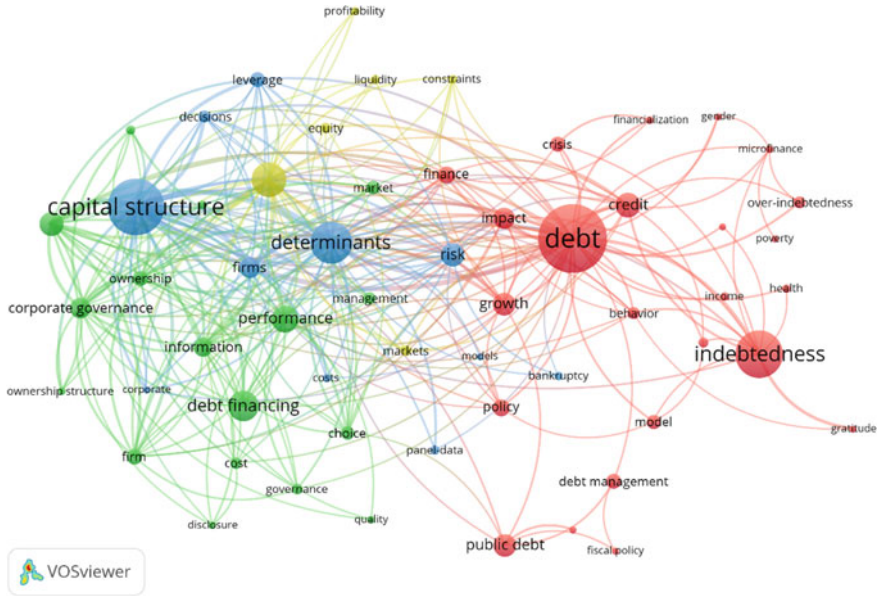


Fig. 3 The most frequently used keywords with the minimum occurrence of one hundred times in the monitored period 2005–2021

table shows that most articles dealing with debt were published in the countries of the Americas. More than 35% of documents were published there in the monitored period 2005–2021, and about 20% of the research papers have been published in the Western European region and the Asian region. The least of all publications (less than 2%) were published in the African region.

Another bibliometric map shows a network visualization between 108 countries of international co-authorship. Again, the individual items are determined by the inscription and, by default, the circle. The more crucial a country is, the bigger its label and circle. The size of each circle shows the number of documents written by authors from that country. Any connection between two circles of different countries indicates that co-authorship exists between the organizations in those countries. The bibliometric map consisted of 19 clusters and is shown in Fig. 4. There are significant

Table 3 The number of documents by region of the world in the monitored period 2005–2021

Region	Frequency	Percent
Countries of the Americas	1706	36.2
Western European region	992	21.1
Asian region	964	20.5
Central and Eastern European region	523	11.1
Eastern Mediterranean region	440	9.3
African region	82	1.7

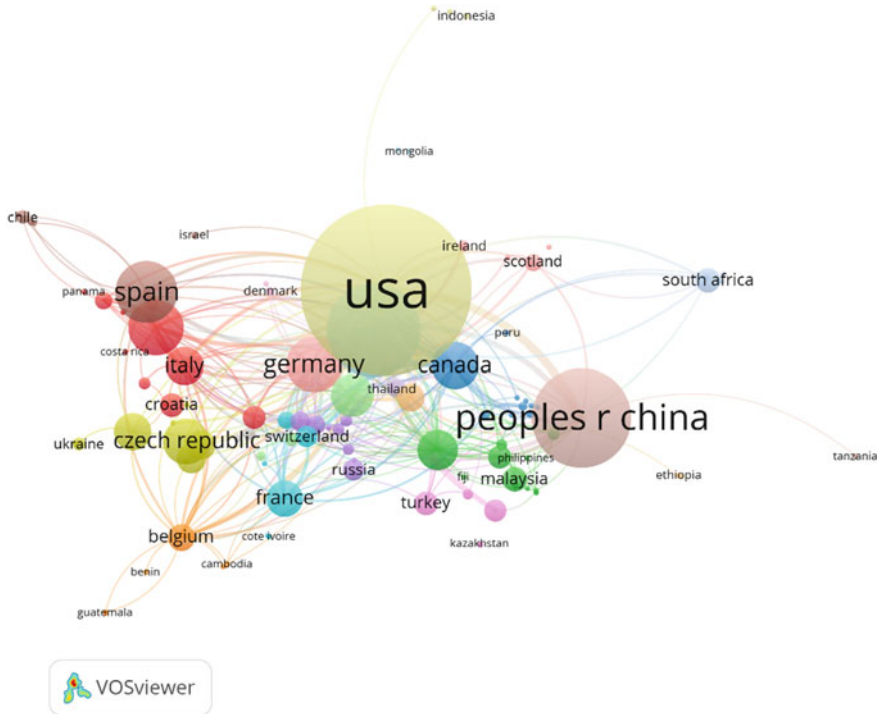


Fig. 4 Network visualization of all countries, where the issue of indebtedness is presented in the monitored period 2005–2021

international co-author relations between all countries, despite most publications being created in cooperation between the United States and China (3.96%), between the United States and England (3.80%), and between the United States and Canada (2.48%).

The bibliometric map shows that the issue of corporate debt is being addressed in many countries around the world. The countries most researched in their scientific articles on corporate debt are summarized in Table 4. The United States is the country with the most debt finance publications in the monitored period 2005–2021 because more than 20% of all documents were published in this country. Likewise, the United States has the highest ratio of document citations in the country of all documents. The Total Link Strength value refers to the number of publications created in collaboration with another country, and in the United States, reached the value of 360. As a result, three hundred and sixty cooperatives were formed with the given country. China and India from the Asian region, England, Spain, Germany and the Czech Republic from the European region, Brazil and Canada from the American region, as well as Australia, are the leading countries in the number of publications on debt financing.

Table 4 The most frequently dealing countries with debt issues in the monitored period 2005–2021

Country	Number of documents	Percent	C/D	TLS
United States	984	20.9	17.8	360
China	469	10.0	7.6	160
England	435	9.2	14.0	271
Spain	246	5.2	7.0	82
Germany	212	4.5	10.7	120
Brazil	211	4.5	3.6	52
Canada	167	3.5	12.7	117
Czech Republic	166	3.5	2.3	25
India	148	3.1	5.5	58
Australia	140	3.0	8.6	86

Note C/D Number of citations per document (calculated as the ratio of the number of citations of documents to the number of all publications), TLS Total Link Strength

Documents published in the Web of Science scientific database reached 72,127 citations in the monitored period 2005–2021, or 42.7 per document, while the most cited publication reached 493 citations.

5 Discussion

The financing process is a complex task of financial management that is based on knowledge of the environment of the enterprise, which directly affects it. The right choice between equity financing, foreign capital, or a combination of these is one of the most difficult managerial decisions of financial managers, which ultimately indirectly affects the indebtedness of the enterprise.

The bibliometric analysis results show that the most frequently used keyword associated with the issue of corporate debt is the word debt, which appeared in publications in the time horizon 2005–2021 five hundred and sixteen times. It can be argued that about 10 percent of publications had the word debt listed as one of their keywords. Debt, which is defined as the amount of money to be repaid, is also the result of the most frequently used keywords through a bibliometric analysis by Rusydian (2021). This study looked at the impact of the coronavirus pandemic on finances, which were heavily affected by the current pandemic. The result of the bibliometric analysis was that debt was one of the most frequently used keywords in the researched articles. The issue of debt financing, which is a debt that an enterprise must repay within a certain time horizon, is also associated with debt. According to Capie and Wood (2021), debt is an outstanding monetary obligation to other entities. The keyword debt financing is considered one of the most frequently used in our bibliometric analysis results because it has appeared in publications two hundred

and thirty-three times. Debt financing is associated with the financing of corporate activities based on foreign capital and is used by enterprises during the period when their capital enterprise is insufficient. It is a cheaper form of financing compared to equity financing because of the reduction in tax paid due to interest (Gregory 2020). The use of foreign capital represents financial leverage that can increase the return on the equity of the enterprise (Roszko-Wojtowicz and Grzelak 2021).

The management of the capital structure of the enterprise is a crucial task of financing the company, i.e. deciding on the representation of individual forms of equity and debt in the total financial coverage of corporate assets. The capital structure of the enterprise characterizes the share of equity and debt in the total capital. (Xu et al. 2021). The term capital structure is the second most frequently used keyword, which was mentioned in the documents dealing with the issue of corporate indebtedness in the time horizon 2005–2021. The keyword capital structure reached a total of four hundred and twenty-six occurrences in individual published documents during this time horizon. Hassan et al. (2021) dealt with a similar bibliometric analysis with a direct focus on one journal of economics. Their study analysed the performance of the journal, its citation structure, as well as the network of keywords using a bibliometric approach. The result of the study is that one of the most crucial topics discussed in this journal is the issue of capital structure. An analysis of the performance of the journal over the past 29 years has highlighted the fact that the top authors of each article are affiliated with the United States and China, which is consistent with the results of our research.

Decisions about the capital structure are essential for increasing the value of the enterprise. In general, every business entity in the market should develop a strategy of combining equity and debt that will subsequently increase its value (Ellili 2020). The value of each enterprise is affected by its performance, which is a crucial part of every business entity operating in the market (Sumiati 2020). The keyword performance can also be classified as one of the most frequently used keywords in publications focused on the indebtedness of enterprises operating in the market. In the results of the bibliometric analysis, the occurrence reached the level of two hundred and three times, which classifies it as the seventh most frequently used keyword associated with the issue of corporate debt. Many authors have studied the impact of various factors on business performance in the past (Pham and Nguyen 2020). Pereira et al. (2021) pointed out in their study that the performance of the enterprise is significantly affected by the firm age, the value of its total assets, and, last but not least, the debt of the enterprise. At the end of their research paper, Teplicka et al. (2019) pointed out the connection between corporate performance and its indebtedness. Forte and Tavares (2019) pointed out that the impact of debt on corporate performance depends to a large extent on the debt itself: short-term debt has a positive effect on corporate performance, while long-term debt has a negative effect on corporate performance.

The most major decision that has a significant impact on the financial performance of the enterprise is the choice of the right mix of equity and debt (Sumani and Roziq 2020), which is primarily addressed by debt analysis closely related to the indebtedness of the market operator (Ma and Xu 2020). The keyword indebtedness is the third most frequent word, occurring three hundred fifty-eight times in documents

published over a time horizon of 16 years, which primarily focused on indebtedness as a key problem for companies operating in the market.

The concept of indebtedness is encountered frequently, especially in the context of the determinants of the indebtedness of the enterprise itself. The keyword determinant is at the forefront of publications related to this issue, as it has appeared three hundred and fifteen times in the examined documents. The indebtedness of the enterprise is influenced by determinants that affect the composition of the corporate capital. The first factor influencing the financing of an enterprise is firm size, which determines its financial structure. Gezici et al. (2020) stated that small businesses have limited access to obtain a bank loan. In general, small businesses obtain foreign capital in smaller quantities, i.e. achieve foreign sources of financing at a higher cost, than large enterprises, and the result is primarily their lack of interest in external forms of financing. Other factors influencing the indebtedness of the enterprise are the size and stability of the realized profit (Cui 2021), its property structure (Li and Shiu 2021), the industry (Tsolas 2021), and many others.

In general, an enterprise with a bad financial situation should not think about increasing debt at all. The main aim of this enterprise should be to resolve the poor financial situation, which can lead to the bankruptcy of the company itself. Every enterprise with problems in insolvency, low profit or loss, and low liquidity should consider any additional debt financing.

In the last years of the nineteenth century, countries such as Italy, the United Kingdom, and Germany were at the forefront of the rankings in the broadest number of research and related publications. The United States became a leader at the beginning of the twentieth century and remained at the top for more than 90 years. China came to the fore in the 1990s, publishing approximately half a million scientific publications in 2016 (Isfandyari-Moghaddam et al. 2021). There are essential international co-author relations between the two countries, as almost 4% of all publications published during the period under review were created in collaboration between the two countries. Vagner et al. (2021), Kostenko et al. (2021), da Silva and de Souza (2021), and others, also pointed to many publications in the field of financial management in bibliometric analysis.

6 Conclusion

Bibliometric analysis is a discipline in which the research work described in the scientific literature is evaluated by measuring indicators. It helps to identify the most active and cited authors and institutions, the most relevant publications, and the most used keywords within the research area. Based on the results of the created bibliometric maps, the indebtedness of market business entities is closely associated to the terms debt and capital structure. Several authors who used these linked keywords in their papers discussed historical developments in the scientific field as well as the linkages between the keywords. The researched issue was the most widespread in the

USA in the monitored period of 2005–2021. Important international co-author relations have developed with the United States, between the United States and China, the United States and England, and between the United States and Canada.

The results of this study are useful for investors, lenders, as well as business entities. It will also help the financial managers to identify their optimal capital structure in order to maximize the value of the firm and to minimize the indebtedness ratio. The following limitations have to be emphasized notwithstanding the contribution of this paper to the existing literature. In order to allow for greater generalization and applicability, it would be interesting to examine the relationships between the various corporate debt-related terms across a longer time horizon than set out in this paper. The use of one scientific database (only the Web of Science database) can be seen not only as a limitation of research but as a challenge for its subsequent direction.

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Measuring the Trade Performance of States



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Abstract The aim of this article is to study indicators that measure the trade performance of states. The study of these indicators will reveal the productive model of each national economy in relation to comparative advantages in high, medium–high, medium–low and low technology sectors, as well as the competitiveness of the countries’ exports at the international level. In order to study these objectives, we adopt the methodology of the theory of comparative advantage. The theory of comparative advantage is at the core of the Neoclassical theory of trade. David Ricardo was the first to formulate the concept of comparative advantage in the nineteenth century, in order to explain which the benefits are for all countries that participate in international trade (O’Brien and Williams, 2016, p. 104). Measuring the comparative advantages of national economies is a difficult task. Economists have developed specific criteria for measuring comparative advantage. The most widely known and most traditional measurement criterion is the Revealed Comparative Advantage (RCA) index, formulated by Balassa in 1965 (World Trade Organization. (2012). *A Practical Guide to Trade Policy Analysis*, WTO., p 26). However, this article also discusses a number of indicators developed by the World Bank for the study of trade relations. The analysis of the article focuses on the countries under review, i.e. Germany, Greece, the US, and China, for the last decade (2011–2021).

Keywords Global Political Economy · International Trade · Indexes · Economic Globalization

JEL Classification Codes F1 · F14 · F4

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1 Introduction

The aim of this article is to study indicators that measure the trade performance of states. The study of these indicators will reveal the productive model of each national economy in relation to comparative advantages in high, medium–high, medium–low, and low technology sectors, as well as the competitiveness of the countries' exports at the international level. In order to study these objectives, we adopt the methodology of the theory of comparative advantage. The theory of comparative advantage is at the epicentre of neoclassical theory of trade. David Ricardo was the first to formulate the concept of comparative advantage in the nineteenth century, in order to explain the benefits for all the countries that participate in international trade (O' Brien and Williams 2016: 104).

Measuring the comparative advantages of national economies is a difficult task. Economists have developed certain measures to measure comparative advantages. The most widely known and traditional measure is the *revealed comparative advantage* (RCA) index that was formulated by Balassa in 1965 (World Trade Organization 2012: 26). That said, this article also analyses a series of indices developed by the World Bank with the purpose of studying commercial relations, i.e, the Liner Shipping Connectivity Index and the Logistics Performance Index. The countries under review are Germany, Greece, the US, and China, for the period 2011–2021.

2 The Comparative Advantage Approach

International trade is a major force of the global economy. Following the manifestation of the international economic crisis, various positions have been developed in regard to the negative effects of international trade. The International Monetary Fund, the World Bank, and the World Trade Organisation published a report titled: *“Making Trade and Engine for Growth for All: The Case for Trade and Policies to Facilitate Adjustment, (International Monetary Fund, World Bank and World Trade Organization 2017)*. Figure 1 illustrates the positive effects of international trade on both developed and developing economies, as there is a positive correlation between imports and GDP. The decline in international trade following the onset of the global financial crisis in 2007 is reflected on both imports and GDP.

Comparative advantage is the theoretical background for studying the benefits of international trade. In particular:

Specialization in accordance with comparative advantage promotes efficiency since, by definition, a small market is an obstacle to growth. Ricardo's theory provides the basic principles underlying modern trade theory. (O' Brien and Williams 2016: 104).

Revealed comparative advantage (RCA) index is the traditional approach to reveal comparative advantage. Bela Balassa defines Revealed Comparative Advantage in his article (1965) titled: *“Trade Liberalization and “Revealed Comparative Advantage”*:

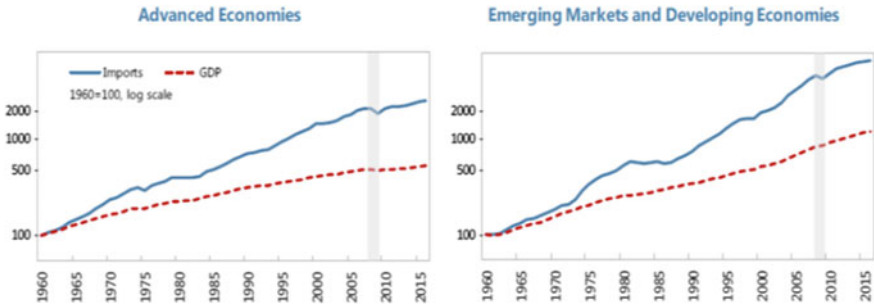


Fig. 1 International trade and GDP 1960–2016. *Source* (International Monetary Fund, The World Bank and World Trade Organization 2017, p.8)

The export performance of individual industries in a particular country can be evaluated by (a) comparing the relative shares of a country in the world exports of individual commodities, and (b) indicating changes in relative shares over time. (Balassa 1965: 105).

More specifically, according to the World Trade Organization, RCA is:

A Ratio of Product *k*'s Share in Country *i*'s Exports to Its Share in World Trade. Formally,

$$RCA_k^i = \frac{X_k^i I X^i}{X_k I X}$$

where X_k^i is country *i*'s exports of good *k*, $X^i = \sum_k X_k^i$ its total exports, $X_k = \sum_i X_k^i$ world exports of good *k* and $X = \sum_i \sum_k X_k^i$ total world exports. A value of the RCA above one in good (or sector) *k* for country *i* means that *i* has a revealed comparative advantage in that sector. RCA indices are very simple to calculate from trade data and can be calculated at any degree of disaggregation. (World Trade Organization 2012: 26)

In order to analyse revealed comparative advantage of the countries under review as regards a certain group of products, the Harmonised System of the World Customs Organisation is adopted, which is described as follows:

The Harmonized Commodity Description and Coding System generally referred to as 'Harmonized System' or simply 'HS' is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). It comprises about 5,000 commodity groups; each identified by a six digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 200 countries and economies as a basis for their Customs tariffs and for the collection of international trade statistics. Over 98% of the merchandise in international trade is classified in terms of the HS. The HS contributes to the harmonization of Customs and trade procedures, and the non-documentary trade data interchange in connection with such procedures, thus reducing the costs related to international trade. It is also extensively used by governments, international organizations and the private sector for many other purposes such as internal taxes, trade policies, monitoring of controlled goods, rules of origin, freight tariffs, transport statistics, price monitoring, quota controls, compilation of national accounts, and economic research and analysis. The HS is thus a universal economic language and code for goods, and an indispensable tool for international trade. (World Customs Organization 2022).

For the purposes of analysing revealed comparative advantage we have selected three sectors that require high, or medium–high technology. These sectors are: (1) [764] Telecommunication equipment and parts; (2) [792] Aircraft and associated equipment; spacecraft; and (3) [871] Optical instruments and apparatus. The study of these sectors will reveal the export potential of the countries under review, in industries that require high-technology concentration. First, in Table 1 the study of the data pertaining to “Telecommunication Equipment and Parts” shows that China enjoys a revealed comparative advantage in this sector, as it gets scores greater than 1. The remaining countries under review get scores below 1 in all reference years, and enjoy no revealed comparative advantage in this sector.

Table 2 analyses the data pertaining to sector [792] “Aircraft & associated equipment; spacecraft.” We can see in this specific sector Germany enjoys an RCA in all reference years. Moreover, in 2011 Greece’s score was greater than 1, therefore the country enjoyed an RCA, but in subsequent years its score was less than unity. Moreover, the US gets a score less than unity in all reference years. Unlike in the previous sector, China does not enjoy an RCA, and, in fact, gets the lowest score for the year 2020 among the countries under review.

Table 3 analyses the RCA of the countries under review in sector [871] “Optical instruments & apparatus.” As shown by the data of this Table, China enjoys an RCA

Table 1 Revealed comparative advantage in category [764] telecommunication equipment and parts

Countries	[764] Telecommunication equipment and parts										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	0.44	0.45	0.42	0.40	0.35	0.38	0.41	0.43	0.46	0.44	–
Greece	0.39	0.37	0.26	0.26	0.25	0.24	0.24	0.21	0.20	0.27	–
US	0.91	0.87	0.86	0.84	0.77	0.76	0.85	0.80	0.78	0.75	–
China	3.03	3.02	2.97	2.96	2.76	2.82	2.87	3.04	2.86	2.65	–

Source (UNCTADSTAT 2022a)

Table 2 Revealed Comparative Advantage in category [792] Aircraft & associated equipment; spacecraft

Countries	[792] Aircraft & associated equipment; spacecraft										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	2.98	3.29	3.07	2.62	2.59	2.50	2.48	2.52	2.64	2.47	–
Greece	1.05	0.61	0.37	0.17	0.36	0.23	0.12	0.08	0.07	0.14	–
US	0.58	0.69	0.63	0.67	0.63	0.70	0.55	0.49	0.58	0.79	–
China	0.10	0.08	0.08	0.10	0.11	0.11	0.13	0.17	0.14	0.11	–

Source (UNCTADSTAT 2022a)

Table 3 Revealed comparative advantage in category [871] optical instruments and apparatus

Countries	[871] Optical instruments and apparatus										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	0.41	0.37	0.40	0.42	0.42	0.51	0.62	0.69	0.76	0.77	–
Greece	0.06	0.15	0.21	0.20	0.27	0.14	0.11	0.16	0.34	0.47	–
US	0.40	0.35	0.38	0.43	0.44	0.54	0.52	0.62	0.67	0.72	–
China	2.99	3.21	3.14	2.84	2.75	2.88	2.68	2.63	2.83	2.55	–

Source (UNCTADSTAT [2022a](#))

in this sector in all years under review, its score, however, slightly decreasing. No other country enjoys an RCA in this category, the worst performer being Greece as compared to Germany and the US.

As shown by the study of RCA in three sectors of the economy, China is the top performer, since it enjoys a revealed comparative advantage in two out of three sectors, followed by Germany, which enjoys RCA in one out of three sectors, while Greece and the US do not have an RCA in any sector. The following section discusses the indices used by the World Bank to study international trade.

3 World Bank International Trade Indicators

The World Bank has developed a series of indicators designed to study each country's trade relations and their various aspects. These indicators analyse the trade competitiveness of each national economy. Trade performance is analysed by the World Bank along the lines of four key dimensions: (a) the composition, orientation, and growth of exports and imports; (b) the degree of export diversification across products and markets; (c) the level of sophistication of a country's main exports; and (d) the survival rate of its export relationships (World Bank [2022a](#)). More specifically, the World Bank has developed the World Integrated Trade Solution (WITS):

The World Bank—in collaboration with the United Nations Conference on Trade and Development (UNCTAD) and in consultation with organizations such as International Trade Center, United Nations Statistical Division (UNSD) and the World Trade Organization (WTO)—developed the World Integrated Trade Solution (WITS). This software allows users to access and retrieve information on trade and tariffs. (World bank [2022b](#)).

Table 4 summarises the World Bank indicators that are discussed below. The classification of indicators in different pillars aims at revealing the states' commercial capabilities in the context of international trade relations. The trade indicators studied by the World Bank are presented below.

This section discusses certain World Bank indicators. The criterion for selecting each of those indicators is to provide a representative image of the World Bank pillars. The analysis of the indicators follows the sequence of the pillars presented in Table

Table 4 World bank indicators—world integrated trade solution

A) Orientation and growth	B) Export diversification	C) Export sophistication	D) Survival of export relationships
1) Exports, imports, and trade balance	1) Number of products and markets	1) Technological classification of exports	1) Export duration
2) Openness to trade	2) Herfindahl–Hirschman product concentration index	2) Sophistication of exports (EXPY)	2) Export suspension and factor endowments
3) Sectoral composition, comparative advantage, and growth	3) Herfindahl–Hirschman market concentration index	3) Export portfolio and factors endowments	3) Decomposition of export growth along margins of trade
4) Primary products, shares, and growth	4) Growth orientation of products		
5) Market composition and growth	5) Growth orientation of markets		
6) Growth in value versus volume	6) Value reach of exports		
7) Trade intensity index (TII)	7) Index of export market penetration (IEMP)		
8) Trade complementarity index			

Source: (World bank 2022a)

4. First, we study trade as a percentage of GDP, a ratio that measures the openness of an economy to trade. This index falls under the first pillar of World Bank indicators, which pertains to trade orientation and growth. The study of Fig. 1 shows that there is a positive correlation between trade growth and GDP.

The study of Table 5 shows the degree of openness of the economies under review. It is obvious that Germany outperforms all other economies, and this demonstrates the country’s strong export orientation. In 2020, Germany was ranked third in the world in terms of exports, following China and the United States (CIA, The World Factbook 2022). As regards this indicator, Greece is ranked second among the countries under review. As it is well-known in international trade theory and the gravity model, small economies are more dependent on international trade than large economies, and this helps explain Greece’s increased trade-to-GDP ratio (Salvatore 2017, p. 5). China is ranked third among the countries under review, its performance having deteriorated as compared to 2011, from 50.74 to 34.50 in 2020. Finally, the US is the worst performer in terms of the trade-to-GDP ratio, and this is explained by the large size of its economy, as discussed above in the case of Greece.

The first pillar of World Bank indicators, which pertains to trade orientation and growth, also includes the Export Volume Index. The Indicator has a value of 100 for

Table 5 Trade-to-GDP

Countries	Trade-to-GDP										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	85.20	86.51	85.07	84.62	86.24	84.77	87.23	88.43	87.6	81.10	–
Greece	56.83	62.06	62.87	66.52	65.27	64.01	71.57	80.15	81.99	71.58	–
US	30.95	30.79	30.10	30.03	27.76	26.51	27.15	27.47	26.29	23.37	–
China	50.74	48.26	46.74	44.90	39.46	36.89	37.63	37.56	35.89	34.50	–

Source (World bank [2022c](#))

the year 2000, and this helps evaluate the growth of a country’s trade relations in the following years in terms of exports, thus assessing the export dynamism of each national economy, as shown in Table 6.

The export volume index demonstrates that all countries under review have increased the volume of their exports as compared to the year 2000. That said, China’s case is the most characteristic, as its trade volume has been rapidly growing since 2000, standing at 803.01 in 2020. Greece is ranked second in 2020 among the economies under review, with an index value of 211.86, its performance significantly improved during the period 2011–2020. Following its entry into the Tripartite Support Mechanism Greece turned to exports as a means of responding to the effects of the recession on the Greek economy (Roukanas 2016; Roukanas and Sklias 2018). The US is ranked third among the countries under review, with an index value of 149.58 in 2020, which is clearly improved as compared to the year 2010, albeit also reflecting the impact of the COVID-19 pandemic as compared to the previous years, Germany is the last among the countries under review as regards this index. Although Germany improved its export performance compared to the other economies under review, the value of the index in its case also reflects the impact of the COVID-19 pandemic (Kotios and Roukanas 2021).

Among World Bank indicators of the second pillar, which pertains to export diversification, we will first examine the Herfindahl–Hirschman Market Concentration Index. This indicator reflects a national economy’s dependency on, and, by extension, vulnerability to, other markets. The closer the value of the index is to 1, the more concentrated a country’s exports are to a small number of markets. As we can see by studying Table 7, all countries under review get values that are much lower than 1, and therefore their dependency on foreign markets is very limited. Moreover, we can see that Germany’s performance converges with that of Greece, and the same stands for the performance of the US and China.

The Index of Export Market Penetration studies the exports of a country in already proven markets and also falls under the second pillar, which pertains to export diversification. A drop in the value of the IEMP is connected with the adoption of barriers to trade. As shown by the study in Table 8, China receives the highest IEMP value, which was, nonetheless, reduced in 2019 as compared to the previous years, according to the latest available data. A country’s performance is linked to the size of its economy.

Table 6 Export volume index By Country

Countries	Export volume, (2000 = 100)										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	146.22	145.47	144.59	147.11	151.03	151.93	156.84	158.12	153.93	138.96	–
Greece	140.63	154.81	157.39	161.76	170.19	180.77	186.33	201.44	206.70	211.86	–
US	142.55	148.07	151.89	156.65	155.09	154.77	161.03	167.69	166.91	149.58	–
China	561.89	596.83	647.42	684.47	680.59	690.24	738.92	769.44	784.49	803.01	–

Source (World bank [2022d](#))

Table 7 HH market concentration index

Countries	Market concentration index										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	–	–
Greece	0.04	0.04	0.05	0.04	0.05	0.04	0.04	0.03	0.04	–	–
US	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	–	–
China	0.06	0.06	0.06	0.06	0.06	0.07	0.06	0.06	0.06	–	–

Source (World bank [2022a](#))

However, despite being the largest economy worldwide, the US are outperformed by China in terms of this indicator. Moreover, in the case of the US, IEMP has fallen from 44.87 in 2011 to 40.62 in 2019. Germany is ranked third among the countries under review, its performance is also slightly deteriorating. Greece is the worst performer, and this obviously has to do with the smaller size of its economy. However, in contrast to the other economies under review, Greece's performance is improving in all reference years, as the value of the IEMP rose from 8.75 in 2011 to 9.26 in 2019, a sign of trade liberalisation.

The third pillar of World Bank indicators studies the export sophistication of economies and, more specifically, the analysis is made on the basis of the technology embodied in the exported products. According to the World Bank:

High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. The OECD has developed a four-way classification of exports: high, medium-high, medium-low and low-technology. The classification is based on the importance of expenditures on research and development relative to the gross output and value added of different types of industries that produce goods for export. Examples of high-technology industries are aircraft, computers, and pharmaceuticals; medium-high-technology includes motor vehicles, electrical equipment and most chemicals; medium-low-technology includes rubber, plastics, basic metals and ship construction; low-technology industries include food processing, textiles, clothing and footwear. Industries of high and medium-high-technology intensity account for over

Table 8 Index of export market penetration

Countries	Export market penetration										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	44.22	43.85	44.36	44.07	43.67	44.22	44.29	42.93	39.03	–	–
Greece	8.75	8.72	9.00	8.92	9.01	9.33	9.71	9.70	9.26	–	–
US	48.87	48.66	48.03	47.46	46.46	46.42	46.44	44.90	40.62	–	–
China	53.62	53.53	54.22	54.50	54.90	55.27	55.92	54.51	48.14	–	–

Source (World bank [2022a](#))

Table 9 High-technology exports as a percentage of manufactured exports

Countries	High-technology exports, % of manufactured exports										
	Years										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	16.3	17.2	17.2	17.2	17.8	18.0	15.8	15.7	16.3	15.5	–
Greece	11.2	10.1	8.4	11.4	12.9	13.7	12.1	12.9	12.5	13.2	–
US	20.6	20.1	20.1	20.4	21.3	22.4	19.2	18.4	18.6	19.4	–
China	30.4	30.8	31.5	29.6	30.4	30.2	30.9	31.4	30.7	31.2	–

Source (World bank [2022e](#))

two-thirds of total OECD manufacturing exports. Differences among countries are substantial; the share of high and medium-high-technology industries ranges from over 80 percent in Japan and Ireland to less than 10 percent in Iceland. Technology exports have grown rapidly in Iceland, Turkey and the eastern European countries, although most of these countries, with Hungary and the Czech Republic as exceptions, still focus primarily on low and medium-low-technology exports. (World Bank [2022e](#)).

Table 9 analyses high-technology exports as a percentage of GDP for the economies under review. As we can see, the best performer in terms of this indicator is China, as high technology exports as a percentage of manufactured goods stood at 31.2% in 2020. The percentage of the US is declining, and from 20.6% in 2011 has fallen to 19.4% in 2020. Germany is ranked third, with its high technology exports remaining more or less unchanged in all reference years, slightly falling from 16.3% in 2010 to 15.5% in 2020. Greece is the worst performer as compared to the other countries under review, its high-technology exports decreasing to just 8.4% in 2013, only to recover afterwards, and in 2020 high-technology exports accounted for 13.2% of manufactured exports.

4 Liner Shipping Connectivity Index (LSCI)

The Liner Shipping Connectivity Index aims at demonstrating the interconnection among countries as a result of sea freight operations, and, consequently, its effect on the trade relations between states, as it measures the transportation of containers. The Index is published each year by the United Nations Conference on Trade and Development (UNCTAD). The Index comprises the following components:

- (i) *“The number of scheduled ship calls per week in the country;*
- (ii) *Deployed annual capacity in Twenty-Foot-equivalent Units (TEU): total deployed capacity offered at the country;*
- (iii) *The number or regular liner shipping services from and to the country;*
- (iv) *The number of liner shipping companies that provide services from and to the country;*

- (v) *The average size in TEU (Twenty-Foot-equivalent Units) of the ships deployed by the scheduled service with the largest average vessel size; and*
- (vi) *The number of other countries that are connected to the country through direct liner shipping services (Note that a direct service is defined as a regular service between two countries; it may include other stops in between, but the transport of a container does not require transshipment).*

The index is generated as follows: The LSCI is generated for all countries that are serviced by regular containerized liner shipping services. For each component, we divide the country's value by the maximum value for the component in Q1 2006 and then calculate the average of the six components for the country. The country average is then again divided by the maximum value for the average in Q1 2006 and multiplied with 100. The result is a maximum LSCI of 100 in Q1 2006. This means that the index for China in Q1 2006 is 100 and all other indices are in relation to this value. (UNCTAD 2022b).

The study of Table 10 demonstrates China's prominent role in container shipping. As we can see, the index has been rising, from 130.67 in the first quarter of 2011 to 170.34 in Q1 2021, rapidly improving, in particular, since 2016. The US are ranked second among the countries under review, its index value of also rising from 77.87 in Q1 2011 to 92.19 in Q1 2021. Germany is in the third place, showing steady improvement, as its index value has risen from 78.60 in Q1 2011 to 84.07 in Q1 2021. Greece's performance as regards this index has improved substantially, especially in the past few years, rising from a value of 30.51 for the first quarter of 2011 to 60.08 in Q1 2021.

Figure 2 shows the Liner Shipping Bilateral Connectivity Index for Germany's top-ten partner states. We can see that the Netherlands holds the first place in terms of liner shipping connectivity with Germany, with an index value of 0,508 for the year 2020. The top-ten positions of this index include five European countries –the Netherlands, Belgium, the United Kingdom, Spain, and France– that are geographically close to Germany, as well as countries that play a prominent role in sea freight, such as China and Singapore.

Figure 3 shows the Liner Shipping Bilateral Connectivity Index for Greece's top-ten partner states. We can see that China is also Greece's top partner, with an index value of 0,425 for the year 2020. Greece's liner shipping connectivity with the countries of Europe is very high, as the top-ten countries in terms of this index include five European countries: Belgium, the Netherlands, the United Kingdom, Germany, and Italy. Moreover, apart from the five geographically proximate European countries mentioned above, the top ten includes Turkey, a country that shares common borders with Greece. As in the case of Germany, the top ten is completed by Singapore.

Figure 4 shows the Liner Shipping Bilateral Connectivity Index for the top-ten partner states of the United States in 2020. As in the case of Greece, China is ranked first, with an index value of 0,523 for the year 2020. The top-ten places include five European states, i.e. the United Kingdom, the Netherlands, Belgium, Germany, and France. Panama is included in the top ten as a result of its geographical proximity to the US.

Figure 5 shows the Liner Shipping Bilateral Connectivity Index for China's top-ten partner states. We can see that, in the case of China, geographical proximity is

Table 10 Liner shipping connectivity index

Countries	Q1 of each year										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	78.60	79.18	78.77	82.46	82.99	85.00	82.14	84.37	82.46	84.41	84.07
Greece	30.51	38.32	40.74	43.42	42.76	41.65	46.73	57.86	58.32	59.70	60.08
US	77.87	76.41	84.07	85.19	86.17	93.46	89.79	86.14	92.91	93.31	92.19
China	130.67	129.56	131.30	133.04	138.51	141.80	139.43	150.05	152.88	158.63	170.34

Source (UNCTADSTAT 2022b)



Fig. 2 Liner shipping bilateral connectivity index—Germany, top-10 partners for 2020. *Note* The index takes values between 0 (minimum) and 1 (maximum). *Source* (UNCTADSTAT 2022c)

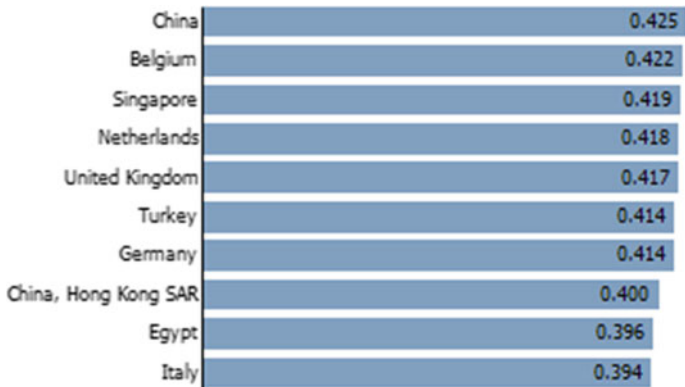


Fig. 3 Liner shipping bilateral connectivity index—Greece, top-10 partners for 2020. *Note* The index takes values between 0 (minimum) and 1 (maximum). *Source* (UNCTADSTAT 2022d)

a key determinant of performance as regard this index, as South Korea is ranked first with an index value of 0,639 for the year 2020. Moreover, China shows high liner shipping connectivity with the following, geographically proximate, countries: South Korea, Japan, Malaysia, Singapore, and Hong Kong. The top ten also includes four European countries, i.e. Spain, Belgium, Germany, and the Netherlands.

Table 11 reflects the total number of containers handled by each country under review during the period 2011–2021, according to the available data. As we can see, China is ranked first, continually increasing its container port throughput between 2011 and 2020. The second place is held by the US, which also follows an upwards course in all reference years, albeit remaining clearly behind China. Third comes Germany, the throughput of which shows minor fluctuations. Greece dramatically

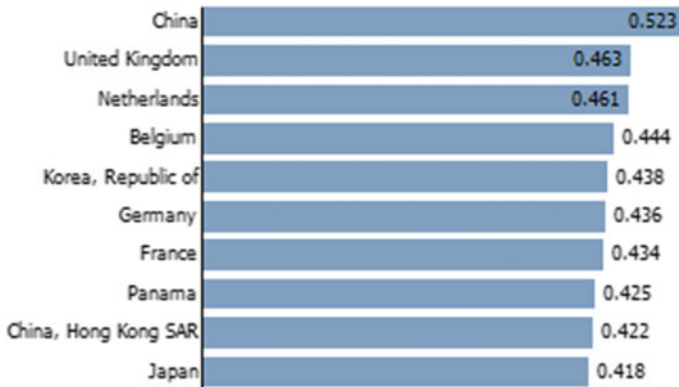


Fig. 4 Liner shipping bilateral connectivity index—US, top-10 partners for 2020. *Note* The index takes values between 0 (minimum) and 1 (maximum). *Source* (UNCTADSTAT 2022e)

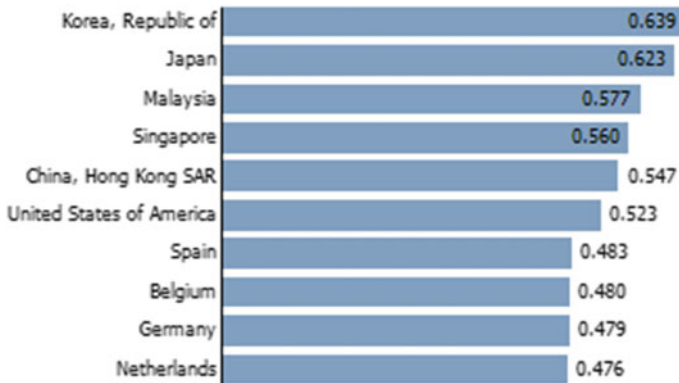


Fig. 5 Liner shipping bilateral connectivity index—China, top-10 partners for 2020. *Note* The index takes values between 0 (minimum) and 1 (maximum). *Source* (UNCTADSTAT 2022f)

improved its container port throughput, from 1,976,000 TEUs in 2011 to 5,756,000 TEUs in 2020.

5 Logistics Performance Index—LPI

The World Bank has developed one more indicator, which is designed to record the states' logistics performance. The 2018 Report titled: *Connecting to Compete* is the sixth version of the Index, which was first published in 2007, and then again in 2010, 2012, 2014, 2016, and 2018. The 2018 Index comprises 160 countries (World Bank

Table 11 Container port throughput

Countries	TEU*										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Germany	18 323 981	18 449 700	18 932 700	19 866 700	19 238 700	19 420 700	19 718 533	19 706 500	19 596 415	18 028 702	–
Greece	1 976 000	3 051 900	3 486 000	3 935 200	3 679 000	4 026 000	4 546 200	5 332 000	5 992 400	5 756 000	–
US	42 550 784	43 538 254	44 340 866	46 233 010	47 886 446	48 436 473	52 132 844	54 776 341	55 518 878	54 963 689	–
China	146 441	159 337	174 393	185 136	193 734	197 849	222 155	233 201	242 030	245 103	–
	501	100	600	300	000	000	820	600	000	781	–

* A TEU (twenty-foot equivalent unit) represents the volume of a standard 20 feet long intermodal container used for loading, unloading, repositioning, and transshipment. A 40-foot intermodal container is counted as two TEUs.

Source (UNCTADSTAT 2022g)

2022f and World Bank 2018). As regards the Index, the World Bank provides the following information:

The Logistics Performance Index is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI 2018 allows for comparisons across 160 countries. The LPI is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics ‘friendliness’ of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries where they trade and experience of global logistics environment. Feedback from operators is supplemented with quantitative data on the performance of key components of the logistics chain in the country of work. The LPI consists therefore of both qualitative and quantitative measures and helps build profiles of logistics friendliness for these countries. It measures performance along the logistics supply chain within a country and offers two different perspectives: international and domestic. (World Bank 2022f).

Table 12 presents the Logistics Performance Index scores of the countries under review for the year 2018. The study of the table reveals that Germany is the top performer, with an LPI score of 4.20. Germany is performing best in timeliness, with a score of 4.39 and infrastructure, with a score of 4.37. Greece holds the 42nd place in 2018 and is ranked last among the countries under review. The country gets its best scores for the year 2018 in timeliness (3.66), and international shipments (3.30). The US are ranked low compared to both the size of its economy and its performance during the previous years, and holds the 14th place. Its best scores are recorded in tracking & tracing (4.09) and timeliness (4.08). China is ranked 26th in 2018, its best performance recorded in timeliness, with a score of 3.84, and infrastructure, with a score of 3.75.

The comparative study of the data from Tables 12, 13, 14, 15, and 16, which pertain to the countries’ performance in previous versions of the index, leads to the following conclusions:

- (i) Germany is ranked first in terms of the overall LPI score in most of the years, demonstrating that logistics is a comparative advantage of the German economy.
- (ii) Greece has clearly improved its LPI ranking, and from the 69th place in 2012 has gradually moved upwards, reaching the 42nd place in 2018.
- (iii) The US has fallen in the rankings, and while in the previous year its performance was among the top-ten, in 2018 its performance deteriorated.
- (iv) China’s International LPI performance is more or less unchanged, as the country moved from the 27th place in the rankings in both 2010 and 2016, moved up to the 26th place in 2018.

Apart from its international dimension, the analysis of the Logistics Performance Index also has a domestic one. The Domestic Logistics Performance Index reflects the logistics environment of 100 countries. The Domestic LPI has two aspects: (a) logistics environment and institutions, and (b) the performance of each country. Table 17 presents the DLPI performance of the countries under review.

Table 12 International Logistics Performance Index (LPI), 2018

Countries	LPI country rankings		LPI score							
	Rank LPI	LPI score	Customs	Infrastructure	International shipments	Logistics competence	Tracking and tracing	Timeliness		
Germany	1	4.20	4.09	4.37	3.86	4.31	4.24	4.39		
Greece	42	3.20	2.84	3.17	3.30	3.06	3.18	3.66		
US	14	3.89	3.78	4.05	3.51	3.87	4.09	4.08		
China	26	3.61	3.29	3.75	3.54	3.59	3.65	3.84		

Source (World bank 2022f)

Table 13 International Logistics Performance Index (LPI), 2016

Countries	Rank LPI	LPI score	Customs	Infrastructure	International shipments	Logistics competence	Tracking and tracing	Timeliness
	Germany	1	4.23	4.12	4.44	3.86	4.28	4.27
Greece	47	3.24	2.85	3.32	2.97	2.91	3.59	3.85
US	10	3.99	3.75	4.15	3.65	4.01	4.20	4.25
China	27	3.66	3.32	3.75	3.70	3.62	3.68	3.90

Source (World bank 2022f)

Table 14 International Logistics Performance Index (LPI), 2014

Countries	LPI country rankings		Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Timeliness
	Rank LPI	LPI score						
Germany	1	4.12	4.10	4.32	3.74	4.12	4.17	4.36
Greece	44	3.20	3.36	3.17	2.97	3.23	3.03	3.50
US	9	3.92	3.73	4.18	3.45	3.97	4.14	4.14
China	28	3.53	3.21	3.67	3.50	3.46	3.50	3.87

Source (World bank 2022f)

Table 15 International Logistics Performance Index (LPI), 2012

Countries	LPI country rankings		LPI components						
	Rank LPI	LPI score	Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Timeliness	
Germany	4	4.03	3.87	4.26	3.67	4.09	4.05	4.32	
Greece	69	2.83	2.38	2.88	2.69	2.76	2.98	3.32	
US	9	3.93	3.67	4.14	3.56	3.96	4.11	4.21	
China	26	3.52	3.25	3.61	3.46	3.47	3.52	3.80	

Source (World bank 2022f)

Table 16 International Logistics Performance Index (LPI), 2010

Countries	LPI country rankings		Customs	Infrastructure	International shipments	Logistics competence	Tracking and tracing	Timeliness
	Rank LPI	LPI score						
Germany	1	4.11	4.00	4.34	3.66	4.14	4.18	4.48
Greece	54	2.96	2.48	2.94	2.85	2.69	3.31	3.49
US	15	3.86	3.68	4.15	3.21	3.92	4.17	4.19
China	27	3.49	3.16	3.54	3.31	3.49	3.55	3.91

Source (World bank 2022f)

Table 17 Country performance, Domestic Logistics Performance Index, 2018

Indicators	Countries			
	Germany	Greece	US	China
Export time and distance/Port or airport supply chain				
Distance (kilometres)	212 km	219 km	275 km	337 km
Lead time (days)	2 days	3 days	2 days	2 days
Export time and distance/Land supply chain				
Distance (kilometres)	569 km	841 km	612 km	707 km
Lead time (days)	2 days	3 days	5 days	6 days
Import time and distance/Port or airport supply chain				
Distance (kilometres)	350 km	302 km	263 km	328 km
Lead time (days)	2 days	3 days	2 days	6 days
Import time and distance / Land supply chain				
Distance (kilometres)	559 km	783 km	483 km	785 km
Lead time (days)	3 days	7 days	4 days	4 days
Shipments meeting quality criteria (%)				
Number of agencies—exports	95%	95%	91%	81%
Number of agencies—imports	1	2	3	3
Number of documents—exports	1	3	2	3
Number of documents—imports	1	3	4	4
Clearance time without physical inspection (days)	1	3	3	4
Clearance time with physical inspection (days)	1 day	1 day	2 days	1 day
Physical inspection (%)	1 day	2 days	3 days	2 days
Multiple inspection (%)	2%	2%	3%	3%
Declarations submitted and processed electronically and on-line (%)	2%	1%	1%	1%
Imports use a licensed Customs Broker (%)	100%	–	100%	71%
Able to choose the location of the final clearance (%)	–	–	100%	71%
Goods released pending customs clearance (%)	100%	–	100%	83%

Source (World bank 2022f)

The study of the information presented in Table 17 reveals the means that states have in their disposal in order to develop their trade relations. The analysis of specific indicators shows the performance of each country along the four determinants of the Domestic LPI, i.e. infrastructures, services, border procedures and time, and supply chain reliability. As regards most determinants of the index for 2018, Germany outperforms the other countries under review, the main findings being summarised as follows:

- (1) Germany has the shortest lead time as regards **exports** either for a port or airport supply chain, or for a land supply chain, which stands at 2 days. Similarly,

Greece has a lead time of 3 days, the US 2 and 5 days, and China 2 and 6 days, respectively.

- (2) Germany also has the shortest lead time as regards **imports** either for a port or airport supply chain, or for a land supply chain, which stands at 2 and 3 days, respectively. That said, Greece has a lead time of 3 and 7 days, the US 2 and 4 days, and China 6 and 4 days, respectively.
- (3) Germany also commands, along with Greece, the higher percentage of shipments that meet quality criteria, which stands at 95%, as compared with 91% for the US, and 81% for China. Moreover, Germany has less red tape, as just one document is required for both exports and imports, as compared to three documents in both cases for Greece, two and four documents respectively for the US, and three and four documents respectively for China.
- (4) At the same time, Germany has the shortest clearance time without physical inspection, i.e. one day, while clearance times stand at three days in Greece and the US, and four days in China.
- (5) China is outperformed by Germany and the US as regards the three last components of the index, while no data is available for Greece in the 2018 report, a fact that in itself leads to a worse evaluation. More specifically, the percentage of importers that use a licensed Customs Broker in China stands at 71%, as compared to 100% for both Germany and the US. Moreover, as regards the ability to choose the location of the final clearance China's percentage also stands at 71%, compared to 100% for the US, while there are no available data for Germany and Greece. Finally, 83% of goods are released pending customs clearance in China, as compared to 100% in Germany and the US.

6 Conclusions

This article is an attempt to systematically study certain indicators designed to capture the trade performance of states. The analysis did not focus on traditional trade indicators, such as the trade balance and the current account balance, as these indicators focus mostly on assessing the evolution of macroeconomic aggregates. After all, a high current account deficit has macroeconomic effects on every national economy. First, the study of revealed comparative advantage showed that China is the top performer in two out of three sectors that require high or medium–high technology. The analysis also focuses on indicators that have been developed by the World Bank through the World Integrated Trade Solution and are classified under the following pillars: (1) Orientation and growth, (2) export diversification, (3) export sophistication, and (4) survival of export relations. We saw that Germany is more open to trade as compared to the other economies under review. Other indicators, though, paint a different picture. As regards the indicator that measures the volume of trade, China is ranked first among the countries under review, far outperforming the others. Next, we studied the Market Concentration Index, where Greece and Germany are the top performers. Moreover, the study of the Index of Export Market Penetration shows

that China is ranked first, demonstrating the dynamism of the country's economy in the context of international trade. China is ranked first in high-technology exports as a percentage of manufactured exports, a fact that demonstrates the comparative advantage its economy enjoys in high-technology sectors.

Our analysis also focused on the Liner Shipping Connectivity Index, where China is the best performer, demonstrating its strength in container shipping. After all, China's container port throughput is four times higher than that of the US, and many times higher than those of Germany and Greece. Finally, we studied the World Bank's Logistics Performance Index, and saw that Germany is ranked first, far outperforming the other countries under review. Germany performs better in both the International Logistics Performance Index and the Domestic Logistics Performance Index.

To conclude, a series of trade indicators have been developed in order to capture in detail certain quantitative and qualitative aspects of the trade relations between states. The systematic study and understanding of these indicators is the means by which states can adopt best practice in order to enhance their trade potential. We should not ignore the fact that the productive model of each national economy, as it has been formed after many decades, along with the size of each national economy, the global division of labour, and economic globalisation determine, to a great extent, the states' trade potential. That said, highlighting the opportunities and capabilities of states through the analysis of international trade indicators, aims at improving certain aspects of the trade relations between states, thus boosting the prosperity of each national economy.

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Business Improvement Districts: A Comparative Analysis of the Legal Framework and Economic/Social Impact Among Different Countries



Zhaklina Dhamo, Irisi Beleraj, and Vasilika Kume

Abstract This study investigates the functional characteristics of Business Improvement Districts (BIDs) among various European Countries and Albania. The legal framework in those countries is used as the main source of information in providing similarities and differences in how different economic realities implement BID models from a regulatory point of view. Countries are divided in two groups, those who currently have a well-defined BID model, and those who have applied similar models to BID. In the first group, the authors identify similarities and differences based on whether there is a legal framework in place, whether the local government does delegate public service provision to BIDs, how decision is made to establish a BID, whether there is a mandatory levy to be paid from members, who is entitled to be a member, and who collects the levy. In the second group, similarities and differences are identified by whether a law is in place, and what are the characteristics that make these forms of organizations like BIDs. Furthermore, this study analyses existing literature with regards to the economic and social impacts that Business Improvement Districts have on local communities. The research builds the bases of a series of future empirical research on the economic impact of BIDs in Albania.

Keywords Business improvement districts · BID legal framework · BID levy · Economic impact

Jel Classification Codes · K23

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1 Introduction

The aim of this research is to identify different aspects of the legal structures of Business Improvement District Organizations in Europe and the economic/social impact that BID models have in local communities.

BIDs are a form of public/private partnership where property and business owners choose to contribute financially to the development, maintenance, and promotion of the area where the business is located (Lloyd et al. 2003; Favro and Toto 2016).

Business Improvement Districts is a place making mechanism introduced 40 years ago in Toronto, Canada. Consumers were abandoning downtown to visit shopping malls, mainly constructed in the provincial areas of the cities. For this reason, the business community of the downtown engaged in a collective funding scheme, which would serve to revitalize, merchandize, increase the number of events/attractions, and provide better public services for the public space where the businesses were located. The model was exported eventually in the United States of America some years later. During the last 20 years, the BIDs pioneers in Europe have been UK and Germany, the latter mainly sponsored by the German Chamber of Commerce (DIHK).

The BID model has been adapted in different variations in some countries around the world. Some of the most locally customized variations of BIDs are found in Australia, New Zealand, and South Africa. Some countries now have their own “BID legacy”, in other countries— especially in Europe—the instrument is still new, such as Germany. In England and Wales, BIDs are regulated based by law since 2004. During the last 16 years, however, over 50 BIDs have been set up in city centers and in commercial and industrial areas. One of the differences of the North American model with European adaptations is that the business owners are liable for the levy and not the landlords/property owners.

A legal basis for BID has also been introduced in the Netherlands. The Investments Zones (BIZ) Experiments Act entered into force in May 2009 in the Netherlands. Entrepreneurs in a BIZ can invest together in an economically attractive and secure environment. In January 2015, this law, “The Investments Zones” (BIZ) became permanent.

There are only a few BIDs in Sweden. Usually, property owners initiate the establishment of BIDs. Currently, there is no specific legislation governing cooperation under the BID model. However, there are several BID-inspired collaboration projects that are based on voluntary membership and are often run as non-for-profit associations.

The UK was the first country to set up a BID in Europe. The largest BID in London is called the New West End Company and operates on Bond Street, Oxford Street and Regent Street. In the UK, PM Tony Blair was one of the driving forces behind the creation of BIDs and BID legislation was introduced in late 2004–05. Planning work and pilot projects started in the early 2000s and legislation in England was finalized in September 2004. The need for improvements in the public environment was an important reason for drafting legislation for BID creation. The English BID model has been given a slightly different form compared to the US with more influence

from the state and the municipality rather than more autonomous decision making from property/business owners.

This study continues with comparative analysis of legislation models in Europe for countries that have a BID Law in place. Section 3 introduces similar forms of organizations like Business Improvement Districts in European countries, who have not approved any legislation on Business Improvement District so far. Section 4 gives an overview of BID model in Albania. Next section introduces findings from previous research regarding the social and economic impact of Business Improvement Districts as a form of organization in Local communities. The last section summarizes the concluding remarks.

2 Comparative Analysis of Bid Models in Europe

This section introduces the comparative analysis of the regulatory characteristics for European countries where BID is used as a form of organization. Specifically, the regulatory differences are structured as per the following criteria:

- Is there a specific law regulating BIDs?
- Has the local/central government the authority by law to delegate a (specific) public service to BIDs or other business organizations with focus place making.
- Based on the legislative framework, is the local government allowed to finance the activities (i.e., services, marketing, events, admin costs) of BIDs
- Who has the right to vote for the establishment of BIDs?
- What is the duration of a BID?
- In case a BID is established, do the members of the organization have the right/obligation to pay a levy.
- What are the criteria used to calculate the amount of the levy in case it applies?
- What are the collection mechanisms for the levy? Does the local government help collect it?

The empirical research has been conducted with the support of the Albanian Assembly. Through the ECPRD Network of the European Parliament, the Albanian Assembly sent the questionnaire regarding the regulatory differences mentioned above to all members of the network. Twenty responses were received, out of which four countries in EU confirmed that they have established BID as a management form, and four other countries in the EU confirmed that they have established similar practices to Business Improvement District. Table 1 lists the BID regulatory differences between Germany, Netherlands, UK, and Sweden.

Table 1 Summary of BID models in Germany, the Netherlands, the United Kingdom, and Sweden
Business Improvement Districts (BID)

	Germany	Netherlands	United Kingdom	Sweden
<i>A specific law governing the creation of BIDs</i>	Paragraph 17 of the Federal Building Code (§17If BauGB). The Federal States have the authority to introduce specific laws to promote private initiatives for area-based urban regeneration and development in various designated urban areas	Law on “ <i>Business Investment Zones</i> ” (BIZ)	<i>England & Wells</i> “Local Government Act” 2003 (part 4) <i>Scotland:</i> “Planning etc. (Scotland) Act” 2006 (part 9) <i>Northern Ireland:</i> “Business Improvement Districts Act” (Northern Ireland) 2013	NA
<i>The delegation of the authority to BIDs for a (specific) public service by local/central government</i>	The Federal States assess if the BID purpose is within the law and if the activities will be able to provide a benefit for all members of the BID. However, local authorities may choose not to delegate public services to the BID	The activities of a BIZ are intended to complement those of municipalities, such as improving traffic infrastructure, signage, green spaces, garbage collection, lighting, cleaning, maintenance damage repair, fire protection etc	When a local authority decides to issue a contract to outsource a public service, BIDs may submit an offer. In the UK this is not the same as delegating the service. If a BID took on a contract to provide a local service, the local authority would remain responsible for the service quality based on law	The local government does not have the authority to delegate services to BID organizations

(continued)

Table 1 (continued)

Business Improvement Districts (BID)			
	Germany	Netherlands	United Kingdom
<i>The local government financing the activities of BIDs</i>	<p>A BID is founded by a private initiative; the local government allows for a compulsory levy paid by all property owners that will benefit from the BID activities. The local government is not allowed to finance BID activities</p>	<p>A BIZ contribution is defined in the form of levy when a BIZ is established, it is collected by the local government and disbursed in the form of subsidy to the BIZ organization. The entrepreneurs will use the money collected from the fee for activities to improve the quality of life, safety, environment, or another public interest in the public spaces in the BIZ. For instance, the money could be used to take an active approach to deal with local deterioration or by putting up festive lighting during the holidays or organizing festivals. No additional financing from local government budgets is transferred to BIZ organization</p>	<p>BIDs in the UK generally raise most of their finance via a BID 'levy', and from additional external funding sources. It would be possible in law for a local authority to fund their activities, though this is uncommon</p>
			Sweden
			Occasionally may be co-sponsor of BID activity

(continued)

Table 1 (continued)

Business Improvement Districts (BID)			
	Germany	Netherlands	United Kingdom
<i>The right to vote for the establishment of BIDs</i>	Typically, the property owners vote for establishment. Generally, at least 15 percent of the owners which should represent at least 15 percent of the area must be in favor of founding a BID. Some Federal States also have an "improvement district" for residential areas (for example the city of Hamburg)	At least half of the entrepreneurs must vote about the plan to set up a BIZ, and two thirds of them must support the plan	BIDs are principally funded by an additional levy on the business rate (local commercial property tax). Businesses in the geographical area covered by the BID levy are entitled to vote in a ballot for the establishment of a BID. A ballot is mandatory. The BID must be approved in the ballot by most ratepayers in terms of number and rateables value (i.e., the 'cadastral value' of the property)
<i>The duration of a BID</i>	In the city of Hamburg and Hesse a BID lasts no longer than five years. However, their existence can be longer, if at least 15 percent of property which constitute at least 15 percent of the area vote in favor of a "new" BID organization (with same duties as the old one and new levy)	This is at a maximum of five years and can then be extended by five years each time	The maximum duration of a BID in the UK is five years. A BID can be renewed, but a further ballot is required
			Sweden The initiative to create BID has generally been shown to the owners. In principle, anyone can take the initiative to create a BID

(continued)

Table 1 (continued)

Business Improvement Districts (BID)			
	Germany	Netherlands	United Kingdom
<i>The right or the obligation of the members to pay a Levy</i>	If a BID is established by the local authority, membership is compulsory, and levy must be paid. Only in rare circumstances, local authorities can decide that one property owner does not have to pay the levy, if for instance the purpose of the BID will not bring any benefit to his or her property at all	The BIZ contribution can only be made by users and owners of non-residential properties in a specific area	Where a BID is established, businesses in the geographical area covered must pay a levy. This is compulsory for all eligible businesses. There is no separate category of 'membership' of the BID. Local businesses that propose a BID must produce a 'prospectus', which must give details of the amount of levy that will be applied, and any exemptions. For instance, many BIDs exempt charitable organizations, or small businesses with a rateables value, from paying the levy

(continued)

Table 1 (continued)

Business Improvement Districts (BID)			
	Germany	Netherlands	United Kingdom
<i>The criteria used to calculate the amount of the levy; in case it applies</i>	In the city of Hamburg, the levy is determined by the size of the property in relation to the amount calculated for the needs of the BID. Regarding the size of the property also the number of floors will be considered. Generally, there is a maximum for the levy. For instance, in the city of Hamburg, the total amount of money needed for the BID's purpose may not be more than 12% of the total value of all premises. In other Federal States similar criteria apply	The amount due depends for example on the WOZ value (property tax) or consists of a fixed amount	This is a decision for the 'prospectuses. There are no legal limits on the amount of the levy. Normally, it is in the region of 1–2 pence per pound of rateables value It is a legal requirement for the levy to be set at the level set out in the 'prospectuses, and the prospectus must be made available before a ballot can take place. Thus, one would expect that an excessive levy would be voted down at the ballot
<i>Role of the local government in collecting the levy</i>	Local authorities oversee collecting. Management of the budget is done by a service provider. The service provider is controlled by local authorities (in the city of Hamburg this is done by DIHA)	Entrepreneurs pay the BIZ tax to municipal authorities, which in turn transfers it to the BIZ organization	The levy is collected through the system used to collect business rates, which is operated by local authorities
			Sweden There is no set fee nor any criteria for calculating the amount of tax / fee

2.1 BID Models in Germany, the Netherlands, the United Kingdom, and Sweden

Table 1 shows that the BID model in Germany, Netherlands and UK are regulated by law. Germany and UK are able directly or indirectly to delegate part of public service budget to BID Associations in the respective areas. Such delegation is not possible in the Netherlands and Sweden.

Based on the legal framework of four countries listed in Table 1, since establishment of a BID would impose an additional levy on business of the area, a voting process must be in place. Most legal frameworks impose the need to participate at least 50% of the businesses in the voting process, and at least 50% of the votes should be in favor of establishing a BID Association.

Legal framework in Germany, Netherlands and UK has an explicit duration of the association up to five years. After five years, businesses have the right to revote on whether they want an association in place or not. Once BID Association is established, levy payment becomes mandatory for three out of four countries under consideration, since BIDs in Sweden are not regulated by law and hence levy payment cannot be forced.

Various metrics are used for the purpose of levy calculation. Germany uses property space, Netherlands uses property tax, while UK uses the rent of the property or rental references in the area. In Germany, Netherlands, and UK the local government collects the levy and transfers collection periodically to the BID Association.

3 Comparative Analysis of Countries with Forms of Organizations Similar to the Bid Models in Europe

This section introduces characteristics of forms of organizations similar to business Improvement Districts in Europe. These forms of organizations are defined by name, the legislation served to regulate its functioning, and main characteristics. The countries included in the analysis are Greece, Romania, Slovenia and Spain. A summary of the findings is presented in Table 2.

Main characteristics of each form are as follows.

For Greece, the essential change with BIDs is the financing of Open Shopping Centers, which is publicly funded and from the European Regional Development Fund and national resources. But like BIDs, in this case, local businesses are also beneficiaries. Applicants can be Municipalities, in cooperation with trade associations, or chambers of commerce. No more than 20% of the applied budget can be used for the platform in support of local entrepreneurs, organizing events to promote the area, financing the decorations for common areas. Most of the fund goes to improving public infrastructure at Open shopping malls. A condition for benefiting from the fund is participation in the application, in the form of trade associations / chambers of commerce of at least 70% of the businesses in the area and at least

Table 2 Other forms like BIDs in Europe

Countries	Forms of organization	Legislation
Greece	Open trade centers	Implementation is described by MD 870/B/2014 as amended by MD 2891/2015 on the Invitation to submit applications for inclusion of investment plans/aid in the Pilot Action Program “Strengthening Open Trade Centers” which describes the purpose, the budget, the regulatory framework, the project integration process as well as the selection of beneficiaries
Romania	Bucharest Ilfov intercommunity development association	Law on Local Public Administration no. 215/2001, republished Government Ordinance no. 26/2000 regarding the associations and foundations, with the subsequent modifications and completions Decision of the General Council of the Municipality of Bucharest no. 86/2008 Decision of the Ilfov County Council no. 144/2007
Slovenia	Town centre management (TCM)	The pilot project Town Centre Management was first introduced in Slovenia in 2011 in cooperation with the Chamber of Commerce and Industry of Ljubljana and the municipalities of three towns (Celje, Ljubljana and Koper). It is more a project initiative rather than a form of organization regulated by law
Spain	Urban shopping centers/ open shopping centers	Over the last decade, numerous alternative initiatives have been developed for Urban Shopping Centers/ Open Shopping Centers in Spain as a formula for commercial dynamization To launch an Urban Shopping Centre initiative, it is not necessary to create a new model such as BIDs, which would entail approving new legislative measures, but only to resort to pre-existing legal instruments

50 businesses in the intervention area. The deadline for the implementation of the project is 12 months.

In the case of Romania, the association aims to prepare and promote at all levels, projects for the regional development of common interest for the two related territorial administrative units, in the fields of social services, transport, environment, business environment, tourism and to provide the necessary funds. It should be aimed to jointly implement development projects of zonal or regional interest, or to jointly provide public services and the joint purchase of equipment for intervention in emergency situations.

The Town Center Management of Slovenia aims to ensure that the functions of the city center are developed and that they are not relocated outside its center. In these towns they have a city manager or coordinator for management of a city center and / or an association of city entrepreneurs in various forms. Many municipalities are involved in the TCM network, where they are carrying out various activities for the revitalization of urban city centers.

Most of Open Shopping Centers in Spain have a legal status of non-profit associations, while some can be private–public joint ventures, private companies, or foundations. In 45% of cases, the creation of Urban Shopping Centers responds to a proactive attitude of the entrepreneurs, who intend to be more competitive and improve the commercial area. They have a mixed funding model: public contributions + membership fees + other private income from service provision, sponsorships, events, etc.

4 BID Model in Albania

In Albania, there have been established nine Business Improvement Districts in eight different cities between 2011 and 2021. Initially there was just the support of a development organization, called the Albanian-American Development Foundation, who, in partnership with local and central government agencies, committed to:

- Participate in the public infrastructure improvement of the intervention areas.
- Establish an Association of businesses in the areas of intervention.
- Support the businesses in the intervention with grants on private investments, following the infrastructure investment in the area,
- Some of the local tariffs paid to the municipalities by the businesses in the intervention area will be returned to the association established, for
 - Improvement of public services
 - Marketing and attraction for the area
 - Event sponsoring, to increase the footfall in the intervention area.
- Businesses agreed to finance part of those activities through further contribution with a voluntary tariff to the association.

Considering the economic impact that the BID areas created, such as more than \$85 M in added property value, 75% increase in business earnings, and more than 120% increase in footfall over the areas, a law regarding BID has been approved in 2020. An additional aspect to the law, on top of the organizational aspects mentioned above, is that, if, through election, businesses in a specific area would decide to establish a BID, a mandatory extra tariff will be implemented regarding BID activities, which will be collected by the municipality and be transferred to the account of the association. The mandatory extra tariff will be based on the business plan for the mandate of the BID, which, according to the law, is between three and seven years. Currently, the nine Business Improvement Districts are going through a transition process of legal transformation according to the new legal requirements.

5 Summary of the Main Findings of Some Studies on the Impact of BIDS

Referring to the study by Bakry, Nicole and Crystal (2018) for the Borough areas of Brooklyn in New York City, it is shown that for more than 30 years, BIDS have been used as a tool of economic development to promote and develop some areas with potential, usually in city centers. The problem, however, is that while BIDS have deliberate intentions, they have the potential to transform the entire area through rapidly increasing the real estate value. Experiences shared by key participants showed that BIDS, as a policy tool, can revitalize a neighborhood as intended, while also creating unwanted outcomes resulting from the unequal distribution of benefits and burden.

As owners and the government earn more, small businesses may face relocation. The findings of this study supported the initial assumptions that BIDS could be an important policy tool, albeit leaving negative impacts on certain groups. Findings from this research showed that like other public policies, BIDS create the dilemma of whose interests should be prioritized and whose perspectives should be used to determine whether BIDS have a negative impact on the urban landscape, acting as a means of changing the character of a neighborhood through the influx of wealthier residents and businesses. This study has described and discussed the process by which BIDS can completely transform a neighborhood starting with immediate impacts (improved physical appearance) and ending with sustainable impacts by which the area has become an expensive area of high level with a mixed building occupying the urban landscape.

The article by Hoyt and Gopal-Agge (2007) states that all BIDS are created with the consent of the municipalities based on the authority given by the relevant legislation. While these laws vary from country to country and even between states, as in the case of the United States, most require a vote to approve the BID institution for the area. Moreover, some responsibility is achieved by including clauses that limit the lifespan of a BID, usually to a few years. However, BIDS are very rarely distributed. Instead, as permitted by law, BIDS renew and extend their boundaries through an authorized standard process.

According to Hoyt's (2005) Philadelphia article, which contributes to the BID debate by identifying theories that support the model, developing a conceptual framework that examines the links between crime theories and BID services measure the impact of BID organizations in criminal activity in and around commercial areas, using statistical methods such as impact analysis. The results show that lower levels of property crime distinguish commercial areas with BID organizations compared to those without BIDS and that these lower rates are not related to the higher level of crime in the surrounding blocks.

Ellen, Schwartz and Voicutregon (2007) study the impact of BIDS on property values in New York shows that, on average, BIDS generate positive impacts on commercial property values, a finding that is strong for alternative areas. However, there is a significant difference in the impact that different types of BIDS have. Specifically, large BIDS and those BIDS that consist primarily of office space have

large and positive impacts on commercial property values. At the same time, smaller BIDs and those that mainly involve retail store space or industrial areas seem to have little impact. Budget differences seem to be deepening these changes (BIDs made up of office buildings tend to have significantly larger budgets than BIDs dominated by retail users.)

Morçöl and Wolf (2010), in their study show, first, an unclear line separation between the public and private spheres because of BIDs; second, BIDs are increasingly important actors in urban governance; third, BIDs engage in cooperative, conceptual relationships with local and central governments; and fourth, direct responsibility and management problems arise from their interdependent relationship with the local government. BIDs cannot exist without governments, but the fact that BIDs take on some of the responsibilities of local governments shows that local and central governments are becoming more dependent on local service providers.

According to Grossman (2014), BID does not only improve infrastructure, promotion/marketing, design, or economic revitalization. BIDs also make an impactful contribution in improving local governance. Ruffin (2014) conducts a cross network study of BID Models. The author finds that BID models applied in different local realities achieve different results, based on the local needs.

Grail et al. (2020) evidence that BIDs have an impact on the changing nature of retail business in the areas they are established. For the future, the authors suggest that resilience probability will increase with the inclusion of other stakeholders in governance, such as residents of the area. Furthermore, they suggest to local and central governments to change their role from BID Encouragers to BID Integrators to wider governance networks or new policies.

Kudla (2022) analysis of the literature on BIDS in two recent themes, BID Policy Mobilidy and BIDs and Social Regulation. Studies, according to the author, suggest that, as BID model encourages permeability, resilience limits neoliberal urban policies. In terms of social control, as the author summarizes the recent literature, BID organizations are built on a framework that administrators in urban spaces are more attractive for consumer groups excluding the poor.

Vialli and Hammani (2020) analyze the impact on constellation of power in BID considering various urban governance actors such as city planning department, public housing, real estate companies, media, politicians, residents, and local businesses. The authors study a BID case in Sweden and conclude that improvements in terms of real estate value, attractiveness of the area and security are achieved by removing vulnerable individual of the society outside the BID area and disciplining residents and business behavior. In other words, the case study shows that issues are solved by removing social problems elsewhere rather than fixing them.

6 Conclusions

This study aims to conduct a comparative analysis on the way Business Improvement Districts are organized among different countries, and also show the main economic and social impacts these forms of organizations have produced, based on previous research. The first part of the study compared the form of the organization of BIDs in four countries, based on the legal framework, local government contribution, mandatory contribution from business/owners, duration, and ability of local governments to delegate. The second part of the study analysed forms of organizations similar to BIDs in countries where no BID framework is in place. The third part of the study presented an analytical review of existing literature regarding the social and economic impact of Business Improvement Districts in the life of local communities.

The legislative research concludes that, in the group of countries that have BIDs as a form of organization, three of the four countries (Germany, United Kingdom and the Netherlands) have a specific law and other regulations governing BIDs. Sweden has BIDs as a form of organization, but there is no legislation for it. The role of local government in delegating activities and their financing is different in these countries. Specifically, in Sweden, local government does not have the authority to delegate activities to BIDs. While in Germany, local governments are not allowed to fund their activities. In most cases, the maximum duration of a BID is 5 years (except in Sweden which is not defined). BID members also pay quotas in all four countries.

Regarding the group of countries, which have organization models similar to BIDs (Greece, Romania, Slovenia and Spain) two of them have Open Shopping Centers as a form of organization (Greece and Spain), while Slovenia uses the City Centers management model.

Main findings from previous research is mostly identified in the study of Bakry, Nicole and Crystal (2018) shows that BIDs, as a policy tool, are capable of revitalizing a neighborhood (as intended), but also create unwanted results due to the unequal distribution of benefits and burden. As homeowners and the government earn more, small businesses may face relocation. The authors have described and discussed the process through which BIDs can completely transform a neighborhood starting with immediate impacts (improved physical appearance) and concluding with sustainable impacts by which the area has become a expensive high-level zone. According to Hoyt (2005) article, lower levels of crime distinguish commercial areas with BID organizations compared to those without BIDs. Ellen, Schwartz and Voicutregon (2007) study on the impact of BIDs on property values in New York shows that, on average, BIDs generate positive impacts on commercial property values. Morçöl and Wolf (2010) concluded that the fact that BIDs take over some of the responsibilities of local governments indicating that local and central governments are becoming more reliant on local service providers.

To the best of our knowledge, this is the first study that analyses how the BID Model is implemented legally and technically in different countries. More specifically, we define what is the role of the local government in the BID legal life, what are the terms of delegation of authority from local government to the BID, and what are

the rights of a BID organization in Germany, Netherlands, UK and Sweden in a comparative analysis framework. Moreover, this is the first study that aims to identify other similar legal forms applied in other EU countries, similar to BID, and what are their characteristics.

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Tax Effort in Eurozone Countries After the Outbreak of the Global Economic Crisis



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Abstract The purpose of this article is to assess the tax effort undertaken by Eurozone countries, during the decade that followed the outbreak of the financial and economic crisis. Tax effort is measured by relating actual tax collections to some indicator of taxable capacity. Some countries are more favorably placed to levy taxes and can be said to have a greater taxable capacity than others. Regression analysis is used on cross-section data, to quantify the influence of Eurozone countries' specific economic and institutional features on the tax ratio. With the resulting estimates of the coefficients, an average tax ratio is estimated for each country. Then, the tax effort for each country is calculated by the percentage difference of the actual tax ratio and its estimate and countries are ranked accordingly. Our findings confirm previous results that Eurozone countries' tax effort index is around one, suggesting that they adequately use their tax bases to raise tax revenues. However, there are some Eurozone countries which undertake greater tax effort while in some other Eurozone countries there is room for raising more tax revenues. The current article contributes to the existing literature of assessing similarities within the euro-area regarding the tax policy adopted, after the outbreak of the 2008 economic crisis. Most of the literature focuses on comparing tax revenues as a percentage of GDP. However, this tax ratio may give a distorted picture, since economic developments in different countries, especially after the outbreak of the crisis, considerably altered the effectiveness in revenue mobilization. The current article goes beyond this comparison, assesses the tax capacity and the tax effort undertaken in the different Eurozone countries and ranks them accordingly. It contributes to the existing tax effort literature, by introducing in the analysis wealth instead of GDP, as a measure of economic activity and wellbeing.

Keywords Tax revenue · Tax capacity · Tax effort · Eurozone

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1 Introduction

Some countries have a greater ability to raise tax revenue based on their wealth-producing resources. These countries are said to have a greater “tax capacity”. But to what extent do countries actually tax, based on their tax potential? The answer is provided if we examine a country’s actual tax revenue in relation to an estimate of its tax potential. The ratio between the actual tax revenue and tax capacity is known as tax effort.

Following the global financial crisis in 2008, a number of countries introduced tax measures to raise revenues, reduce the budget deficit and improve the primary balance. The current research focuses on the euro-area and aims to assess tax capacity in Eurozone countries during the period 2008–2018 and the tax effort undertaken in these countries and to rank them accordingly and conclusions on whether countries examined adequately used their tax bases to mitigate the negative effects of the crisis.

The paper is structured as follows; Sect. 1 presents the existing literature on tax effort, Sect. 2 provides a comparative analysis of actual tax revenue as a percentage of GDP in Eurozone countries during the period 2008–2018. Section 3 presents the methodology employed in our research, the data used in our model in order to estimate tax capacity and the sources of these data. Finally, Sect. 4 presents the estimated tax capacity for the countries in our sample and the resulting tax effort index and ranks these countries accordingly.

2 Literature Review

In principle, a country’s tax capacity is approached by its Gross Domestic Product (GDP), which is considered to be an indication of the size of its tax base and therefore of its ability to raise tax revenue. Therefore, the total taxes collected as a percentage of GDP could be considered as a first indication of the country’s tax effort. This ratio is a reasonable indicator to establish trends or compare revenue performance across countries with similar economic structures and/or income levels.¹ However, GDP alone is not enough to assess a country’s tax capacity as there are undoubtedly other factors that decisively affect countries’ ability to raise tax revenue. This has led some economists to find alternative ways of measuring tax capacity.

One of the most well-known studies in this field is that of Lotz and Morss (1967), who, using data for 72 countries, calculated their tax capacity by first introducing GDP per capita as an explanatory variable and then adding the degree of openness of the economy (defined by exports as a percentage of GDP). They also found that

¹ Dalamagas et al. (2019).

the trade balance (defined as exports minus imports divided by the Gross National Product) was also a good predictor of tax capacity. Finally, they also found a positive relationship between fiscal decentralization and fiscal capacity. When comparing the estimated tax capacity with the actual tax revenue collected, they concluded that around half of the countries of their sample collected more and half of the countries collected less.

The conclusions of Lotz and Morss have been reproduced. Bahl (1971) estimated tax capacity and tax effort for 49 developing countries. He factored in the regression the structure of the economies examined (proxied by the share of agriculture in GDP and the share of mining exports in total exports) and also included regional dummy variables, leading to different conclusions for different regions. Chelliah et al. (1975) also introduced in their models additional explanatory variables that potentially affect the tax potential of developing countries such as the share of the mining sector in GDP, the share of the agricultural sector in GDP, exports as a percentage of GDP etc. Among other things, they concluded that in countries where tax revenue as a percentage of GDP was above the average of the sample, the tax effort ratio was higher than one and vice versa. Tanzi (1992) for a sample of 83 developing countries concluded that the fluctuation of tax revenues as a percentage of GDP was explained partly by changes in GDP per capita, but for other determinants, such imports, the agricultural sector and external debt were significant explanatory variables. Ghura (1998) examined a sample of 39 sub-Saharan African countries. He extended the models used up to that point, by including as explanatory variables inflation, change in real effective exchange rate, structural reform and a measure of human capital. He also introduced corruption as an explanatory variable, being the first in the relevant literature, to include governance / institutional variables in the analysis. Bird et al. (2004) extended the traditional models for measuring tax potential by introducing as explanatory variables, in addition to supply side variables (GDP per capita, population growth rate, total exports and imports as a percentage of GDP, and non-agricultural contribution) and demand factors (quality of governance, informal economy, inequality, fiscal decentralization), which also prove to have a decisive influence on tax revenue. More recent studies by the World Bank (Le et al. 2008, 2012) extend the empirical study by Bird et al. to cover a larger sample of countries and time period. Their conclusions confirm that institutional factors significantly affect a country's tax capacity. According to these studies, a country with a higher GDP per capita, lower population growth rate, greater economic openness and a smaller contribution of the agricultural sector to GDP formation, is expected to be able to raise more tax resources. A more recent study that used the standard regression approach is that of Yohou and Goujon (2017) who estimated tax capacity and tax effort for 120 developing countries over the period 1990–2012 by taking into account structural economic and human vulnerabilities, proxied in their model by the Economic Vulnerability Index and the Human Assets Index. They found that economic vulnerability is harmful to taxes while human asset enhances taxes.

Pessino and Fenochieto (2013) did not follow the traditional regression method of estimating tax capacity and tax effort and instead employed the stochastic frontier tax analysis for 113 countries during the period 1991–2012 (they extended previous

work conducted in 2010). The estimated tax frontier represents the theoretical maximum amount of tax revenues a country can collect (i.e. tax capacity), taking into account economic and institutional characteristics. The difference between actual tax revenues and stochastic tax frontier includes technical inefficiencies, public choice or policy issues. Pessino and Fenochieto concluded that most European countries with high level of GDP per capita, education, openness, low levels of inflation, corruption and income inequality were near their tax capacity (especially Austria, Belgium, Denmark, Finland, France, Italy and Sweden). Langford and Ohlenburg (2016) also estimated tax capacity and tax effort using a stochastic frontier analysis model for 85 non-natural resource-rich countries for the period 1985–2010 and their results were in line with the existing literature. Also, Mawejje and Sebudde (2019) estimated tax capacity and tax effort for 150 countries over the period 1996–2015 by incorporating in their model economic variables (GDP per capita, openness, agriculture share GDP, inflation, grants, income inequality), demographic variables (share of rural population and health expenditure) as well as institutional variables (corruption) and their results are in line with previous estimates.

Cyan et al. (2013) introduced a third approach to estimate tax effort by comparing a country's actual tax revenues to its desired level of taxation (level of public expenditure) for 94 countries over the period 1970–2009.

Boukbech et al. (2018) followed as well a different approach to identify the main determinants of tax revenues for a panel of 29 lower-middle-income countries during the period 2001–2014. They distinguished two different components in tax revenues. The component determined by structural factors on which government has little control in the short-term (tax capacity = τB), and the component determined by public policy influenced by either direct or indirect government action (tax effort = e). Therefore, they first estimated the tax capacity equation and in a second step the tax effort equation using the panel data technique. Regarding tax capacity, they found a positive and significant effect of GDP per capita and of the share of the value added of agriculture on tax revenues, while the openness degree has a positive but not significant effect and the population growth has a negative and not significant effect. Regarding the tax effort, the level of inflation and public expenses have a positive and significant effect, while the official assistance received and the external debt have a negative and significant effect.

Dalamagas et al. (2019) proposed a utility maximization process to estimate the optimal tax revenue for 30 countries over the period 1996–2015 (and the two subperiods of 1995–2009 and 2010–2015). To our knowledge, it is the first study to examine the impact of the world economic crisis on countries' tax effort. In their analysis, the optimal level of tax revenue is shown to be equal between GDP and consumption. On the basis of this definition, the actual tax burden was below its optimal level for 26 out of the 30 countries studied.

The current paper contributes to the discussion on tax effort by introducing total wealth as a proxy for economic development, in lieu of GDP, which is most commonly used in the literature. Also, by focusing in euro-area countries, it provides useful insight in existing comparative analysis regarding the impact on the global economic crisis in the Eurozone in the field of taxation.

Also, in all the above studies, regardless of the approach used to estimate tax capacity and calculate tax effort, GDP per capita has been used as a proxy of economic development in the countries examined.

The current paper is structured as follows: the first section describes the methodology used, the data selected and the sources of these data. The second section provides the empirical results of countries' tax capacity, i.e. the potential revenue they can raise.

3 Evolution of Actual Tax-to-GDP Revenues, 2008–2018

The current section provides a brief overview of taxation trends in Eurozone countries² over the period 2008–2018.

Given that countries' populations and economies differ and to enable cross-country comparisons, total tax revenues are expressed as a percentage of GDP. This is the so called 'tax-to-GDP' ratio.

Data are extracted from the European Commission, Taxation and Customs Union, where total taxes are defined as taxes on production and imports (D.2), current taxes on income and wealth (D.5) and capital taxes (D.91), minus 'Capital transfers (representing taxes assessed but unlikely to be collected)' (D.995) (Table 1).

Tax revenues as a percentage of GDP reached in 2018 24.9% on average in the countries included in our sample, increased by 1 percentage point relative to 2008. Since 2009, after the outbreak of the financial crisis, a trend of annual increases is observed in the Eurozone average.

Of the 17 countries of our sample, the tax-to-GDP ratio in 2018 compared to 2008 rose in 13 countries and fell in 4. Between 2008 and 2018, the largest tax-to-GDP ratio increase was seen in Greece (at 7 p.p), followed by France (3.3 p.p). Increases of 2 percentage points or more were seen in Slovakia, Portugal, Netherlands, Luxembourg and Spain.

The largest fall in the tax-to-GDP ratio was in Ireland (−5.9 p.p.), followed by Lithuania (−3.7 p.p).

Even though the total level of tax revenue as a % of GDP has increased in most Eurozone countries, the level of total taxation differs considerably among Member States. In 2018, the tax-to GDP ratio varied between 31,4% in Belgium and 17,4% in Lithuania (Fig. 1).

As it was already mentioned, a country's tax capacity is in principle approached by its Gross Domestic Product (GDP), which is considered to be an indication of the size of its tax base and the tax effort is approached by dividing actual tax collections to GDP. However, GDP alone is not enough to assess a country's tax capacity as there are undoubtedly other factors that decisively affect countries' ability to raise

² Due to lack of data for Cyprus and Malta in the empirical analysis, these countries are not included in the Table 2.1. either.

Table 1 Evolution of total tax revenues as a % of GDP, 2008–2018

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2018–2008
Lithuania	21.1	17.7	16.7	16.1	16.2	16.1	16.4	17.4	17.6	17.2	17.4	-3.7
Ireland	24.6	22.9	22.7	22.9	23.5	23.8	24	19.4	19.7	18.7	18.6	-6
Slovakia	17.3	16.4	16	17	16.4	17.6	18.3	18.9	18.8	19.3	19.3	2
Estonia	19.8	22	20.3	19.7	20.4	20.5	21.1	22	22.1	21.4	21.4	1.6
Latvia	20	18.3	19.7	19.6	20.3	20.7	21.3	21.5	22.5	22.7	21.9	1.9
Slovenia	22.9	21.8	22.2	22	22.1	22	22.2	22.2	22.2	21.9	22	-0.9
Spain	20.3	17.7	19.5	19.4	20.7	21.7	22.3	22.5	22.3	22.4	23	2.7
Germany	23.5	23.1	22.1	22.7	23.2	23.3	23.1	23.5	23.8	23.9	24.3	0.8
Netherlands	22.7	22.5	22.6	21.9	21.1	21.4	22.4	23	23.7	24.9	24.8	2.1
Portugal	23.4	21.2	21.8	23.3	23	25.1	25.2	25.4	25	25	25.3	1.9
Austria	27.9	27	27.1	27.3	27.8	28.3	28.3	28.7	27.3	27.3	27.6	-0.3
Greece	21.1	20.6	21.3	23.4	25.2	25.2	25.8	26	27.8	27.6	28.1	7
Italy	28.3	28.4	28.3	28.3	30.1	30.2	30	29.9	29.4	29.1	28.7	0.4
Luxembourg	26.4	26.9	26.8	26.4	27.3	27.3	27	25.5	25.9	26.8	28.8	2.4
France	27	25.9	26.2	27.3	28.1	28.8	28.8	29	29	29.7	30.3	3.3
Finland	29.6	28.6	28.5	29.8	29.8	30.9	30.9	30.9	31	31	30.5	0.9
Belgium	30.2	28.9	29.6	30.2	31	31.6	31.4	30.8	30.6	31.2	31.4	1.2
Average	23.9	22.9	23.0	23.4	23.9	24.4	24.6	24.5	24.6	24.7	24.9	1.0

European Commission, Taxation and Customs Union

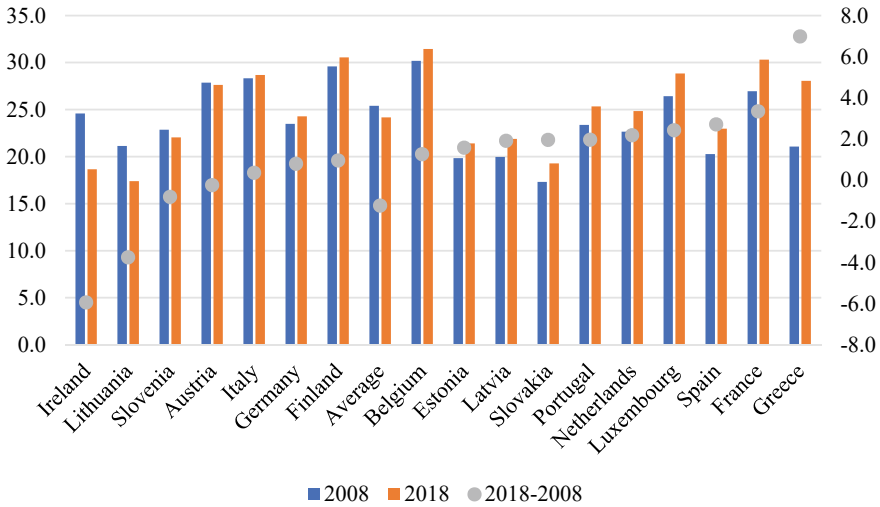


Fig. 1 Tax revenues, 2008–2018 (% of GDP)

tax revenue. Therefore, the paper proceeds with estimating empirically the Eurozone countries’ tax capacity.

4 Methodology and Data

The current research follows the standard regression method for predicting Eurozone countries’ potential revenues for the period 2008–2018, i.e. for estimating their tax capacity. The basic model can be expressed as follows:

$$Y_{it} = f(X_{it})$$

where

Y_{it} is tax revenue as a percentage of GDP

X_{it} are factors that have a decisive influence on the size of the tax base and consequently affect countries’ potential tax revenue collection

t = years covered (from 2008 to 2018)

i = countries covered (from 1 to 17).³

Following existing literature, the underlying hypothesis of this specification is that the tax revenue capacity of a country is determined by both economic factors and institutional characteristics. Therefore, the following empirical specification is estimated:

³ Cyprus and Malta are not included in our sample no data on national wealth per capita were available at the time of the research.

$$\text{Tax/GDP}_{it} = a_0 + a_1 \text{WEALTHPC}_{it} + a_2 \text{SERV}_{it} + a_3 \text{IND}_{it} + a_4 \text{AGR}_{it} + a_5 \text{CORRUPT}_{it} + e_1$$

where

WEALTHPC: wealth per capita (constant 2018 US\$)

SERV: services value added, measured as a fraction of GDP

IND: industry and construction value added, measured as a fraction of GDP

AGR: agricultural value added, measured as a fraction of GDP

CORRUPT: Corruption Index

e : the stochastic term

National wealth is a new (albeit historically older) indicator which has gained attraction and is used as a proxy for the level of development of a country by going beyond economic output. While GDP, which is the traditional means of determining a country's economic vitality, measures the monetary value of the goods and services a country produces on a yearly basis, national wealth considers a country's assets. Specifically, national wealth accounts for produced capital (resources made by humans like buildings, machines and technology), natural capital (renewable and non-renewable assets like forests, fisheries, minerals, fossil fuels and agricultural land), human capital (skills and experience of the labor force) and net foreign assets (the sum of a nation's foreign assets minus its foreign liabilities).⁴ Needless to say that the measure of national wealth does not substitute the GDP measure. These two measures are linked and when considered alongside each other provide useful understanding of an economy's sustainability. In our analysis, national wealth per capita is measured in constant 2018 USD and data is extracted from the World Bank Wealth Accounts dataset. One would expect the sign of the coefficient on national wealth per capita in the regression to be positive.

The economy's composition also affects the tax revenue level that a country can potentially raise. Certain sectors of the economy have been traditionally hard to tax, such as services and agriculture. Services are often provided informally and therefore are hard to capture by tax administrations. Similarly, agriculture activities can easily escape formal economy and also for equity or political economy issues, they are often taxed at lower rates and are even exempted (Cyan et al. 2013). As a result, the largest the share of these two sectors in an GDP, the more difficult would be for a country to raise tax revenues and thus one would expect a negative relationship in the regression. Data on services value added⁵ as a fraction of GDP and agricultural value added as a fraction of GDP (including forestry and fishing) are extracted from the World Development indicators, World Bank database.

⁴ World Bank (2021). © World Bank. <https://openknowledge.worldbank.org/handle/10986/36400>
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⁵ Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs.

Industry is another important sector of the economy. Data on industry value added as a fraction of GDP are similarly extracted from the World Development indicators, World Bank database. The effect though on potential tax revenues is ambiguous, as this indicator also includes construction section, which in many countries has a high percentage of output produced informally.

Following Ghura (1998), recent tax effort studies included institutional variables in the analysis. The current research uses corruption as a proxy for governance quality, as measured by the Corruption Perception Index, which is published annually by the non-governmental Transparency International. The Corruption Perception Index ranks countries and territories around the world based on how corrupt their public sectors are perceived to be and the results are given on a scale of 0–100 where 0 is highly corrupt and 100 is very clean. In this paper, following the methodology used by Tanzi and Davoodi (1997), the index is multiplied by minus one, so that higher values of the index imply higher corruption. It is expected that the coefficient on CPI will be negative, as corruption discourages taxpayers compliance and discourages investment, leading thus to lower tax revenues.

Finally, data on tax revenues are extracted from the European Commission, Taxation and Customs Union, where total taxes are defined as taxes on production and imports (D.2), current taxes on income and wealth (D.5) and capital taxes (D.91) minus ‘Capital transfers (representing taxes assessed but unlikely to be collected)’ (D.995).

Dividing actual tax revenue as a percentage of GDP by the tax capacity (fitted tax revenues) estimated in each country results in the tax effort that each country makes. When the result is greater than one, it is concluded that the country adequately uses its tax base to increase its tax revenues and vice versa. When the result is lower than one, it is concluded that there is room either to increase taxes or the efficiency of collecting them.

Since our sample consists of a combination of cross section data and time series, where the same unit cross section is measured at different times, the methodology applied to estimate our model is Generalized Least Squares in Eviews, with country fixed effects. This method controls for time-invariant unobserved individual characteristics that can be correlated with the observed independent variables. This is different from a simple Ordinary Least Square Model in the intercept term. By introducing Dummy variables (Cross-section Fixed Effects) a different intercept is calculated for each individual country. As a result, the estimation of an unknown constant effect in the model is enabled, which is unmeasured by the data.

Also, the Generalized Least Squares method with a cross section weighting in the sample is considered appropriate to fix heteroskedasticity, as subpopulation differences attributed to the wealth standard of each country are eliminated.

As a result the model is changed to:

$$\text{Tax/GDP}_{it} = a_0 + a_1 \text{WEALTHPC}_{it} + a_2 \text{SERV}_{it} + a_3 \text{IND}_{it} + a_4 \text{AGR}_{it} \\ + a_5 \text{CORRUPT}_{it} + \text{CSFE}_j + e_1$$

where

CSFE = the Cross Section Fixed Effect per Country, which is actually a dummy variable for each country that differentiates the constant variable against the average constant variable of our sample. In other words, the fixed effects assume that differences between individual countries (cross section) can be accommodated from different intercepts.

It is expected that our estimations are auto-correlated. To correct for auto-correlation, an auto-regression scheme of low order AR(1) is introduced. As a result, the model is transformed to:

$$\text{Tax/GDP}_{it} = a_0 + a_1 \text{WEALTHPC}_{it} + a_2 \text{SERV}_{it} + a_3 \text{IND}_{it} + a_4 \text{AGR}_{it} \\ + a_5 \text{CORRUPT}_{it} + \text{CSFE}_j + \text{AR}(1) + e_1.$$

5 Empirical Results

5.1 Estimation of Tax Capacity

The results obtained from the estimation of the above equation, using the fixed effects model with cross-section weighting are presented in the following Table 2.

The adjusted R-squared is high, indicating that approximately 99% of actual tax revenues is explained by the model. The coefficient on wealth per capita has the expected positive sign and is statistically significant at 0.001 level. This means that the wealth per capita has a positive and significant relation with tax revenues from corporate tax. The coefficients for services value added and agricultural value added have both the expected negative signs and are statistically significant at 0.001 level. This confirms that they are both hard-to-tax sectors and an increase in their share in GDP, will affect negatively tax revenues. Similarly, the coefficient with the industry value added (construction included) has a negative sign and is also significant at 0.001 level. The coefficient on corruption is also negative and significant at 0.001 level, confirming that when the public sector of a country is perceived to be corrupted, then tax revenues are negatively affected. Finally, the constant term is significant,

Table 2 Determinants of tax capacity

<i>Dependent variable: tax revenues as a % of GDP</i>		
C	128.4133 (8.646)	***
Wealth per capita	0.0000182 0.000	***
Services value added % of GDP	-1.2848 (0.098)	***
Industry (incl. construction) value added % of GDP	-1.3774 (0.095)	***
Agriculture value added % of GDP	-0.7725 (0.178)	***
Corruption	-0.5596 (1.154)	***
AR(1)	0.5668 (0.051)	***
Method	Generalized panel least squares	
Observations	170	
Cross-sections included	17	
R-squared	0.989	
R-squared adjusted	0.987	
F-Statistic	602.99	
Country fixed effects	Yes	
Year fixed effects	No	

*** means statistically significant at the 0.001 level

suggesting that there is an unmeasured common effect, not explained by the data that has a positive overall effect on tax revenues.

It should be noted that several studies (Ghura 1998; Bird et al. 2004; Le et al. 2012; Cyan et al. 2013; Langford and Ohlenburg 2016; Yohou and Goujon 2017) use a demographic variable in their empirical estimation, which is either the growth rate of population between 15 and 64 years old or the age dependency rate, or population density or human capital index. The current paper attempted to introduce as an additional explanatory variable the age dependency ratio and the ratio of population over 65 years old, but the results were not significant. Also, in lieu of these demographic variables the unemployment rate and the employment rate were tested as additional explanatory variables, but again the results were not significant.

The following Table 3 presents the time invariant fixed effects for each country in our sample.

Tax capacity (predicted tax to GDP ratio) is calculated for each country, using the estimated coefficients in Table 2 and the country fixed effects.

Table 3 Country fixed effects

Country	Country fixed effects
Austria	0.18419
Belgium	4.29654
Estonia	-2.66305
Finland	-2.24263
France	2.32495
Germany	-3.48789
Greece	4.02274
Ireland	1.38374
Italy	8.02871
Latvia	-1.26939
Lithuania	-1.44919
Luxembourg	-5.21347
Netherlands	-5.56810
Portugal	1.12528
Slovak Republic	1.09135
Slovenia	-2.42032
Spain	1.85655

5.2 Estimation of Tax Effort Indexes

The following Fig. 2 illustrates the actual tax to GDP ratio and tax capacity on average across Eurozone countries included in our sample, over the period 2008–2018.

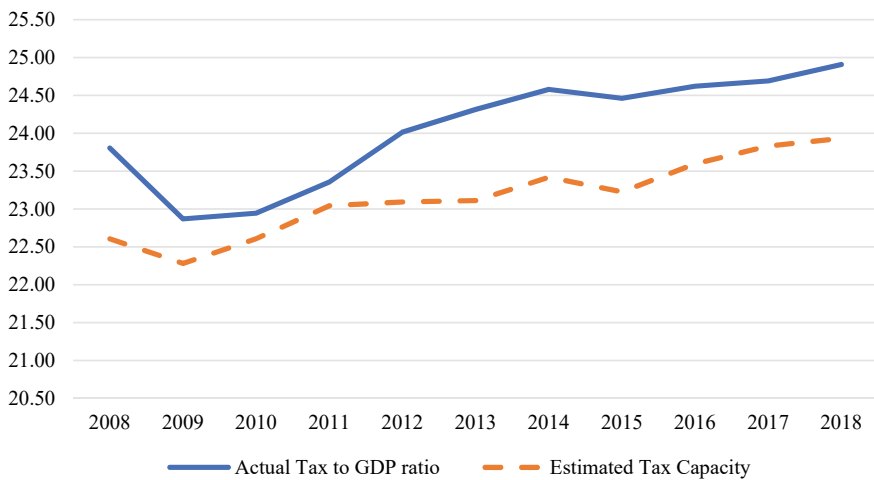


Fig. 2 Average actual tax to GDP ratio and tax capacity euro area, over 2008–2018

Table 4 Average actual tax to GDP ratio, tax capacity and tax effort by country, 2008–2018

Country	Actual tax to GDP ratio	Tax capacity	Tax effort
Lithuania	17.27	14.77	1.17
Slovak Republic	17.76	16.04	1.11
Slovenia	22.12	20.25	1.09
Estonia	21.10	19.51	1.08
Germany	23.32	21.64	1.08
Latvia	20.83	19.62	1.06
Finland	30.15	28.49	1.06
Austria	27.69	26.21	1.06
Ireland	21.93	20.84	1.05
Spain	21.07	20.45	1.03
Italia	29.15	28.40	1.03
Belgium	30.64	30.12	1.02
Netherlands	22.81	22.53	1.01
France	28.20	28.05	1.01
Portugal	23.96	23.86	1.00
Luxembourg	25.85	27.04	0.96
Greece	24.72	25.88	0.96

During the 10 year period since the outbreak of the global economic crisis, in the Eurozone area, on average, tax capacity is well below the actual tax to GDP ratio. The gap between the two series was large in 2008, it became smaller in the years that followed and up to 2013. The gap is the largest in 2015 and since then euro-area countries on average receive tax revenues closely above their tax capacity.

To compare countries' effectiveness in revenue mobilization, the index of tax effort is calculated by dividing the actual tax to GDP ratio by the estimated tax to GDP ratio (taxable capacity). The following Table 4 presents the actual and predicted tax revenue as a percentage of GDP (i.e. tax capacity) as well as the tax effort for each country included in our sample, on average over the period 2008–2018.

Countries in the Table 4 are ranked according to Tax Effort data, from the highest to the lowest value of tax effort. Lithuania has the highest tax effort index, while Luxembourg and Greece have the lowest tax effort index. The results confirm previous findings that most developed countries are located around the value of 1. With the exception of Luxembourg and Greece, all other countries adequately use their tax base to increase tax revenues.

Table 5 Ranking of countries according to tax effort–tax collection

Low tax effort–Low tax collection No countries	High tax effort–Low tax collection Slovak Republic, Lithuania, Latvia, Estonia, Slovenia, Spain, Ireland, Netherlands
Low tax effort–High tax collection Luxembourg, Greece	High tax effort–High tax collection Germany, Italy, Belgium, France, Austria, Portugal, Finland

Le et al. (2012) classify countries into different groups based on their tax efforts and actual tax collections. Countries with a tax effort index < 1 are included in the low tax effort group, while countries with a tax effort index higher than 1 are included in the high tax effort group. Similarly countries with actual tax to GDP ratio less than the median of the sample are regarded as low-collection countries while countries with actual tax to GDP ratio higher than the median are regarded as high-collection countries. In our results, the median value of the actual to GDP ratio equals 23.32.

As a result Slovak Republic, Lithuania, Latvia, Estonia, Slovenia, Spain, Ireland, Netherlands are regarded as low-collection countries (Table 5).

For high tax effort, high tax collection countries, where all of them are older EU members, there is little scope for increasing revenue collection without generating disproportionately high economic costs, therefore tax policy in these countries should be oriented towards rationalizing the tax mix and reducing excessive high tax rates, so as to avoid possible distortions.

High tax effort, low tax collection countries, are the newer members of the EU, which have all implemented (at least for some years) flat tax systems, together with Spain, Ireland and Netherlands. These countries adequately use their tax base to raise tax revenues, but they need to improve collection of revenues.

Finally, Luxembourg and Greece seem to have high revenue potential but the combination of high level of collection and low tax effort might reflect their choice of the level of taxation. According to Le et al. (2008), countries belonging in this group need to consider restructuring their tax mix since they typically impose high factor income taxes, specifically on labor.

Average values give us the general picture of tax efforts across countries. A detailed analysis of countries overtime can provide a clearer understanding of the trends in taxes (Table 6).

Countries are ranked according to 2018 values (from smallest to largest) while the last column reports the difference between the 2018 and the 2008 values. The biggest increase in the tax effort index is reported in Ireland (+0.22), followed by Greece (+0.19) and Portugal (+0.09).

Table 6 Tax effort index, annual, 2008–2018

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2018–2008
Latvia	1.19	1.11	1.09	1.10	1.08	1.06	1.04	1.04	1.04	1.04	0.96	-0.23
Italy	1.01	1.02	1.01	1.00	1.06	1.07	1.06	1.05	1.02	1.00	0.98	-0.03
Greece	0.81	0.86	0.84	0.90	1.00	1.02	1.01	1.01	1.03	1.01	1.00	0.19
France	1.00	0.98	0.97	0.98	1.01	1.03	1.03	1.02	1.01	1.01	1.01	0.02
Belgium	1.02	0.98	1.00	1.01	1.03	1.04	1.04	1.03	1.00	1.01	1.02	0.00
Spain	1.05	1.03	0.99	0.99	1.04	1.06	1.06	1.04	1.02	1.02	1.03	-0.02
Netherlands	1.02	1.02	1.03	1.00	0.97	0.97	1.01	1.01	1.01	1.05	1.04	0.02
Estonia	1.18	1.13	1.09	1.08	1.08	1.09	1.07	1.07	1.06	1.03	1.04	-0.14
Austria	1.09	1.04	1.04	1.04	1.06	1.08	1.09	1.09	1.03	1.03	1.04	-0.05
Portugal	0.96	0.95	0.93	0.97	0.97	1.08	1.05	1.05	1.02	1.03	1.04	0.09
Finland	1.16	1.08	1.05	1.03	1.01	1.04	1.05	1.06	1.05	1.08	1.05	-0.12
Luxembourg	0.93	0.97	0.98	0.93	0.92	0.92	0.90	0.95	0.98	0.98	1.05	0.12
Slovenia	1.16	1.10	1.09	1.09	1.09	1.08	1.09	1.08	1.08	1.08	1.08	-0.07
Germany	1.15	1.08	1.07	1.05	1.06	1.06	1.06	1.07	1.09	1.08	1.09	-0.05
Lithuania	1.50	1.27	1.17	1.15	1.14	1.15	1.13	1.12	1.12	1.06	1.09	-0.40
Slovakia	1.10	1.06	1.09	1.10	1.12	1.11	1.13	1.15	1.13	1.10	1.10	0.00
Ireland	0.94	0.94	0.98	0.98	1.05	1.12	1.12	1.22	1.17	1.05	1.16	0.22
Average	1.07	1.04	1.02	1.02	1.04	1.06	1.06	1.06	1.05	1.04	1.05	-0.03

Table 7 Average values over the period 2008–2018, by variable and country

Country	Tax_Rev	Wealth_per_capita	Serv_value_added	Ind_value_added	Agr_value_added	CPI
Austria	27.69	60371403714.59	62.33	25.61	1.23	7.54
Belgium	30.64	55495754957.14	68.60	20.06	0.68	7.45
Estonia	21.10	22486624866.94	59.72	24.65	2.90	6.78
Finland	30.15	60540905409.57	59.70	24.67	2.32	8.93
France	28.20	53524035240.56	70.30	17.82	1.54	6.98
Germany	23.32	62112721127.29	62.21	26.91	0.81	7.98
Greece	24.72	20618706187.21	70.06	14.60	3.36	4.14
Ireland	21.93	45379253792.75	61.19	29.27	0.98	7.48
Italy	29.15	37128971289.79	66.41	21.57	1.94	4.46
Latvia	20.83	20543305433.77	64.99	19.90	3.45	5.15
Lithuania	17.27	15314953149.78	59.95	26.88	3.29	5.44
Luxembourg	25.85	85456154561.37	78.90	11.15	0.26	8.24
Netherlands	22.81	64322943229.68	69.01	19.15	1.70	8.51
Portugal	23.96	25119351193.32	65.94	19.42	2.01	5.90
Slovak Republic	17.76	18040780407.09	57.91	30.12	2.15	4.75
Slovenia	22.12	31219112191.90	57.10	27.83	1.98	6.12
Spain	21.07	32057020570.12	67.36	21.62	2.56	6.04

The economic crisis largely affected all three countries, and they had to undertake restrictive fiscal consolidation measures. The largest decrease in the tax effort index is reported in the three Baltic countries, Lithuania (−0.4), Latvia (−0.23) and Estonia (−0.14) and Finland (−0.12).

In 2018, the highest tax effort index is reported in Ireland, followed by Slovakia. The lowest tax effort index is reported in Latvia and Italy, which are the only two countries where actual tax collections are below the estimated tax capacity. It is observed that Greece, despite having one of the largest increases in their tax effort index since 2008, still has the third lowest tax effort index in 2018, among the countries included in our sample.

In the Annex, Table 7 provides the average values over the period 2008–2018, by variable and country. Also, in the Annex, Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19 illustrate graphically the evolution of the Actual Tax Collections, the Predicted Tax Revenues and the Tax Effort Index for each country included in our sample.

Germany

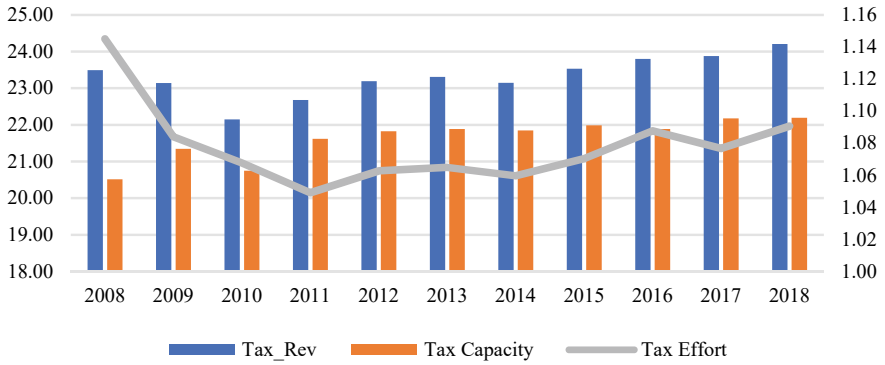


Fig. 3 Germany—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

Belgium

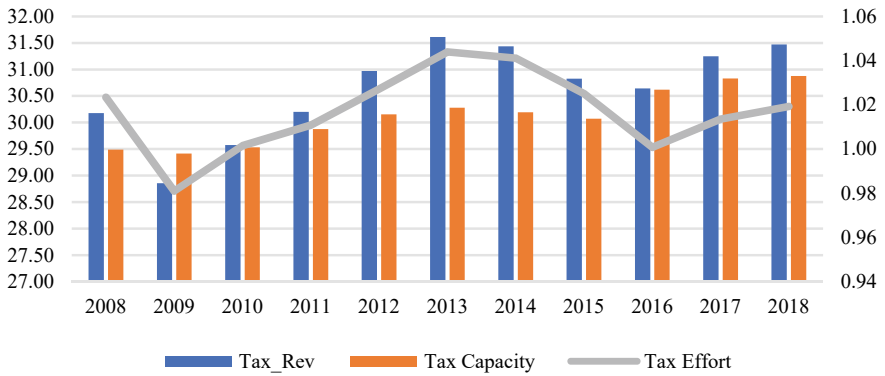


Fig. 4 Belgium—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

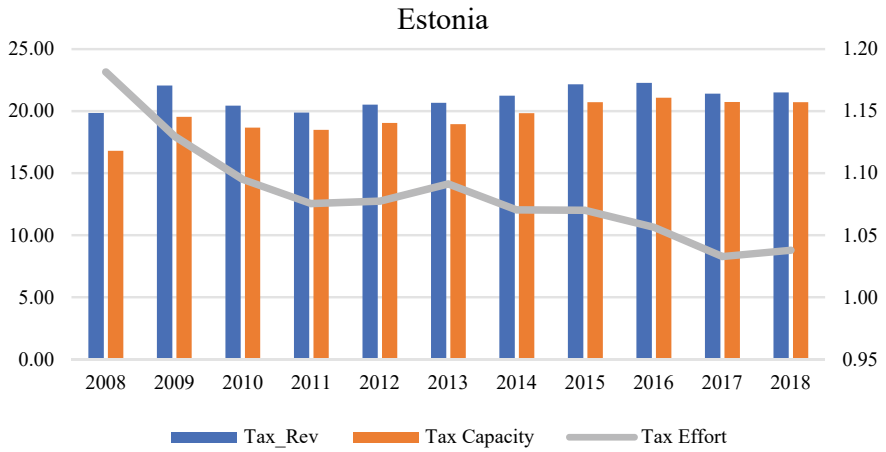


Fig. 5 Estonia—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

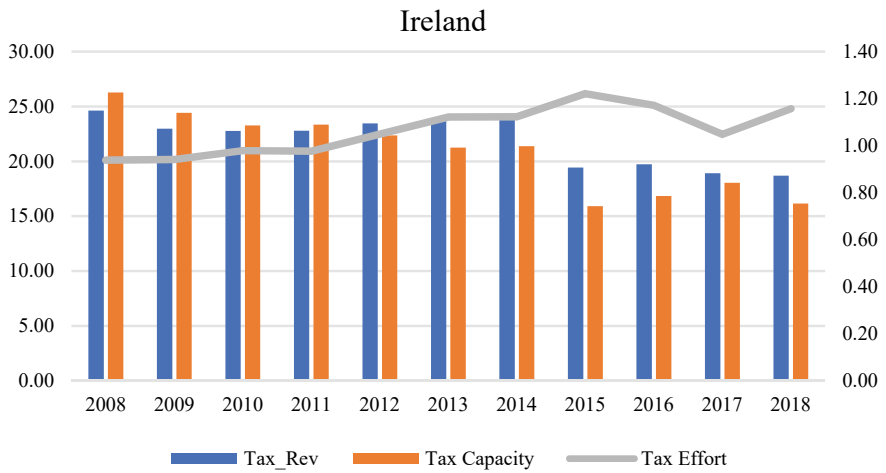


Fig. 6 Ireland—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

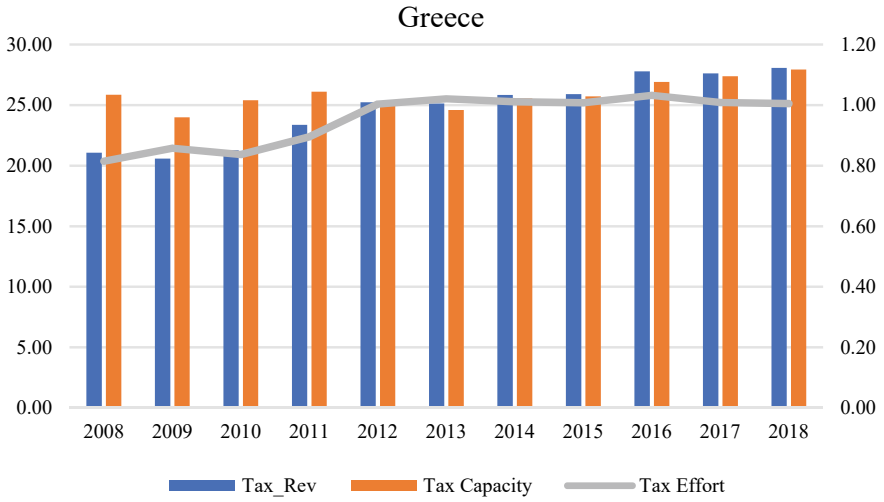


Fig. 7 Greece—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

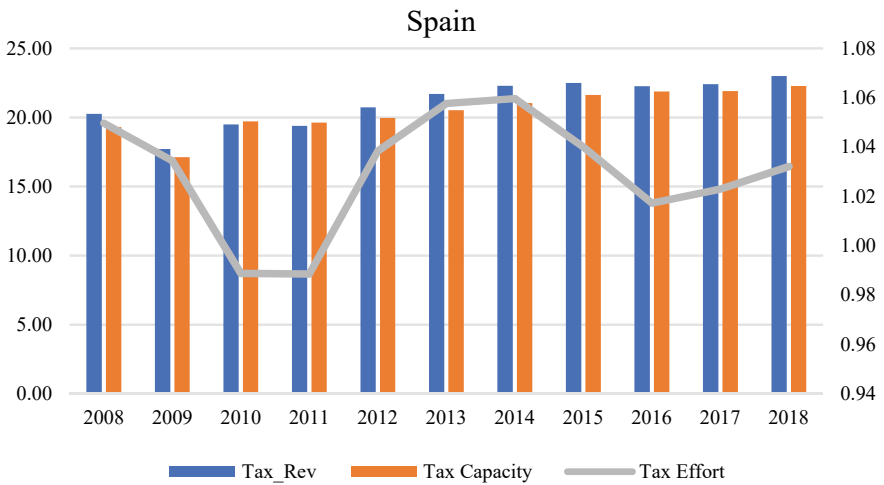


Fig. 8 Spain—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

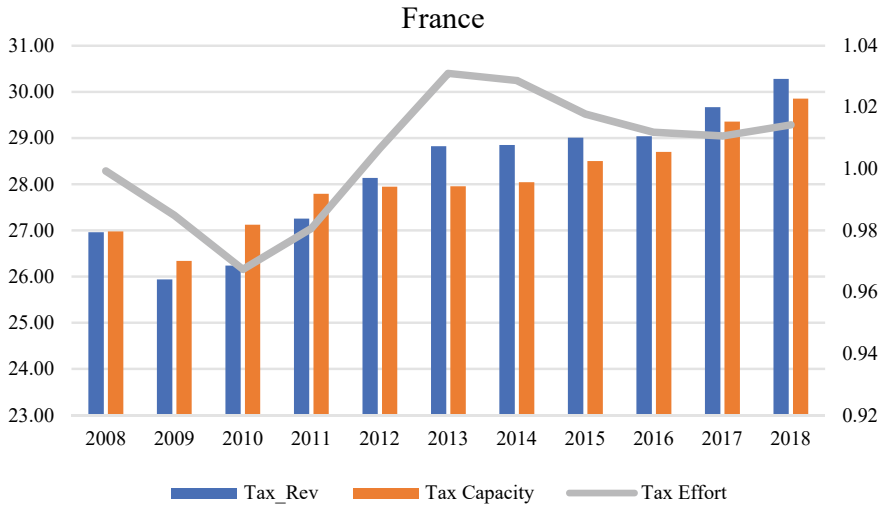


Fig. 9 France—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

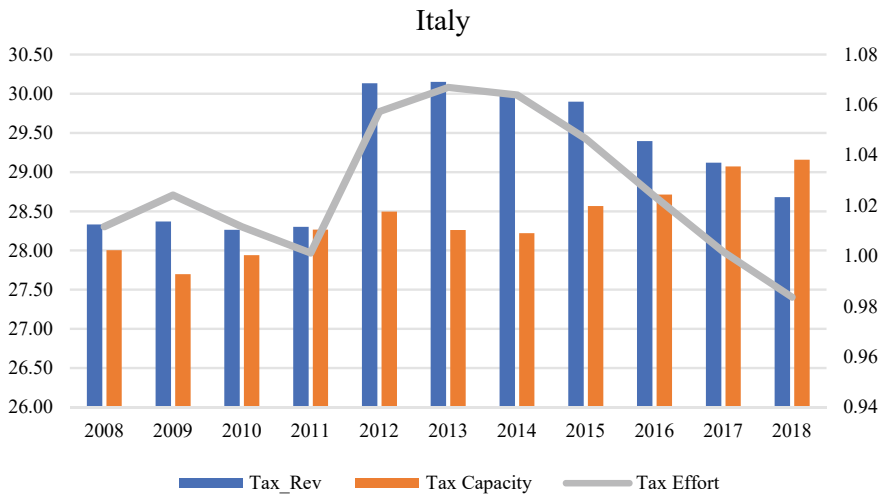


Fig. 10 Italy—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

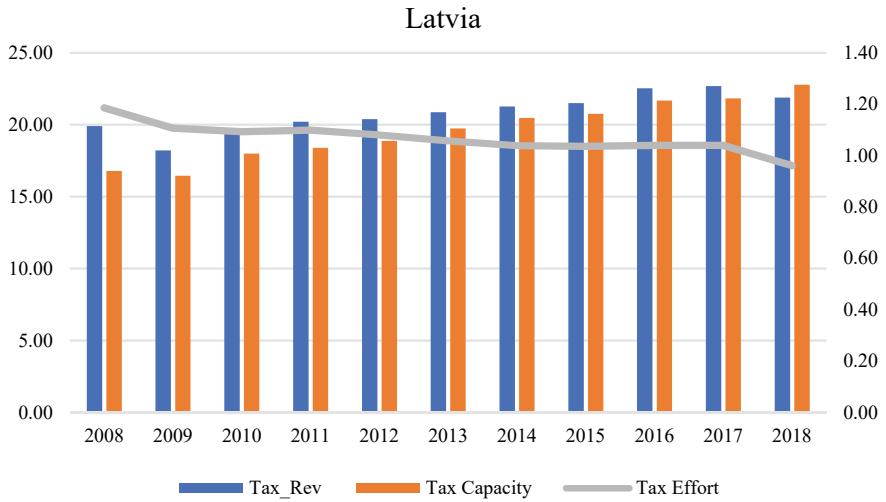


Fig. 11 Latvia—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

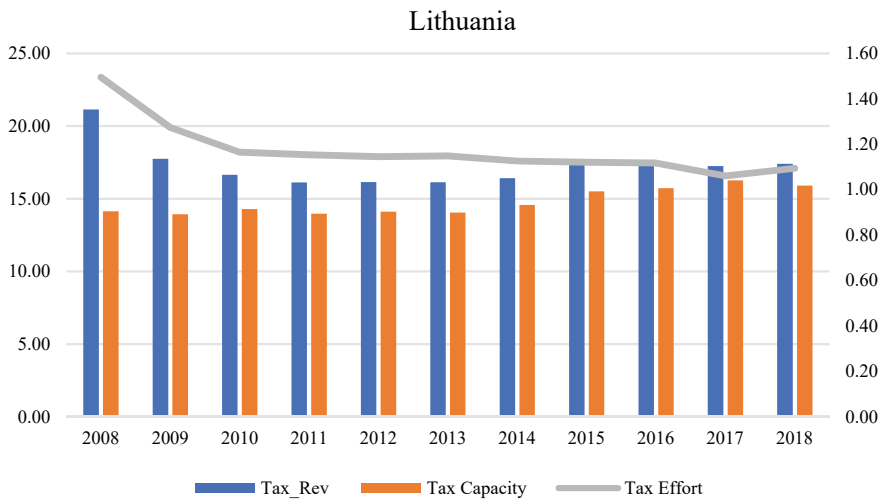


Fig. 12 Lithuania—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

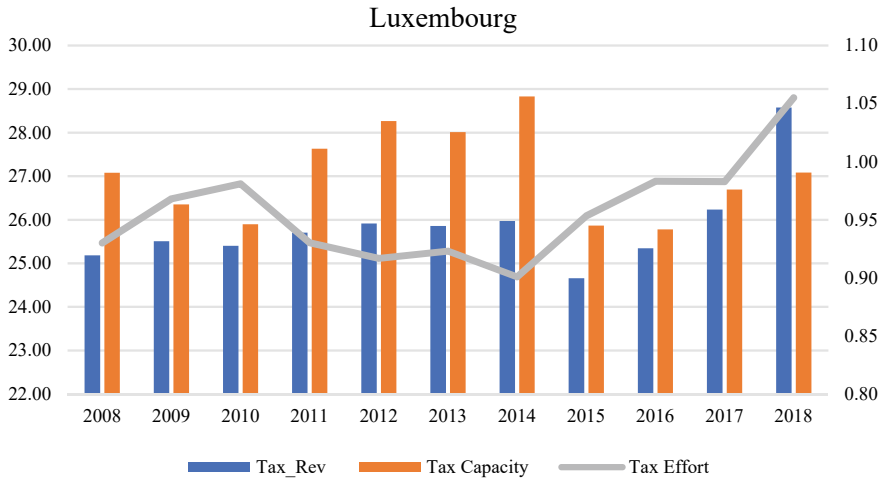


Fig. 13 Luxembourg—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

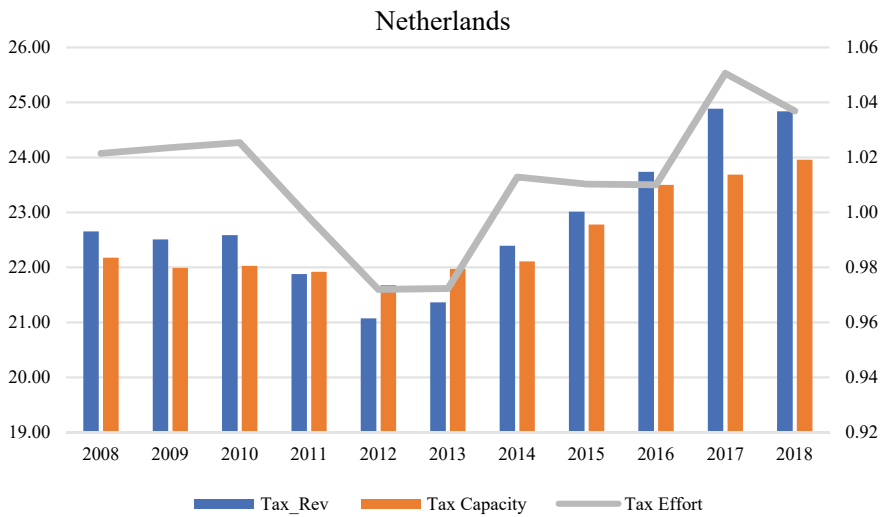


Fig. 14 Netherlands—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

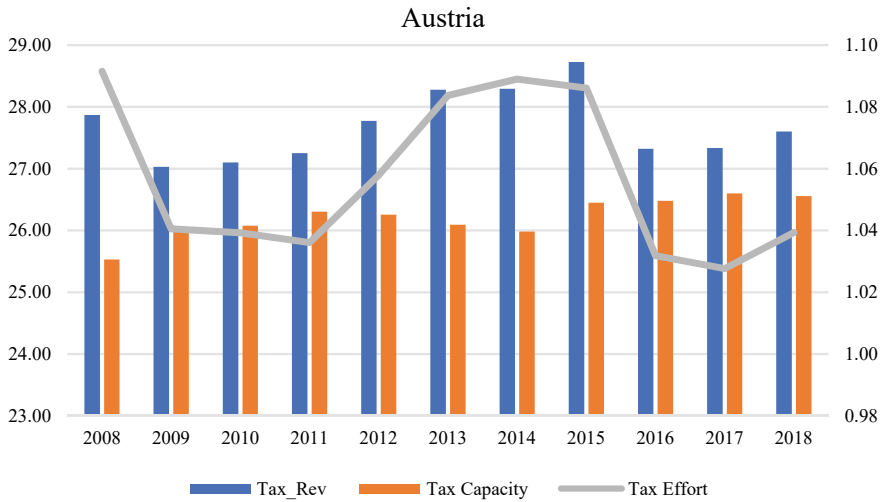


Fig. 15 Austria—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

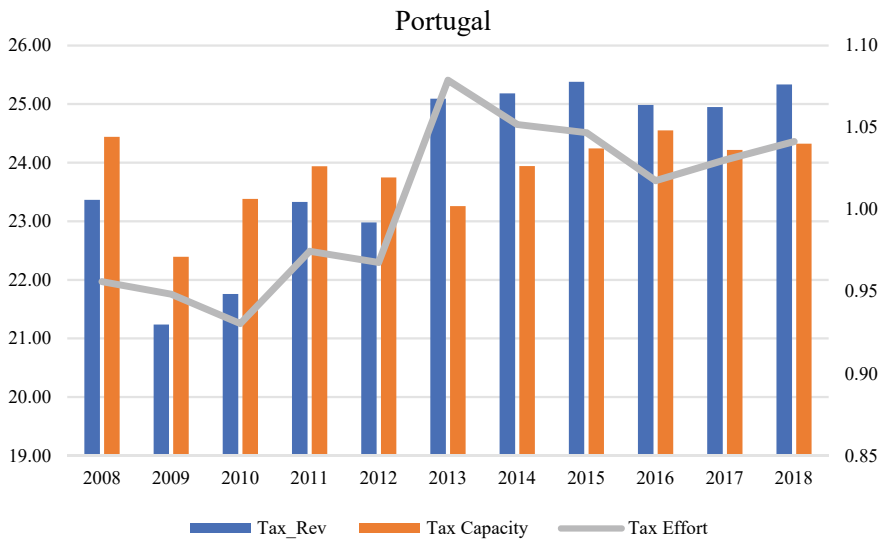


Fig. 16 Portugal—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

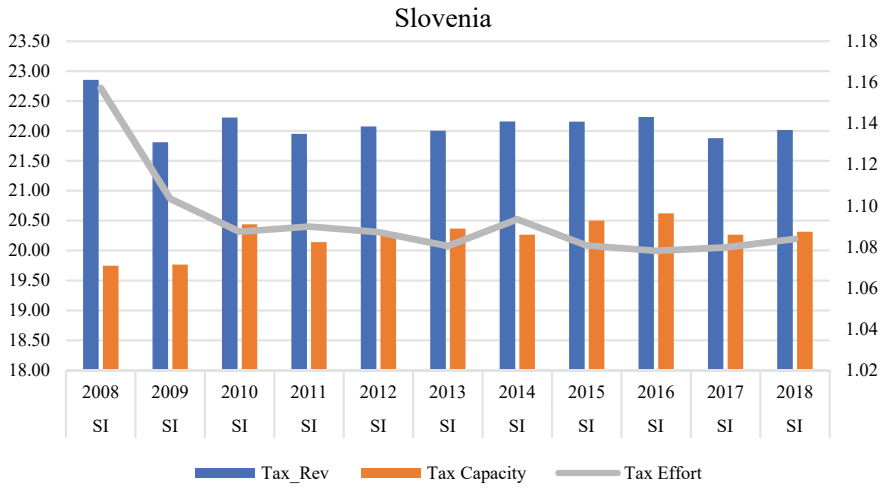


Fig. 17 Slovenia—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

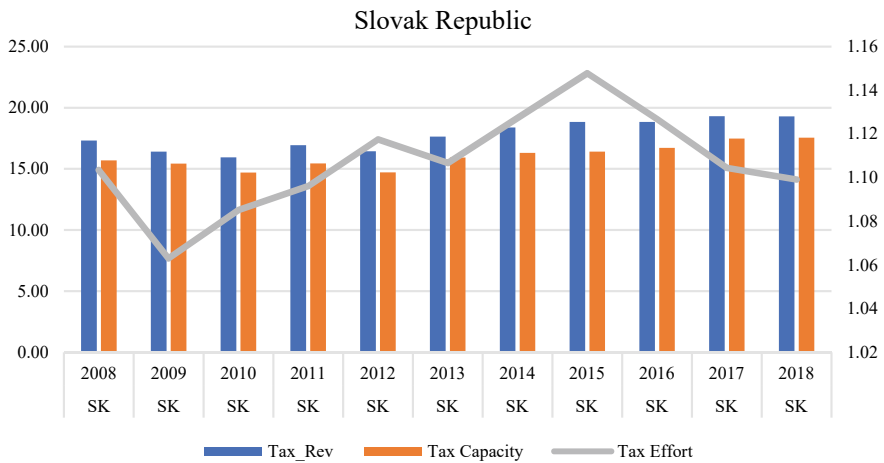


Fig. 18 Slovak Republic—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

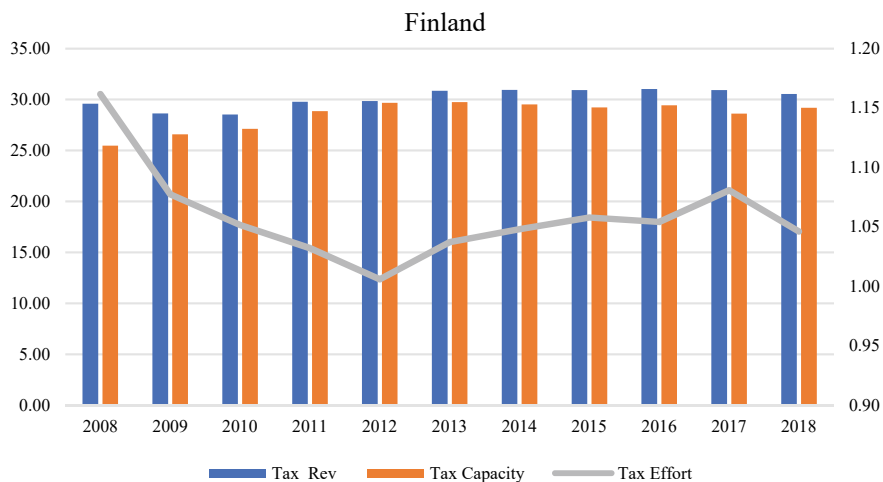


Fig. 19 Finland—Evolution of actual tax collections, predicted tax revenues and tax effort index (2008–2018)

6 Conclusion

The calculation of the tax effort index which relates a country's actual tax revenues as a percentage of GDP with some estimation of its tax capacity, gives a more complete comparative measure which takes into consideration the countries' economic and institutional characteristics.

The current paper focused on estimating tax effort index for Eurozone countries in the period that followed the outbreak of the global economic and financial crisis (2008–2018), so as to assess whether there were strong divergences among the euro-area countries. Compared to previous studies, the paper uses wealth per capita as a proxy for economic development, in order to estimate tax capacity.

As in previous studies, and since all countries in our sample are classified as high income-developed countries, the tax effort index is around one, with the majority of Eurozone countries' actual tax revenues exceeding their estimated tax capacity. This proves that Eurozone countries, during the period where the effects of the crisis were pronounced, were able to utilize adequately their tax bases in order to raise revenues. Undoubtedly, differences were recorded among the countries in our sample. For example, Greece, Ireland and Portugal, all severely hit by the crisis, undertook a major effort during the period examined recording. Their tax effort index was below 1, in 2008, which meant that there was room for increasing efficiency in their tax systems.

It should be stressed that the results need to be interpreted with caution, since there is not adequate a priori justification for the use of the selected explanatory variables and also, since the corruption index variable is an estimate, based on people's perceptions.

Further research could be directed towards confirming the results obtained in this paper, by using an alternative methodology, following Cyan et al. (2013). Also, the evolution of countries tax effort index could be examined in conjunction with the tax policy reforms introduced in these countries over the period 2008–2018.

7 Annex

See Table 7, Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19.

Graphical Illustration of Actual Tax Collections, Predicted Tax Revenues and Tax Effort Index for Each Country Separately

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The Perceived Micro and Macroeconomic Impacts of a Health Management Crisis in Greece: An Empirical Survey



Nikolaos Zisoudis, Eleni Zafeiriou, Alexandros Garefalakis,
and Fragiskos Gonidakis

Abstract The outbreak of pandemics COVID-19 in March of the year 2020, has led to numerous socioeconomic coups by psychological impacts all around the world (Cucinotta and Vanelli in *Acta Bio Medica* 91:157–160). The present study with 450 questionnaires on consumers through the google platform aims to unveil the determinants of macro and microeconomic perceptions of a small economy like Greece in post pandemics era. The study is conducted with the assistance of logit (multinomial and binary). The findings of the particular study can provide an insight to the socioeconomic and psychological impacts of the health crisis management by the government on consumers and how measures taken may well modificate the rational expectations in order not only to minimize the micro and macro-economic impacts of this crisis, but this event to become the starting point for economic growth.

Keywords Economic crisis · Covid-19 · Income deterioration · Unemployment rate · Individual income

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1 Introduction

The outbreak of COVID 19 pandemics has arisen multiple socioeconomic issues in developed and developing economies. The changes in everyday life of all people, young and old, workers, students and pupils has gone through multiple changes.

The first change recorded in national economies is the restriction of movement of humans, goods and services (Baldwin and Tamiuro 2020). In conditions of terror for the public health due to pandemics a number of changes have been recorded in the function of the public and private sector. (Laborde et al. 2020; Kraemer et al. 2020). First of all, the practice of teleworking was established. More specifically, in most organizations either previously familiar with teleworking, or not, teleworking has become the most popular practice of function in history (Kraemer et al. 2020). The urgent nature of the existing situation is where the changes were instant resulting in an abundance of information for employers and employees transmitted through different means i.e., social networks along with economic and political uncertainty and a significant expansion of unemployment (Dubey et al. 2020).

The uncertainty, the financial volatility and the fear of the public has led to a significant stress of economic agents and recession of most developed economies (Pfefferbaum and North 2020).

Within this framework and with the indices of pandemic still high a pressure on the macroeconomic indices is evident with significant impacts on consumer preferences and habits due to economic difficulties. The objective of the present subject is to unveil the changes in Greek households and how the changes in living and working conditions have affected their perception of macroeconomic and microeconomic variable. This paper is organized as follows; Sect. 2 describes the existing literature, the next section the data collection and the methodology. Section 4 describes and discusses the result while the last section the conclusions.

2 Literature Review

COVID-19 is a disease spread in the developing as well as in developed countries with multiple impacts to their citizens (World Health Organization 2020). This is the first time that a new pandemic appeared since the outbreak of Influenza H1N1 pandemic in 1918–1919. Another common feature among the two involves lack of access to a vaccine, making extremely difficult the confrontation of the public health emergency on behalf of the governments (Aristodemou et al. 2021; Ferguson et al. 2020).

Lack of efficient knowledge and limited information on the new virus is a difficult task to be managed by governments of developing and developed countries. The situation to be confronted and the solutions provided could have adverse results either in economic terms or in terms of citizens' health. More specifically, Public Health Management involves measures that may have adverse effects since confinement may

achieve the target of spread risk while on the same time entail economic, social and psychological impacts in micro and macro level (Merad and Trump 2020). Therefore, the public management of this pandemics requires the participation of all the potential participants namely experts, stakeholders, decision-makers, and the simple citizens (Aristodemou et al. 2021).

Within this framework, this particular disease is expected to heavily affect the global economy in terms of the Domestic Product (is expected to be reduced with a rate of 24%) and also in terms of trade given that it is assessed on an average decline of 20% in global trade (Mollalo et al. 2020).

Apart from the different social group involvement in the government's decision making a number of different factors do play a crucial role in the particular process. In the recent literature the pattern of COVID-19 occurrences and deaths in a country seems to be determined either by the proportion of inter (national) migration rate, that is also related to low-income jobs (UNDESA 2020; World Health Organization 2020). A significant finding of the existing literature is that migration may affect both in a negative as well as in a positive way to the pandemic since the higher rates of COVID 19 infections in countries where the migrants constitute 10% or more the proportion of the total population, may be outperformed by the migrants' contribution to significant sectors in tackling COVID-19 issues (United Nations Department of Economic & Social Welfare 2020; World Health Organization 2020).

The major dimensions that have to be considered for a successful tackling of a health crisis like a pandemics COVID19 are three and are synopsisized in the following indices: The first index denotes how well prepared are the health systems of a country to confront the shock caused by the outbreak of COVID 19. Another dimension involves the strictness of measures taken by the governments aiming to confine the public. The last but certainly not least dimension are the socio-economic effects entailed by the government measures taken (Aristodemou et al. 2021).

As a result of lack of vaccination and effective medication to limit the impacts of the virus numerous measures had to be adopted in order to limit the spread of coronavirus with a number of socioeconomic impacts. The measures' impacts were focused on ensuring public health and social distancing. More specifically closure of schools and non-essential businesses, the prohibition of social gatherings and events, along with restriction on trips in terms of national and international level has resulted in the citizens to be confined at home (Aristodemou et al. 2021; Hale et al. 2020). Despite the fact that the measures were imposed to save lives, consequences were inevitable for societies and economies as well as the lives of both infected and non-infected citizens (Gupta et al. 2021; Wedar Di Mauro 2020).

To mitigate the adverse effects of the crisis, a number of fiscal measures were taken including an increase in the capacity of health systems, enhancement of support in the affected workers, sectors and business. Despite the temporary nature of the measures the pressure put to the public finance of the economies may well entail higher debt especially for the EU Mediterranean countries that are already going through an economic crisis strongly associated with public indebtedness.

Within this peculiar and blur situation the present study aims to define the socio-economic impacts of coronavirus 19 in Greece, a country characterized by a heavy

economic crisis within the last decade. The study and assessment of the impacts is based on the citizens' perception and to make a criticism on the measures taken, while on the other hand to be suggested health management strategic plans that could not only be effective in the mitigation of this health crisis without resulting in economic recession.

3 Research Methodology

3.1 Data Collection

(I) Participants

The objectives of the particular study will be based on a questionnaire distributed to 450 consumers from various regions of Greece, with random sampling. The time period the survey was conducted was in mid-2021.

(II) Questionnaire Design

The questionnaire is the research tool and consists of 17 closed-ended items. The respondent may choose one or more responses from a set of possible answers. This type of questionnaire was selected because it is preferable for the respondents and it is easier and less time-consuming for the respondents to complete this. In addition, it is easier for the analyst to analyze the data and to derive the results (Filiat 1966; Siardos 2011; Zafeiriou et al. 2022).

The construction of the questionnaire has incorporated the following factors: (a) the socioeconomic conditions of the respondents and the research area; (b) the existing but limited through literature review on the related issue (Siardos 2009; Ntanos et al. 2018).

The first part of the questionnaires involves the demographic features of the respondents (gender, age, profession, marital status, monthly income, educational level), while the rest part of the questionnaires involves highlighting the changes in microeconomic and macroeconomic figures brought about by the covid factor in Greek households and economy respectively.

In addition, the survey unveils the public perception of the evolution of the economy, the social changes, the level of the unemployment rate, and the probability for a global economic crisis, defining in that way the macroeconomic impact of COVID 19 while at the same time the evolution of individual income, the insecurity of the respondents for their professional future, their perception of a reduction in the labor positions are also a subject of the survey.

The questions used in the second part of the questionnaires are using the 5-grade Likert type scale.

3.2 Methodology

The analysis of data derived by from the questionnaire was analyzed by SPSS software and more specifically, the methodology is organized in two stages.

The first stage involves the calculation of descriptive statistics for the demographic features of the sample and the questions of interest, while the second one involves a multinomial ordered “logit model” estimation in order to unveil the respondents’ perception of the positive, less positive, negative, or less negative future of the Greek economy. The same process is repeated for the respondents’ perception of their income.

The frequencies of the demographic features calculated are provided in the results’ section synopsized in a table. As far as the two logit models are estimated the first one is an ordered logit model aiming to quantify the rank of the global economic crisis that is the dependent variable while the exogenous variables are demographic features, the perception of changes in income, the perception for the unemployment rate and the probability for a national economic crisis.

The logistic regression is a widespread used methodology in which the probability of a dichotomous outcome (global economic crisis or not) is a function of a set of exogenous factors (Zafeiriou et al. 2022; Hair et al. 2009). The objective of this analysis is to estimate the impact of exogenous variables on the odds or the probability of global economic crisis or not as a result of the changes arisen by the health crisis of COVID 19. The binary dependent variable in the case of global crisis is described by the values 1 and 0. The general model is provided by Eq. 1:

$$P(Y = 1) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_{1i} + \dots + \beta_n X_{ni})}} \tag{1}$$

The P function denotes the probability of the participant to expect global economic crisis (that is the first category of the dependent variable), while the exogenous variables $X_1, X_2 \dots X_n$, describe the responses of the i participant to each one of the n independent variables that are quantitative. In case the linearity hypothesis is violated the regression estimation becomes feasible with the logarithmic transformation of the initial Eq. (1) and therefore the model estimated is the following:

$$\log it[P(Y = 1)] = \beta_0 + \beta_1 X_{1i} + \dots + \beta_n X_{ni} \tag{2}$$

where

$$\log it[P(Y = 1)] = \log \frac{P(Y = 1)}{1 - P(Y = 1)} \tag{3}$$

The term $\frac{P(Y=1)}{1-P(Y=1)}$ provides the odds of global risk occurrence and represents the ratio of the probability of global crisis divided by the probability of no global crisis.

Post the parameter estimation of the logistic regression the interpretation involves the description of the value of the odds ratio calculated for each one of the independent

variables and provides the change in the probability of the dependent variable being caused by a unit change in the value of the independent variable. This is the elasticity according to which, a 1% increase in the independent variable leads to a change in the dependent equal to the estimated coefficient (Fu and Simonoff 2015). The logistic regression model is a type of generalized linear model. The parameter estimation for the family of GLM models is based on maximum likelihood methodology, the estimation results of which are known as maximum likelihood estimates (Zafeiriou et al. 2022; Fu and Simonoff 2015). The variables to be excluded were determined with the assistance of forward selection (forward entry) while the model variables were selected with the use of the existing literature and backward elimination (Zafeiriou et al. 2022; Siardos 2009; Field 2009). The above-mentioned processes secured that the model estimated would be reliable and statistically significant.

The process of multinomial logit model was implemented for the model estimation where the dependent variable is the respondents' perception of improvement of individual income as a function of demographic factors and perceptions of professional future, return to normality and income ability to satisfy personal needs. The particular model is an extension of a binary logit model. Explicitly, the model was used to predict either categorical placement in or to estimate the probability of category membership on the formation of the dependent variable as a function of independent variables. The independent variables may well be dichotomous or continuous. This is just a simple extension of a binary logistic model while the methodology used for the model estimation is maximum likelihood, that is to evaluate the probability of categorical membership. The assumptions of normality, linearity, or homoscedasticity do not have necessarily to be satisfied, a fact that alluring for the use of the Multinomial logistic regression. In addition, in this paper we use marginal logistic modelling (Vittinghoff et al. 2006) through which it is possible for the coefficients to represent population averages across all the statistical data used.

In terms of mathematics the multinomial logistic model requires in our case three categories while the reference category is the first one.

More specifically:

$$\ln \frac{P(Y_i = m)}{P(Y_i = 1)} = e_3 + \sum_{k=1}^K \beta_{mk} X_{ik} = U_{mi} \quad (4)$$

Hence for each category there will be $M-1 = 3-1 = 2$ log odds. This means that the computed probabilities will be provided by the following equation (for $m = 2, 3$):

$$P(Y_i = m) = \frac{\exp(U_{m1})}{1 + \sum_{k=2}^m \exp(U_{hk})}$$

Based on the equations given above each of the $M-1$ log odds will be calculated and exponentiated. This will provide the probabilities in a straightforward manner. The model estimation results are provided in the analysis and results section.

4 Analysis and Results

As already mentioned above the first part of our analysis involves the descriptive analysis of our results. Regarding the demographic characteristics of the respondents next Table 1 provides the frequencies and the percentages in terms of age, gender, profession, income, residence, and marital status.

Based on the sample 37.4% of the respondents are women while almost 63% of the sample are men. Regarding the marital status of our respondents, 69.5% of the sample are married, and 20.3% are single. Regarding the educational level, Graduates of University or PhD holders are a significant proportion of the respondents. Regarding the age almost 40% belong to the 41–50 age group and in terms of profession, more than 40% of them are employed in the private sector which means that they have been affected by COVID 19 in a significant way. Furthermore, the majority of the respondents are living either in a city or in a town while 28% of the respondents are residents of a village.

The second part of our analysis involves the analysis of the perceptions of the respondents on the macroeconomic impacts of COVID 19 being synopsized in Table 2.

Evidently based on the perception of the respondents' pessimism is the major finding since most of them believe that an economic crisis will arise in the global and in the national level while almost 75% of our sample think that an increase in the unemployment rate is favorable.

The results are similar for the citizens' perceptions on microeconomics impacts of COVID 19. More specifically 37% of the total sample believe that there is going to be a change in their income while the majority of the respondents are neutral a result that highlights lack of information to the citizens for the evolution of their income. Another significant finding is the citizens' perception of their inability to satisfy their personal needs since almost 40% find this scenario is possible while the opposite is believed almost by half of the respondents. Another interesting result is that despite that more than 60% perceive the decrease in the working positions as possible creating a sense of insecurity in the respondents. The particular results are provided in Table 3.

Having described the results on the frequencies that involve the demographic features of the respondents and their perception of the macroeconomic and the microeconomic impacts of COVID 19 the next part of our analysis as mentioned above involves the estimation of two logit models, where in the first one the dependent variable will be the global economic crisis (probability of occurring or not base to the sample perception) and the second one involves the probability of individuals to satisfy their personal needs (or not) as a function of demographic features of the respondents. The methodology used for the present analysis, as mentioned above, is logistic regression. In order to minimize the robustness arisen by autocorrelation problems we employed the technique of "bootstrap". More specifically, bootstrap iterations were implemented while the binomial logit involved as a dependent variable was the global economic crisis. The dependent variable is encoded as follows: no

Table 1 Frequencies of demographic features of the respondents

Variables	Categories	Frequencies
Gender	Female	276 (59.7%)
	Male	173 (37.4%)
Monthly income	0–500	51 (11%)
	501–1000	148 (32%)
	1001–1500	118 (25.5%)
	Over 2000	20 (4.3%)
	1501–2000	112 (24.2%)
Age	20–30	54 (11.7%)
	31–40	86 (18.6%)
	41–50	206 (44.6%)
	51 and more	103 (22.3%)
Educational level	Elementary school	7 (1.5%)
	High school	136 (29.4%)
	Lyceum	69 (14.9%)
	University/post Lyceum studies	103 (22.3%)
	Post graduate	98 (21.2%)
	Ph.D.	36 (7.8%)
Profession	Student	9 (1.9%)
	Public servant	112 (24.2%)
	Employee in the private sector	189 (40.9%)
	Freelance	22 (4.8%)
	Farmer	9 (1.9%)
	Retired	8 (1.7%)
	Unemployed	3 (0.6%)
	Housewife	3 (0.6%)
Marital status	Married	321 (69.5%)
	Single	94 (20.3%)
	Divorced	12 (2.6%)
	Contract	4 (0.9%)
	Live together	18 (3.9%)
Residence	City	155 (33.5%)
	Town	165 (35.7%)
	Village	129 (27.9%)

Table 2 The respondents' perception on the impact of COVID 19 on macroeconomic indices

Variables	Categories	Frequencies
Improvement of national economy	Strongly disagree	96 (20.8%)
	Disagree	205 (44.4%)
	Neutral	108 (23.4%)
	Agree	40 (8.7%)
Global economic crisis	Strongly disagree	11 (2.4%)
	Disagree	32 (6.9%)
	Neutral	48 (10.4%)
	Agree	236 (51.1%)
	Strongly agree	122 (26.4%)
Increase in the unemployment rate	Strongly disagree	3 (0.6%)
	Disagree	48 (10.4%)
	Neutral	44 (9.5%)
	Agree	247 (53.5%)
	Strongly agree	107 (23.2%)

Table 3 The perception of the respondents on COVID 19 microeconomic impacts

Variables	Categories	Frequencies
Individuals are unable to satisfy personal needs	Strongly disagree	26 (5.6%)
	Disagree	86 (18.6%)
	Neutral	145 (31.4%)
	Agree	176 (38.1%)
	Strongly agree	16 (3.5%)
Decrease in positions	Strongly disagree	9 (1.9%)
	Disagree	57 (12.3%)
	Neutral	71 (15.4%)
	Agree	245 (53.0%)
	Strongly agree	67 (14.5%)
Insecurity for professional future	Strongly disagree	18 (3.9%)
	Disagree	105 (22.7%)
	Neutral	125 (27.1%)
	Agree	134 (29.0%)
	Strongly agree	67 (14.5%)
Unchangeable income	Strongly disagree	27 (5.8%)
	disagree	106 (22.9%)
	Neutral	144 (31.2%)
	Agree	161 (34.8%)
	Strongly agree	11 (2.4%)

crisis at all is indicated by 0, and crisis by 1. The results of the first model estimated are synopsized in the next Table 4.

Based on our findings the global crisis perception by the respondents is affected in a statistically significantly way by marital status and monthly income in terms of demographic features, while the respondents' perception on return to normality, their future in professional life as well as their ability to satisfy their needs, along with their perception on professional future.

More specifically single or divorced seem to find less possible the probability of global economic crisis. In addition, the higher is the monthly income of the respondent the lower is the probability for the particular respondents to go through a global economic crisis while the return to normality for those who are affected by the particular condition the global economic crisis seem to be by far more probable. Finally, for those who perceive their professional future to become worse are those who find more probable the occasion of global economic crisis. As it becomes evident by the results the respondents characterized by pessimism, perceive as more probable the occurrence of a global economic crisis while gender and age does not seem to affect the particular perception.

The next model estimation involves amicroeconomic concept that is an improvement in individual income. The model estimated is a multinomial logit model and the estimation results are provided in the next Table 5. The multinomial logit involves as dependent variable the improvement in individual income.

For every possible evolution of income (deterioration, improvement or stability) we estimated the impact of different factors including the marital status, the ability to

Table 4 Estimation results of a binomial logit model

		B	Bias	Std. error
Step 1	proffut (1)	12.9* (0.1)	-0.155 ^b	5.458 ^b
	proffut (2)	16.8*** (0.002)	-1.051 ^b	6.063 ^b
	proffut (3)	1.6** (0.03)	-0.287 ^b	5.373 ^b
	proffut (4)	1.9*** (0.00)	-5.009 ^b	8.588 ^b
	normret (1)	46.5*** (0.00)	-2.157 ^b	6.684 ^b
	normret (2)	47.3*** (0.00)	-1.997 ^b	8.378 ^b
	normret (3)	45.6*** (0.00)	-4.021 ^b	16.267 ^b
	normret (4)	42.9* (0.1)	-8.477 ^b	25.931 ^b
	needsats (3)	-59.3 (0.11)	11.579 ^b	24.135 ^b
	needsats (4)	-47.5*** (0.02)	6.752 ^b	24.622 ^b
	inc (3)	-20.3*** (0.00)	0.154 ^b	1.380 ^b
	mars (2)	-27.74** (0.02)	4.680 ^b	8.336 ^b
	mars (4)	-13.9** (0.04)	7.110 ^b	7.714 ^b

Notes -2 Log likelihood 122.875^a, Nagelkerke R = 0.826, *, **, *** reject of null hypothesis for, 10, 5 and 1% level of significance

Table 5 Multinomial logit estimation results (individual income is the dependent variable)

Improveco		B	Bias	Std. error
Income deterioration	Intercept	-445.701	105.336 ^b	124.850 ^b
	[mars = 2]	2.5** (0.04)	0.012 ^b	0.628 ^b
	[needsats = 1]	1.4* (0.09)	4.283 ^b	41.707 ^b
	[needsats = 3]	-1.9*** (0.02)	4.292 ^b	41.726 ^b
	[normret = 1]	451.13 (0.14)	-109.962 ^b	129.735 ^b
	[edu = 2]	-0.815* (0.06)	0.026 ^b	0.337 ^b
	[edu = 3]	-0.3* (0.06)	0.007 ^b	0.133 ^b
	[edu = 4]	-0.19** (0.08)	-0.002 ^b	0.089 ^b
	[proffut = 4]	0.2* (0.1)	0.010 ^b	0.115 ^b
[unemp = 1]	0.931** (0.04)	-0.038 ^b	0.390 ^b	
Income stability	Intercept	-446.525	105.354 ^b	124.805 ^b
	[mars = 1]	3.07*** (0.00)	-0.001 ^b	0.350 ^b
	[mars = 2]	2.4** (0.01)	0.022 ^b	0.360 ^b
	[mars = 3]	2.4** (0.01)	0.027 ^b	0.364 ^b
	[mars = 5]	1.2* (0.09)	-0.318 ^b	9.062 ^b
	[normret = 1]	452* (0.09)	-119.873 ^b	129.746 ^b
	[normret = 2]	461.7** (0.01)	-109.857 ^b	129.749 ^b
	[edu = 1]	-3*** (0.00)	0.005 ^b	0.477 ^b
	[edu = 2]	-2.6*** (0.00)	-0.017 ^b	0.403 ^b
	[edu = 3]	-2.4*** (0.00)	-0.023 ^b	0.404 ^b
	[edu = 4]	-2.3*** (0.00)	-0.032 ^b	0.405 ^b
	[proffut = 1]	0.78** (0.05)	0.003 ^b	0.352 ^b
	[proffut = 2]	0.97** (0.02)	0.019 ^b	0.345 ^b
	[proffut = 3]	1.01*** (0.00)	0.008 ^b	0.324 ^b
	[proffut = 4]	1.03*** (0.00)	0.029 ^b	0.335 ^b
[unem = 1]	-1.3** (0.002)	-0.001 ^b	0.267 ^b	
Income improvement	Intercept	-439.551	105.785 ^b	124.784 ^b
	[mars = 1]	-8.7* (0.06)	-0.360 ^b	2.049 ^b
	[mars = 2]	-6.9* (0.06)	-0.394 ^b	1.888 ^b
	[mars = 3]	-6.7* (0.05)	-0.454 ^b	1.931 ^b
	[needsats = 1]	-5.5* (0.05)	4.450 ^b	42.635 ^b
	[needsats = 2]	-4.5* (0.06)	4.443 ^b	42.650 ^b
	[needsats = 3]	-2.8* (0.07)	4.398 ^b	42.704 ^b
	[needsats = 4]	-2.8* (0.05)	4.395 ^b	42.706 ^b
	[edu = 1]	2.1** (0.02)	-0.003 ^b	0.772 ^b
	[edu = 2]	0.68** (0.07)	-0.011 ^b	0.336 ^b

(continued)

Table 5 (continued)

Improveco		B	Bias	Std. error
	[edu = 3]	0.74* (0.06)	-0.019 ^b	0.334 ^b
	[edu = 4]	0.7* (0.06)	-0.017 ^b	0.323 ^b
	[edu = 5]	0.66* (0.07)	-0.017 ^b	0.304 ^b
	[proffut = 1]	-3.1*** (0.00)	-0.055 ^b	0.830 ^b
	[proffut = 2]	-2.94*** (0.00)	-0.056 ^b	0.903 ^b
	[proffut = 3]	-2.97*** (0.00)	-0.024 ^b	0.841 ^b
	[proffut = 4]	-2.7*** (0.00)	-0.023 ^b	0.787 ^b

Notes -2 Log Likelihood 109.727, Chi-Square 943.820 (0.00) for 88 df
Pseudo R squares; Cox and Snell 0.878, Nagelkerke 0.956, McFadden 0.839

satisfy the basic needs, the return to normality, the level of education, the respondents' perception on the professional future and the situation of the national economy.

What is more, for the individual income deterioration the case that the respondents are single seem to affect in a positive way the respondents' perception for income deterioration, while the return to normality does not seems to affect in a statistically significant effect the individual income deterioration. On the other hand, the respondents' perception of a negative professional future affects positively and in a statistically significant way the deterioration of the economy, while according to the respondents the higher rates of unemployment (if expected) seem to intensify the public perception of individual income deterioration.

The results are modified in case the respondents agree for a stability in individual income. In this case the marital status, the return to normality, the educational level and their opinion in their professional future are found as statistically significant. More specifically, married, single, divorced or widow seem to affect in a positive way their perception for individual income stability while this is not the case for different education levels since the higher the education level the less the probability for respondents' perception of the stability of individual income. Furthermore, for the consumers who believe that return to normality is a necessity, this is a factor that amplifies the probability of individual income stability while for the respondents that agree or are neutral in the way the pandemics will affect their professional future is a statistically significant determinant for their perception of income stability to be more probable. Similar are the findings for the role of the unemployment rate.

The last alternative studied involves the determinants for income improvement as a possible post-pandemic status. First of all, most categories of marital status enhance the perception of respondents for an improvement in individual income while the educational level affects the probability of an improvement also in the same way. The changes in professional future due to the pandemics decreases the probability for an improvement in individual income, as well as the perception of inability to satisfy the needs, also decreasing the probability of an improvement in individual income.

According to our findings the post-pandemic period entails different perceptions of the economy in Greece in micro and macroeconomic level given their education level their marital status and how the existing health management has affected the public sense on their own life.

It is evident that the consumers have gone through a total change in their living and working conditions and the way the governments have tackled this health crisis has caused fear uncertainty and expectations for the worst economic scenarios in micro and macro level. The reason that we used the concept of global economic crisis is to get an insight based on the information gathered by different means and what is the impact of different health management policies adopted by the governments. It is also a fact that the differences in the measures taken among countries slightly differ since lack of previous experience has caused mimic reactions and common policies adopted globally at least for developed countries and countries in the European Union.

In addition as it is well known the dominant measure globally are nation-wide lockdowns. A severe impact of this measure involves the wellbeing deterioration of the impoverished and the vulnerable households. This impact is common especially in rural areas which is also in line with our findings in the second multinomial logit model (Gupta et al. 2020).

This was the reason that the measures taken within the last six months have focused on vaccination and defensive mechanisms that protect individuals without locking them down and preventing them from working and being productive. It is a reality that in the period after the pandemic outbreak numerous measures had to be taken to support the vulnerable households and this has overloaded the national budget therefore the nation-wide lockdown does not seem to be an effective measure hereafter.

5 Conclusions

COVID 19 has being declared by the World Health Organization (WHO) as a pandemic. The multiple consequences in social, economic and health terms have been a subject of an extensive survey within the last two years. Within this particular conditions the present work makes an effort to unveil the perceptions of consumers in Greece, an economy that has already been through a severe economic crisis within the last decade. This fact stresses the scientific value of the manuscript, while our findings may well provide policy makers with an example of how a policy mix may achieve simultaneously two mutually goals namely economic growth and public health security.

For the study objective we used a questionnaire consisting of 17 items addressed to a sample of 450 consumers in Greece. The data collection was based on interviews and via google forms. The data analysis includes the descriptive statistics of the data collected and at the same time a two logit model estimation with dependent variables of the public perception on global economic crisis (binomial model) and the public

perception on changes in individual income (multinomial logit). Based on our analysis most of the respondents think that a global economic crisis is possible, based on their attitude towards their own economic situation. More specifically, the respondents who expect their professional future to deteriorate, not to be able to satisfy their own needs and that expect high rates of unemployment due to the specific conditions seem the major determinants of their perception. Another highly significant factor is the return to normality, since otherwise the engine of economy to restart is a difficult problem to solve despite the effort of distant learning or distant working have been adopted as alternatives. As far as the second model mentioned above we employed a multinomial model having as a dependent variable a microeconomic variable namely the respondents' perception of evolution of individual income in post pandemic period (deterioration, unchangeable or improvement). The factors related to the respondent's perceptions on certain socio-economic conditions expected to prevail in the post-pandemic era like the return to normality, needs to be satisfied or the unemployment rate. More specifically, the probability for improvement of individual income is affected by marital status and education, along with the professional future perception and the ability of the respondents to satisfy their needs. Regarding the probability for income stability the return to normality is an additional determinant, the impact of which is validated as statistically significant, while the income deterioration is affected by the same factors. A significant result involves the fact the respondents' perception for individual income improvement or deterioration is affected strongly by their perception for the unemployment rate. All these psychological issues confronted by the consumers have been reflected in the two logit models estimated in the present study. More specifically, both models do reflect the role of psychology and rational expectations of the economic agents and therefore the health crisis management should focus mainly on this aspect.

The basic conclusion reached is that the health crisis management is a complicated issue that requires individual, organizational, and institutional responses and large-scale coordination involving interdisciplinary and multidisciplinary approaches in order to be tackled with successful results.

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Social Economy Entities and Social Enterprises in the Greece-Bulgaria Cross-Border Area



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Abstract The current article records the recent evolutions and institutionalisation of the Social Economy and Social Entrepreneurship in Greece and Bulgaria, while it also illustrates public support policies in terms of legal framework and support measures, by showcasing selected results of a recent study in the cross-border area Greece-Bulgaria. The research presentation draws on the following aspects: (a) the size and characteristics of the Social Economy and Social Entrepreneurship in the Greece-Bulgaria cross-border area; (b) the profile and various issues at economic, social, professional, productive and developmental levels of the Social Economy Entities and Social Enterprises within the designated cross-border area and finally, (c) the main obstacles and barriers faced by the Social Economy sector and its Entities, in the same area.

Keywords Social Economy Entities · Social Enterprises · Greece · Bulgaria · Cross-border area

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1 Introduction and Brief Literature Review

Social Economy aims to solve social, mainly, problems that the state (public sector) is unable to cover and where the market (private sector) does not want to intervene and includes all economic activities conducted by Associations, Cooperatives, Mutual Benefit Societies, Institutions, Foundations, Voluntary Organisations, Non-Governmental–Non-Profit Organisations, Social Enterprises, etc. that operate on the principles of justice, independence (autonomous management), democracy (democratic decision-making process), free participation, solidarity, equality, sustainability, etc. to provide social, proactive, economic and supportive actions for employment, entrepreneurship, local development, social inclusion, etc. (such as the prevention of unemployment, advances in education, support of the health system, environmental protection, the well-being of local community and so on), with the distribution of revenues, work take precedence over capital and service to members or the community takes precedence over profit. As a major aspect of the Social Economy, Social Entrepreneurship aims to function as an intermediate in the management of social issues, which cannot be handled otherwise (that is, neither by public nor by private bodies/institutions). The term Social Entrepreneurship consists of two components, the entrepreneurship dimension and its social dimension. On a theoretical level, this task corresponds to various roles, active involvement and decision-making that directly serve a social purpose, in several ways by the application of radical ideas and entrepreneurship innovation and with the “good use” of resources and initiatives. In addition, Social Enterprises (SEs), as the basic part of the Social Entrepreneurship, focus on producing and supplying products and services to meet the socioeconomic needs of the local community and its members for supporting actively the vulnerable and susceptible social groups and communities at local level. More specifically, SEs are organisations founded by groups of individuals with a clear focus on serving the community and in which the material interests of capital investors are subject to restrictions. SEs place a great priority on their independence, and assuming financial risks associated with continuous socioeconomic activities, they can be established and developed by persons or entities, in any sector, without discriminations or restrictions, and use earned income strategies to attain a social cause as they address a wide range of social problems (i.e. poverty, unemployment, social exclusion, climate change, healthcare availability and so on) by relying on market-based activities (Borzaga and Maiello 1998; Campbell 1999; Defourny and Develtere 1999; Borzaga and Defourny 2001; Defourny 2001; Amin et al. 2002; Boschee and McClurg 2003; Evers and Laville 2004; Moulart and Ailanel 2005; Anheier and Salamon 2006; Defourny and Nyssens 2006; Hulgård 2006; Laville et al. 2006; Mair and Marti 2006; Nyssens 2006; European Commission 2013; Mair 2020).

The aim of the present study is to provide a non-exhaustive overview/preview on the profile of the Social Economy (SE) Entities and Social Enterprises (SEs) and their eco-systems in the Greece-Bulgaria cross-border area. For this purpose, the subsequent parts of this article refer to: 1. the legal framework and the governmental

support policies for the Social Economy and Social Entrepreneurship in Greece and Bulgaria; 2. the employed methodology which was produced and 3. specific findings of the study “Synthetic report on the profile of the Social Enterprises in the cross-border area Greece-Bulgaria”¹ which had been designed so as to involve and reflect the geographical location, the activities, the objectives, the operation, the characteristics, the financial data, the employment matters, the development issues, the barriers and the obstacles of the faction, the main challenges, etc. in the context of the SE Entities and SEs. Hence, that study serves a wider goal that is to provide an account of the Social Economy and Social Entrepreneurship eco-system in the aforementioned cross-border area (Karavangeli et al. 2019).

It should be noted that in the current article, two (2) specific terms have come in handy, particularly that of 1. Social Economy (SE) Entities and 2. Social Enterprises (SEs), for the comparative examination of the research. Both functioned complementarily as “umbrella” terms in order to cover the entire spectrum of miscellaneous entities, operators, organisations, associations, cooperatives, institutions and enterprises of the Social Economy and Social Entrepreneurship, due to the inexistence of either robust definition, or legally similar corresponding entities, in the countries under consideration (Greece and Bulgaria).

2 Public Policies, Legal Framework and Needs for Support Measures for the Social Economy and Social Entrepreneurship in Greece and Bulgaria

In Greece, according to Law 4430/2016 of the Ministry of Labour titled “Social and Solidarity Economy and Development of its Entities and Other Provisions” (replacing former Law 4019/2011), Social and Solidarity Economy (SSE) is the set of economic activities in which products and services follow a non-ordinary procedural cycle, embracing the democratic values, fairness, respect and team spirit, and acting responsibly both toward people and environment (Article 2). Law 4430/2016 provides an inclusive approach to the SSE in Greece attributing to it an alternative corporate identity which extends its operation from non-prominent fields of entrepreneurship to creative new self-managed productive entrepreneurial ventures (Article 1).

¹ The study research titled “Synthetic report on the profile of the Social Enterprises in the cross-border area Greece-Bulgaria” was developed in 2019, during the implementation of the project “Support of Social Enterprise and Enhancement of Employment—SoSEDEE”, through the Cooperation Programme INTERREG V-A “Greece-Bulgaria 2014–2020”. The report’s main goal was to give a comprehensive overview of the profile of the Social Enterprises (SEs) and their eco-systems in the cross-border area Greece-Bulgaria. The purpose of the study was to contribute to the preparation of a responsible academic training package which would ensure a good understanding of the concept and principles of SEs and their legislative framework, as well as a good knowledge of professional and managerial skills, in order to develop business plans, analyse the market needs and potentials, gain access to funding and generate social impact (Karavangeli et al. 2019).

Prior to the enactment of Law 4430/2016, the main factors on the legislative, financial and administrative level, as well as the threats and impediments which the Social Cooperative Enterprises (SCEs) in Greece had to deal with, were (a) discrepancies in the legislation concerning the day-to-day exchanges and communication between SCEs and public entities, since the relevant framework on the SCEs was quite ambiguous; (b) issues related to taxation, since the relevant framework was proved to be inconvenient for the establishment of a reserve, there were no clear social aims in place, and accounting was troublesome; (c) work-related problems, due to lack of a taxation approach pertaining to tasks of legal nature performed by members/employees, also the option of recruiting personnel from the SCEs, and imposed work compensation, all of which had raised various obstacles both operational and technical; (d) problems of economic nature, in cases when the SCEs were relying on financial aid and developmental mechanisms from the Social Economy Fund (founded in 2011); (e) bureaucratic issues such as the outdated, costly and time-consuming communication by post with the Ministry of Labour—Registry of Social Economy (instead of the electronic communication); (f) problematic failed communication between the SCEs and Local Entities about issues related to contracts, between certain Municipal Administrations and SCEs which they wanted to have under their influence (Kostas et al. 2017, 2018).

Based on the Social and Solidarity Economy (SSE) Law 4430/2016, SSE Entities can be (a) Social Cooperative Enterprises (SCEs); (b) Limited Liability Social Cooperatives (LLSCs); (c) Workers' Cooperatives and (d) any other multiple-stakeholders' legal entities that apply the statute, regulations and requirements pertaining to the mandatories-specifics for the operation of SCEs (Article 3). SCEs in Greece are labelled as social welfare cooperatives (under Law 1667/1986) with the statutory aim of collective and social benefit (Article 2, Law 4430/2016) as well as with corporate/entrepreneurial character based on law (Article 14, Law 4430/2016). Moreover, according to Law 4430/2016, the SCEs are 1. the SCEs for Integration that fall into two sub-divisions: (i) the SCEs for Integration of Susceptible Social Groups, and (ii) the SCEs for Integration of Special Social Groups; 2. the Limited Liability Social Cooperatives (LLSCs), which function as SCEs for Integration in accordance with Article 12 of Law 2716/1999; 3. The SCEs for Collective and Social Benefits that promote "sustainable activities" or deliver "social services for the common good". Finally, the SSE wider scope entails: (a) the implementation of actions to the best interest of communities and the society, at large; (b) the application of democratic decision-making processes drawing on the "one member, one vote" principle, regardless of each member's degree of involvement and (c) the allotment of revenue based on their strategic framework (Ministry of Labour, Social Security and Social Solidarity 2017).

The study of European Economic and Social Committee (2017), argues that Law 4430/2016 in Greece first, defines a legal foundation for Greece's SSE (Article 1); second, develops measures to promote SSE Entities (Articles 4–13) and third, governs SCEs (Articles 14–23) and Worker's Cooperatives (Articles 24–34). Furthermore, Law 4430/2016 on SSE Entities: (a) have access to the Public Investment Fund (Article 10) and the Social Economy Fund (the goal is to fund programmes and

initiatives to strengthen SSE Entities); (b) meet the standards for programmes that boost Social Entrepreneurship, and local public bodies to concede assets that are not only reliable, but also assist their public and social interest activities (Article 5) and (c), it is also feasible to enter into contracts with public authorities to design and implement beneficial social projects, and to get finance for installations, machinery and other items from the European Union, as well as national and regional sources (Article 6).

According to Adam (2019), for the first time in Greece, Law 4430/2016 attempted a significant move toward the formal acknowledgment of SSE Entities. It also made an effort to circulate the ideas and principles advocated and shared by the SSE movement in Greece and abroad, in current debates. Even so, “blind” dependency on the legislative process as well as the lack of a partnership culture coupled with enforcement mechanisms on ministerial level have all prevented these goals from being put into practice. Adam’s research shows the stumbling blocks in the unifying process, which are mostly caused by misalignment in two (2) respects: (a) due to the restrictions placed upon other legal entities to be registered as SSE actors and the provisions of Law 4430/2016; and (b) because of the criteria set by several legislative frameworks addressing traditional Social Economy operators in Greece as well as the stipulations of Law 4430/2016. It could be argued that for reasons, irrelevant to the SSE conformity to standards, legislation might sometimes ignore legal actors. Despite good intentions, the greater “picture” and final outcome may stand as a barrier to the dissemination of SSE practices. It is urgent that the task of unifying and harmonising cooperative legislation in Greece be undertaken with a dual purpose: (a) to investigate how international collaboration principles can be translated into legal provisions in the country, and (b) to extend interest in cooperative legislation in order to preserve the distinctiveness of the partnership identity.

Until recently, Bulgaria has been lacking unified legislation for the Social Economy and Social Entrepreneurship (it is noted that Bulgaria only recently, in 2018, enforced a legal framework specifically designed for SEs). In Bulgaria, the role of SE Entities and SEs was previously assumed by associations, foundations, institutions or non-profit legal entities, whose structure and mission entailed social, environmental, cultural and humanistic purposes, prioritising human value and reinvesting profit exclusively toward such goals (Terziev et al. 2016). As evidenced in the national approach on Social Economy in Bulgaria, the State appears decisive to help build favourable conditions as well as a unified legislative framework for the Social Economy and Social Entrepreneurship with the adoption of the innovative ideas and models which the sector has to offer (European Commission 2014). Bulgaria’s immediate priorities include the fight against poverty and social exclusion, youth employment, equal access to the labour market for all citizens, social innovation and the integration of minorities. Therefore, the socioeconomic situation prevailing in Bulgaria, combined with the increase in local society’s interest in culture, environment and innovation, leads the country toward strengthening the field of Social Economy and Social Entrepreneurship (Terziev and Nichev 2017). Thus, over the past few years in Bulgaria a large number of social projects and social organisations

have emerged with the intention to assist addressing some of the major socio-economic issues ending up to the development of the SE Entities and SEs (Marinova and Yoneva 2021).

The four (4) SEs models in Bulgaria are 1. the Social-Business model (Specialised Enterprises for people with disabilities and Commercial Companies); 2. the Social-Cooperative model (Cooperatives pursuing a social mission, Cooperatives for the disabled, Credit Cooperatives and Microfinance Organisations); 3. the Entrepreneurial Non-Profit model (Associations, Foundations and Chitalishte) and 4. the Public-Sector SE model (Specialised enterprises for people with disabilities created by the Municipalities and other SEs established by the Municipalities) (Defourny et al. 2019; Marinova and Yoneva 2021).

In another approach, the main SEs models in Bulgaria are listed as follows: 1. The model for employment and labour force development—the economic logic of the business venture is based on the opportunity to create jobs for disadvantaged people. The model is associated with the so-called “Protected Employment”, where the SEs are employers of people with disabilities. 2. The entrepreneurial model, in which the SEs mediate between the disadvantaged people and the market. In this model, particularly in its form of occupational therapy, people with disabilities participate in the production of goods for which the respective SEs seek a market and engage in the marketing and distribution process. 3. The direct service model. This model is most directly related to social service providers. In this case, SEs provide social services in exchange of payment to external clients, while simultaneously supplying social services to their members, the payment being made via contracts with a municipality or the state (Karavangeli et al. 2019).

The Cooperative Law of 1999 and the Non-Profit Legal Entities Act of 2000 were the first laws that have been passed in Bulgaria that might be associated with the sphere of SEs. In accordance with European priorities and policy initiatives in this field, the government designed the national policy on Social Economy and the SEs. In 2012, the Bulgarian government approved a policy document called “The National Social Economy Concept”, which reflects the social commitment of the state to support the creation of a favourable environment for the implementation and development of models and practices in the field of Social Economy and Social Entrepreneurship, in the country (Marinova and Yoneva 2021). It should be mentioned that, according to the National Social Economy Concept, SEs in Bulgaria are defined as enterprises which perform and develop economic activity, produce goods and services for the market economy and allocate part of their resources to the accomplishment of social and economic goals (Ministry of Labour and Social Policy 2011).

Moreover, the Biannual Action Plans for the Social Economy in Bulgaria prioritise enhancing the legal environment, fostering favourable conditions for Social Economy education, training and research, and evaluating the economic and social impact of SEs on employment and social inclusion. Biannual Action Plans support the implementation of the National Social Economy Concept and lay out a series of priority actions/axes aimed at facilitating the development of Social Economy. These axes are (1) Raise of awareness of stakeholders about the nature and operation of the

Social Economy sector; (2) Create support structures for the sector; (3) Disseminate information on the Social Economy and SEs; (4) Provide favourable conditions for education, training and research to strengthen the Social Economy sector; (5) Create a favourable environment that encourages the development of the same sector (European Commission 2019).

The enactment of the Law on Social and Solidarity-Economy Enterprises in October 2018 called “Social and Solidarity-based Enterprises Act” and its implementation in May 2019 show that the evolution of SEs has reached a national priority level in Bulgaria. With enhanced market access and increased competitiveness, this law intends to foster an environment that is favourable for SEs. The Ministry of Labour and Social Policy also established a Social Economy and Social Responsibility Department in 2018. According to the Article 5 of the Law on Social and Solidarity-Economy Enterprises in Bulgaria, Social and Solidarity-Economy Entities are Cooperatives, Public-Benefit Non-Profit Legal Entities and Social Enterprises (Marinova and Yoneva 2021).

3 Research Methodology

The present article illustrates selected quantitative research results of the study “Synthetic report on the profile of the Social Enterprises in the cross-border area Greece-Bulgaria” (Karavangeli et al. 2019). For the collection of primary data, an online questionnaire addressed to active social entrepreneurs and employees of SE Entities in the cross-border area was used, in order to identify the profile of Social Economy and Social Entrepreneurship sector, as per its type (legal form, sector of activity, main objective, etc.) and size (turnover, number of employees, main source of income/funding, etc.). The questionnaire included also questions regarding the capabilities and the development strategies, as well as the main barriers for the development of the SEs. The use of the questionnaire intended to contribute to the mapping of the Social Economy and Social Entrepreneurship eco-system in the cross-border area between Bulgaria and Greece.

In the research context of the abovementioned study, all specific conditions were observed. Its subjects, meaning the surveyed sample, were social entrepreneurs (target group) of all legal forms of SE Entities. The research methodology was based also on quantitative research conducted electronically, by distributing, receiving and processing an online closed-ended structured questionnaire. Quantitative research methods analyse the number and quantity of occurrence of the object under consideration and include precise measurements and strict control of variables in order to collect data through recording and with the ultimate purpose to extract statistics, mainly standardised and measurable uniform data elements (Kiriazzi 2001; Babbie 2018).

The online research approach often entails no interaction with the interviewer or researcher throughout the data collection process, because surveys carried out via the internet are typically based on automated self-administered questionnaires

(Vasja et al. 2007). Moreover, this quantitative research is particularly based on cross-sectional research methodology, which has been employed to achieve the research objectives. In the cross-sectional approach, a representative sample of respondents is only questioned once at a certain time, allowing for descriptive statements about the population at the allotted time of inquiry. Furthermore, web surveys have got the benefit of allowing respondents to finish a research whenever it is convenient for them, making it a non-intrusive, flexible and affordable method of requesting individuals to respond to self-administered surveys (Wolf et al. 2016).

Research results have been highly satisfactory, since there was a significantly sufficient number of answers retrieved through the questionnaire. In particular, a total of 173 questionnaires were completed by the social entrepreneurs and employees active in the respective SE Entities, of whom 121 corresponded to the Bulgarian sample and 52 to the Greek sample of the entire research. Technically, the 173 anonymous online questionnaires comprised a series of questions concerning: (a) general entrepreneurship data, such as the industry and the legal form of SE Entities and SEs; (b) company financial data, such as turnover, number of employees, etc. of SE Entities and SEs; (c) other facts related to the main development approaches implemented and the most important problems encountered; in order to draw a picture of the size of the sector (statistical information on the number of SE Entities and SEs, their activity field, the income and employability they incur, etc.) in the cross-border area, as well as their development strategies and the main obstacles they were facing.

According to the data of the General Register of Social Solidarity Economic (SSE) Entities of the Ministry of Labour in Greece (on 16-01-2019), a total of 1316 SSE Entities were registered, while in the Greek part of the cross-border area 205 were operating. On the other hand, in the Bulgarian context, the respective figures differentiated substantially and the basic reason for that was the lack of normative act to determine the limits and operation specifics of the Social Economy sector. As the National Statistical Institute (NSI) data demonstrated in Bulgaria in 2013, the number of self-identified SE Entities and SEs was 3612; of those, 2046 were registered as trading companies and cooperatives. Furthermore, 52 SSE Entities out of the 205 ones in the Greek section of the cross-border area responded to the questionnaire equal to a sample of over 25% of the total, a figure capable of delivering reliable results. Accordingly, on the Bulgarian side 121 out of the 501 SE Entities and SEs responded to the questionnaire, producing a sample of over 24% of the total.

4 Research Findings

The thematic questions (key questions) from which the data and the results emerged attempted to (i) capture the profile of the respondent in relation to their field of activity; (ii) examine the size of the SE Entities and SEs via economic data (turnover, financial results, number of volunteer workers, etc.); (iii) investigate the development and expansion strategies (if any); and lastly, (iv) describe the main problems intercepting their operation as well as their further development.

The first question introduced the location details of the activities of the existing SE Entities and SEs (place, regional unit, region). The highest rate of replies (from representatives and executives) was 75% (corresponding to 6 out of 8 registered SSEs) and concerned the Regional Unit (hereafter RU) of Rhodopi, representing 11.54% of the sample. The second highest rate of answers came from the RU of Kavala, i.e. 53.33% (that is 8 out of 15 registered SSEs), representing 15.38% of the sample. In turn, the subsequent ones, from higher to lower rate of response, included the RU of Serres, the RU of Drama, the RU of Xanthi and the RU of Thessaloniki. Although the response rate from the latter was the lowest, i.e. 15.67% (that is 21 out of 134 registered SSEs), it did nevertheless have the highest representation in the entire sample, with an overall per cent of 40.38% (Table 1).

Also, the amount of replies is counterbalanced between the larger regions, with 26 respondents (representatives and executives of SE Entities and SEs) from the Region of Eastern Macedonia and Thrace, and another 26 from the Region of Central Macedonia (Table 1).

In Bulgaria, the highest response rate is observed in the Regional Administration (RA) of Kardzhali (64.86%), while the highest representation rate is observed in the RA of Blagoevgrad, which is the RA with the higher number (46) of registered (self-defined) SE Entities and SEs (Table 2).

According to the research findings, the main activity sector of the Greek sample is in the “Food and Nutrition” sector with a rate of 21.15% followed by the “Culture

Table 1 Geographical distribution of the sample (Greece)

Region	Regional unit	Frequency	Registered	Representation rate (%)	Response rate %
East Macedonia and Thrace	Drama	3	8	5.77	37.50
	Evros	6	17	11.54	35.29
	Kavala	8	15	15.38	53.33
	Xanthi	3	11	5.77	27.27
	Rhodopi	6	8	11.54	75.00
Central Macedonia	Thessaloniki	21	134	40.38	15.67
	Serres	5	12	9.62	41.67
	Total	52	205	100.00	

Table 2 Geographical distribution of the sample (Bulgaria)

Regional unit	Frequency	Registered	Representation rate (%)	Response rate %
Blagoevgrad	46	234	38.02	19.66
Smolyan	25	98	20.66	25.51
Kardzhali	24	37	19.83	64.86
Haskovo	26	132	21.49	19.70
Total	121	501	100.00	

and Leisure” sector with a rate of 13.46% and the field of “Education—Training” and “Manufacturing” (both with a percentage 9.62% respectively) (Table 3).

In Bulgaria, the key economic activity of the sample is found in the “Social care” and “Retail” sectors with a percentage of 16.53% and 15.70% respectively, followed by the “Manufacturing” and “Primary sector—agriculture/livestock/fishery” with a rate of 11.57% and 8.26% respectively (Table 4).

With respect to their overall objective, the main scope of the SE Entities and the SEs of both sides (Greece and Bulgaria) is the creation of employment opportunities. More specifically, in the Greek part some important general objectives are “to promote education and knowledge”, “to address financial exclusion” and “to empower and uplift women”, while for the Bulgarian part these goals aim to “improve health and well-being” and “support vulnerable children and young persons” (Tables 5 and 6).

The following questions concern the financial profile of the SE Entities and SEs. It is noticeable that, on financial level, SE Entities and SEs in Bulgaria present larger figures compared to those on the Greek side of the border. In fact, the majority of the SE Entities and SEs for the Greek part (65.38% of the Entities) produce a turnover of 0–10,000 EUR, while in the Bulgarian side, the 77.69% of the SE Entities and SEs yield turnovers of more than 30,000.00 EUR (Tables 7 and 8).

Indeed, the financial results of the current study are quite interesting. In particular, the majority of the SE Entities and SEs on the Greek side do not show any profits. Statistically, 32.69% of the sample (17 Entities) exhibits balanced profits and losses, while 28.85% (15 Entities) generates very small profits of up to 1,000 EUR. Moreover, 17.31% of the sample (9 Entities) shows losses (more expenses than revenues), while only 9.62% (5 Entities) have got profits of between 1,000 and 5,000 EUR. Finally, only 7.69% (i.e. 4 Entities) appears to be earning more than 10,000 EUR

Table 3 Activity sector of the sample in Greece

Activity sector	Frequency	Rate (%)
Food and nutrition	11	21.15
Culture and leisure	7	13.46
Education—training	5	9.62
Manufacturing	5	9.62
Primary sector—agriculture/livestock/fishery	4	7.69
Environmental—recycling/reuse/awareness	4	7.69
Other (networking, research, cleaning)	4	7.69
Business support/consultancy	3	5.77
Tourism/hospitality	3	5.77
Retail	2	3.85
Creative industries—web, design, print	2	3.85
Social care	2	3.85
Total	52	100.00

Table 4 Activity sector of the sample in Bulgaria

Activity sector	Frequency	Rate (%)
Social care	20	16.53
Retail	19	15.70
Manufacturing	14	11.57
Primary sector—agriculture/livestock/fishery	10	8.26
Food and nutrition	9	7.44
Tourism/hospitality	8	6.61
Creative industries—web, design, print	6	4.96
Education—training	5	4.13
Justice/rehabilitation/human rights	5	4.13
Transport	5	4.13
Business support/consultancy	4	3.31
Culture and leisure	3	2.48
Financial support and services	3	2.48
Healthcare	3	2.48
Information communication technology	2	1.65
Energy and clean technology	1	0.83
Forestry	1	0.83
Housing	1	0.83
Local government	1	0.83
Water and sanitation	1	0.83
Total	121	100.00

Table 5 Overall objectives of the sample in Greece

Overall objective	Frequency
Creating employment opportunities	40
Promoting education and knowledge	13
Addressing financial exclusion	13
Empowering and uplifting women	9
Addressing social exclusion	8
Supporting agriculture and allied activities	8
Protecting the environment	6
Supporting other SE entities and SEs	4
Other (historical tourism, youth support, etc.)	4
Supporting vulnerable children and young persons	3
Improving health and well-being	1

Table 6 Overall objectives of the sample in Bulgaria

Overall objective	Frequency
Creating employment opportunities	87
Improving health and well-being	17
Supporting vulnerable children and young persons	15
Supporting other SE entities and SEs	12
Addressing social exclusion	11
Other (historical tourism, youth support, etc.)	8
Promoting education and literacy	7
Protecting the environment	6
Empowering and uplifting women	1
Supporting agriculture and allied activities	1
Addressing financial exclusion	0

Table 7 Turnover 2017 of the Greek sample

Turnover	Frequency	Rate (%)
0–10,000 euro	34	65.38
10,001–20,000 euro	6	11.54
20,001–30,000 euro	0	0.00
30,001–40,000 euro	1	1.92
40,001–50,000 euro	1	1.92
50,001–100,000 euro	6	11.54
100,001–250,000 euro	2	3.85
250,001–1 million euro	2	3.85
Over 1 million euro	0	0.00
Total	52	100.00

Table 8 Turn over 2017 of the Bulgarian sample

Turn over	Frequency	Rate (%)
0–10,000 euro	8	6.61
10,001–20,000 euro	4	3.31
20,001–30,000 euro	15	12.40
30,001–40,000 euro	16	13.22
40,001–50,000 euro	29	23.97
50,001–100,000 euro	26	21.49
100,001–250,000 euro	14	11.57
250,001–1 million euro	5	4.13
Over 1 million euro	4	3.31
Total	121	100.00

Table 9 Financial results 2017 in the Greek sample

Results	Frequency	Rate (%)
Losses	9	17.31
0	17	32.69
Profit 0–1,000 euro	15	28.85
Profit 1,000–5,000 euro	5	9.62
Profit 5,000–10,000 euro	2	3.85
Profit 10,000 + euro	4	7.69
Total	52	100.00

Table 10 Financial results 2017 in the Bulgarian sample

Results	Frequency	Rate (%)
Losses	0	0.00
0 euro	11	9.09
Profit 0–1,000 euro	6	4.96
Profit 1,000–5,000 euro	20	16.53
Profit 5,000–10,000 euro	24	19.83
Profit 10,000 + euro	60	49.59
Total	121	100.00

a year. On the other hand, on the Bulgarian side, the majority of the SE Entities and SEs profits of up to 10,000 EUR. That is 49.59% of the sample (60 Entities), 19.83% of the sample profits between 5,000 and 10,000 EUR (24 Entities), 16.53% (20 Entities) have got profits of between 1,000 and 5,000 EUR, while only 9.09% (11 Entities) have balanced profits (Tables 9 and 10 and Fig. 1).

Regarding the number of employees, from the Greek SE Entities and SEs respondents, 51.92% of the sample (27 Entities) indicates that there are no paid employees whatsoever in their organisation. At the same time, 38.46% (20 Entities) reports that it has hired 1–5 employees. A small percentage of this sample, 5.77% (3 Entities), mentions a larger number of staff, between 6 and 10 employees. And, lastly, only two (2) Entities, representing 3.85% of the sample, comment that they occupy 11–50 employees (Table 11 and Fig. 2).

On the contrary, in the Bulgarian part of the cross-border area, all the SE Entities and the SEs were fortified with paid employees. In detail, 42.98% of the sample (52 Entities) indicates that there are 11–50 employees in their organisation, 34.71% of the sample (42 Entities) reports that there are 6–10 employees and 21.49% (26 Entities) answers that there are 1–5 employees in their organisation (Table 12 and Fig. 2).

As far as the type of employment is concerned, in the Greek section of the sample, most SE Entities and SEs (16 Entities—30.77%) maintain part-time staff, while only 5 Entities (9.62%) occupy full-time staff. On the opposite contrary, in the Bulgarian

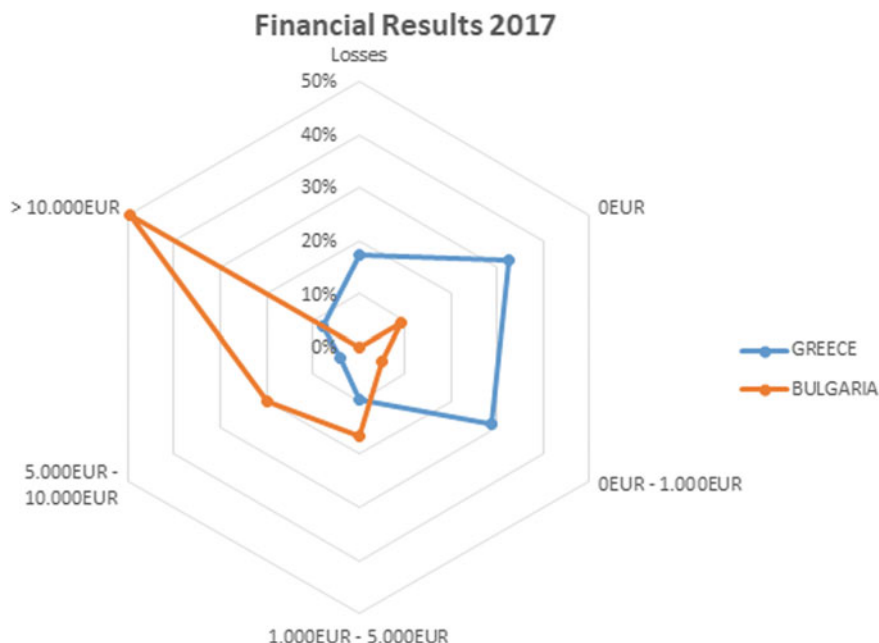


Fig. 1 Radar chart for financial results of SEs in Greece and Bulgaria

Table 11 Number of paid employees (2017) in the Greek sample

Employees	Frequency	Rate (%)
There are no paid employees	27	51.92
1–5	20	38.46
6–10	3	5.77
11–50	2	3.85
More than 50	0	0.00
Total	52	100.00

section, most Entities (108 Entities—89.26%) employ full-time staff, while only 12 Entities (9.92%) employ part-time staff (Tables 13 and 14).

Concerning the number of volunteers employed on the Greek side, the highest percentage (24 Entities—46.15%) corresponds to 1–5 volunteers, while several Entities (20 in number and 38.46% percentage-wise) do not have volunteers among their staff. It then subsequently follows a percentage of 7.69% (4 Entities) which occupy 6–10 volunteers, while only 2 (3.85%) comment that they maintain a number of unpaid staff between 11 and 50; finally, there are merely 2 instances-cases (i.e. 3.85%) with more than 50 volunteers. Respectively, as for the number of volunteers in the Bulgarian part, it is important to mention that 91.74% (111 Entities) claim that they do not employ any volunteers for their activities; only a few of them (that is

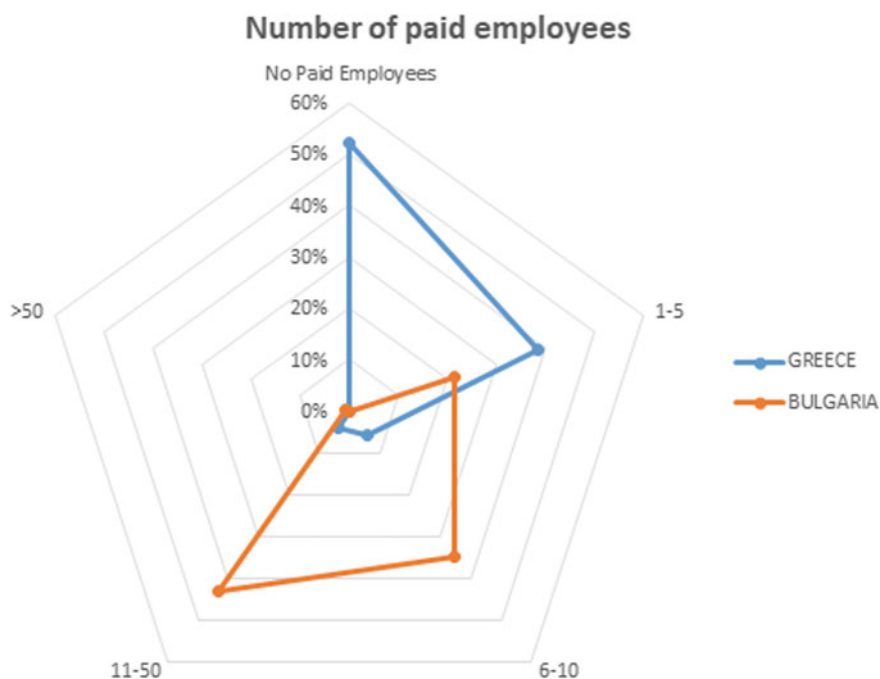


Fig. 2 Radar chart for paid employees of SEs in Greece and Bulgaria

Table 12 Number of paid employees (2017) in the Bulgarian sample

Employees	Frequency	Rate (%)
There are no paid employees	0	0.00
1–5	26	21.49
6–10	42	34.71
11–50	52	42.98
More than 50	1	0.83
Total	121	100.00

Table 13 Type of employment in the Greek sample

Type of employment	Frequency	Rate (%)
Not applicable	27	51.92
Part time	16	30.77
Full time	5	9.62
Seasonal	4	7.69
Total	52	100.00

Table 14 Type of employment in the Bulgarian sample

Type of employment	Frequency	Rate (%)
Not applicable	1	0.83
Part time	12	9.92
Full time	108	89.26
Seasonal	0	0.00
Total	121	100.00

Table 15 Number of volunteers in the Greek sample

Volunteers	Frequency	Rate (%)
There are no volunteers	20	38.46
1–5	24	46.15
6–10	4	7.69
11–50	2	3.85
More than 50	2	3.85
Total	52	100.00

Table 16 Number of volunteers in the Bulgarian sample

Volunteers	Frequency	Rate (%)
There are no volunteers	111	91.74
1–5	8	6.61
6–10	1	0.83
11–50	1	0.83
More than 50	0	0.00
Total	121	100.00

8 Entities) are equipped with 1–5 volunteers and just one (1) of them has got at its disposal 6–10, or 11–50 volunteers (Tables 15 and 16).

Furthermore, regarding the sources of income for the SE Entities and SEs on both sides of the sample, the elicited trends seem to converge. In general, the major source of income comes from private transactions, while the second in a row from transactions with public sector Entities. Also, other important sources come from income derived from transactions with other Entities and SE Entities as well as with SEs, transactions with civil society and transactions with international organisations (Tables 17 and 18).

Proceeding with the basic sources of funding, it should be noted that most SE Entities and SEs on both sides rely on self-financing extensively based on the use of private capital and contributions in kind (concession of land, equipment, etc.). Following that a significant number of responders in the Greek section argued that they have received funding via European Union (EU) funds and a few through public/national funds, too. Conversely, in Bulgaria, the second major source of funding is

Table 17 Basic source of income/GR

Source of income	Frequency
Transactions with private entities	30
Transactions with public entities	8
Transactions with other SE entities and SEs	5
Transactions with international organisations	4
Transactions with donors/charities/civil society	4
Other (members' contributions)	1

Table 18 Basic source of income/BG

Source of income	Frequency
Transactions with private entities	95
Transactions with public entities	50
Transactions with donors/charities/civil society	9
Transactions with international organisations	8
Transactions with other SE entities and SEs	6
State profit	2
State funding	1
Other (members' contributions)	0

Table 19 Basic source of funding/GR

Source of funding	Frequency
Private funds/own contribution/in kind contribution	41
European Union funds	12
Public funds (national programmes)	8
Donors/charities	4
Loans	1
Other (sponsorships)	1

the public sector followed by donors/charities, and next loans, whereas less funding depends on EU funds (Tables 19 and 20).

Last but not least, an interesting aspect that was discussed in the survey was the most favourable “strategy development” for the SE Entities and SEs in the Greece-Bulgaria cross-border area. The research results show that the majority of the SE Entities and SEs in the Greek sample intend to evolve and progress through the development of new products and services as well as via the attraction of new customers. On the other hand, in the Bulgarian sample, the SE Entities and SEs seem to be in favour of development through the increase in sales with existing customers. Still, on the whole, both sides did support the attraction of new customers, the expansion into new geographic areas and to win business as part of consortium, as ways of growth (Tables 21 and 22).

Table 20 Basic source of funding/BG

Source of funding	Frequency
Private funds/own contribution/in kind contribution	94
Public funds (national programmes)	35
Donors/charities	14
Loans	14
European Union funds	5
No funding	1
Other (sponsorships)	0

Table 21 Ways of growth/GR

Ways of growth	Frequency
Develop and launch new products and services	41
Attract new customers	35
Increase sales with existing customers	23
Expand into new geographic areas	20
Win business as part of consortium	13
Attract investment to expand	8
We have no growth plans	2
Merge with another organisation	1
Acquire another organisation	1
Other (new members)	1
Replicate or franchise	0

Table 22 Ways of growth/BG

Ways of growth	Frequency
Increase sales with existing customers	73
Attract new customers	57
Expand into new geographic areas	19
We have no growth plans	18
Win business as part of consortium	16
Develop and launch new products and services	12
Merge with another organisation	1
Other—quality services for disabled people	1
Attract investment to expand	0
Acquire another organisation	0
Replicate or franchise	0

Drawing on the last question pertaining to the most significant barriers for the development of SEs, in Greece, the biggest obstacle appears to be the securing of grants or else funding. The next main impediments are reported to be taxation/VAT and the maintenance of cash flows. Also, another factor is the availability and/or the cost of suitable premises. What is more, on a daily the lack of understanding/awareness of the role and importance of the SEs among banks and other support organisations adds up to the so-called threats, not least to mention the bad “economic climate” in Greece, as well. Finally, the lack of a marketing strategy for the product/service coupled with the lack of access to technical support and advisory services have also been pointed out as obstacles to the development of SE operators (Table 23).

Finally, according to the same last question for the Bulgarian side, in short, the main barrier for the development of SEs is the lack of marketing plan/marketing strategy of SEs products. Then, the second negative parameter shared with the Greek side alike is that of taxation obstacles. Ultimately, again as in the case of the Greek part, in the Bulgarian section the economic climate does not favour the development of SE Entities and SEs, although they tend to be more resilient against the global economic crisis. Moreover, obstacles to access to public services, lack of expert technical support and advisory services, require of demand for products and services are other significant barriers to the development of SEs in Bulgaria (Table 24).

Table 23 Most important barriers in Greece

Barrier	Frequency
Obtaining grant funding	17
Maintaining cash flow	11
Taxation, VAT, business rates	11
Availability/cost of suitable premises	8
Understanding/awareness of SE Entities and SEs among banks and support organisations	6
Economic climate	6
Lack of market plan/marketing strategy of our product/service	5
Lack of access to technical support and advisory services	5
Late payment	4
Access to public services	3
Recruiting other staff	2
Recruiting executives	1
Shortage of managerial skills	1
Understanding/awareness of SE Entities and SEs among general public/customers	1
Shortage of technical skills	0
Lack of demand for product/service	0
Other (please specify)	0

Table 24 Most important barriers in Bulgaria

Barrier	Frequency
Lack of market plan/marketing strategy of our product/service	61
Taxation, VAT, business rates	41
Economic climate	24
Lack of demand for product/service	15
Lack of access to technical support and advisory services	12
Access to public services	9
Obtaining grant funding	5
Understanding/awareness of SE Entities and SEs among banks and support organisations	5
Recruiting other staff	5
Understanding/awareness of SE Entities and SEs among general public/customers	5
Shortage of technical skills	5
Late payment	4
Maintaining cash flow	3
Availability/cost of suitable premises	1
Recruiting executives	1
Shortage of managerial skills	0
Other (please specify)	0

5 Discussion and Conclusions

The field of Social Economy and Social Entrepreneurship constitutes a means and a tool which shall boost and reinforce entrepreneurship, employment, social inclusion, education, social cohesion, productive reconstruction, innovation, local development, etc. across the Greece-Bulgaria border region. This is true especially when contemplating the fact that this particular area is struggling with severe unemployment and low levels of productivity and education supply, while being inhabited by groups of people living in poverty and social exclusion (European Commission 2016).

Especially for services, but also products, that are needed in local communities, however they have only a limited profit margin which makes it hard for ordinary private entities to make a decision to develop and provide them, entities that do not prioritise the profit (i.e. SE Entities and SEs), could find the precious market space to develop, covering a real market need and at the same time, creating new jobs and increases the overall local GDP, which also means more cumulative community income to be spend, etc.

For the development of Social Economy and Social Entrepreneurship at local and regional levels in the Greece-Bulgaria cross-border area, it is very important to build an environment that would facilitate cooperation and interaction among

SE Entities, SEs, regional-local administration bodies, other public bodies, local Non-governmental organisations (NGOs) and local enterprises. In that sense, recommendations ought to be targeted at (a) incorporating Social Entrepreneurship as a specific priority and measure in regional and municipal strategies for the development of social services; (b) providing a mechanism for assessing the impact of different social instruments; (c) designating a Local Officer for the Development of Social Economy and SEs; (d) creating a fund or a special budget code at municipal level with the purpose to support initiatives of civil organisations and thus take action to popularise the SEs model, and at the same time, receive services for the local communities that would cover real needs for which the local authority have legal obligations to responsibilities.

In the Greece-Bulgaria cross-border area, SE Entities and SEs are in need of an initial financial support (grant) to organise their envisaged activities. Local authorities could make available certain land property or space in municipal buildings with low rent, or even free of charge (concession agreement), to assist the operation of SE Entities and SEs with social impact. Also, Municipalities could support SEs by using or buying services provided by them for social services delegated by the local authorities, for which they do not have sufficient human resources (public servants). Furthermore, in order for Social Economy and Social Entrepreneurship to be effective in the cross-border area between Bulgaria and Greece, the presence of well-functioning and stable civil society organisations would be a prerequisite, along with the presence of local enterprises dealing with public social issues. In other words, strong reliable joint partnerships among SE Entities and SEs, public and private sectors could be a key factor for the development of the Social Economy sector, which admittedly works in favour of sustainable inclusive growth at local level.

The creation of local mechanisms that support and promote SE Entities and SEs would provide also a tool to keep young people in the villages and small cities and allow them to work and create there and subsequently proceed with their family formation and prevent the population ageing. The substantial difference in the general development of SEs in Bulgaria and Greece, despite the differences in the legal framework, lead to the conclusion of the importance of exchange of experience and practices, allowing adoption, suitably adjusted to local conditions.

The formulation of policies for supporting Social Economy and Social Entrepreneurship is necessary for the development of local economies in Greece and Bulgaria. Today, more than ever, social problems have exacerbated, particularly during the recent economic crisis and the current global health crisis, too, afflicting more the weakest members of society. It is necessary to design a holistic approach, with the cooperation of every interested party, which shall take advantage of all possibilities-opportunities and invest in strategic action plans with a significant social and economic impact on SE Entities and SEs in the Greece-Bulgaria cross-border area.

It is important to consider solutions to the real needs of local communities, especially in the fields that are not the preference of the ordinary private sector, through SE Entities and SEs, in cooperation with other actors of community, at local level, as

its area has its particular needs, priorities, sets of assets, restrictions and in general combination of a variety of parameters, that affect the approach to certain issues.

It is proven that SEs and SE Entities can play a significant role in the local communities and the cooperation with the local authorities for certain services, can upgrade the applied social policies, without increasing the cost that is related to those services. It is suggested to upgrade the related legislation and provide incentives (e.g. financial or other) for those local authorities that cooperate with SEs and SE Entities for social services.

In conclusion, it would be very important for the Greece-Bulgaria cross-border local level to build a network of local funds so as to finance ideas for the development of the Social Economy and Social Entrepreneurship and to support SE Entities and SEs at local level, particularly through affordable financing, the exchange of experiences with mainstream enterprises, as also by creating conditions for a competitive mode of SE Entities and SEs distribution of products as well as promotion. For each of these proposed interventions, roles and responsibilities should be shared between the three sectors at local level (public, private and non-profit) to enable the formation of local expertise.

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The Effects of Covid-19 Pandemic on Economic Development of Western Balkan Countries



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Abstract The spread of Coronavirus around the globe was in a relatively short period of time, resulting in the most severe socio-economic crisis in the modern history. Therefore, the aim of this research article is to estimate the effects of COVID-19 pandemic on the main economic indicators through an empirical investigation, using annual data for the period 2001–2020. The research methodology consists of a panel regression analysis, including a dummy variable for the COVID-19 crisis, taking the value 1 for the years 2020–2021 and 0 otherwise. The empirical results reveal that COVID-19 had strong negative impact on the real sector in the Western Balkan countries, mostly affecting the countries' output, while causing minor increase in the average unemployment rate and keeping the average price level stable.

Keywords Covid-19 · Economic output · Unemployment rate · Panel regression · Western Balkan

1 Introduction

COVID-19 pandemic was a bitter reality in the recent time. Due to the high and expanding degree of globalization, the coronavirus spread around the globe in a relatively short period of time, resulting in the most severe socio-economic crisis in the present history.

Western Balkan countries, as small and open economies depending on the international trade, and strongly relying on the growth and development of the real sector,

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experienced significant macroeconomic shock that will unquestionably result in long-term economic and social consequences. This region is encompassed by 6 countries that are strongly determined to integration in the European Union. Although several facets can be analysed, the emphasis of this research paper is on the impact of COVID-19 to the real sector in the Western Balkan region. For this purpose, it was employed a well-defined methodological approach aiming to reveal the severity and direction of impact of COVID-19 on the GDP growth rate, unemployment rate and inflation rate.

The containment measures undertaken by the respective authorities at the beginning of pandemics unequivocally had an impact on domestic demand and supply, significantly decreasing economic activity. The supportive macroeconomic policies aid the recovery of demand even though did not completely offset the economic consequences of enforced shutdowns during the 2020 year. However, based on the Western Balkans Regular Economic Report (Fall 2021) reports that the economies of the Western Balkans are coming out of the economic crisis caused by COVID-19 pandemic, compared to global trends. Economies are recovering faster than it was foreseen since the lockdown measures were eased and external demand is picking up. After a contraction of 3.1% in 2020, the Western Balkans is expected to grow by 5.9% in 2021, 1.5 percentage points more than projected.

The COVID-19 pandemic has seriously injured the world economy with grave consequences impacting all communities and individuals. However, after almost of two and half years, the health and economic impact of the COVID-19 pandemic are not still well recognized. Rapid spread of new variants has increased uncertainty about how quickly the pandemic can be overcome. Policy choices have become more difficult, with limited room to manoeuvre (IMF 2021). As of today, based on the World Health Organization data an estimate of 318 million people has contracted the virus worldwide, and over 5.5 million died from the disease.

The coronavirus pandemic led to substantial revisions of 2020 GDP growth projections (König and Winkler 2021). According to the International Monetary Fund (2021), the global economy is projected to grow 5.9% in 2021 and 4.9% in 2022, 0.1 percentage point lower for 2021 than in the July forecast. The downward revision for 2021 reflects a reduction for advanced economies—partly due to supply disruptions—and for low-income developing countries, mainly due to deteriorating pandemic dynamics. This is partially offset by stronger near-term predictions among some commodity-exporting emerging markets and developing economies.

2 Brief Review of the Literature

Although for a short period of time, a large body of literature is produced by different authors concerning the severe impacts of COVID-19 in different spheres. For instance, Brodeur et al. (2021) explore the transmission channels for understanding the potential negative economic impact of COVID-19. They state that it is important to comprehend the economic transmission channels through which

the shocks will adversely affect the economy. As summarized by Brodeur et al. (2021), there are three main transmission channels according to Carlsson-Szlezak et al. (2020). The first channel has to do with the decrease in the consumption of goods and services because of restrictive measures that affect the reduction of consumer confidence and their decisions about long-term economic prospects. The second is related to the indirect impact of the financial market on the real market, which will significantly affect the decrease in family income and, consequently the increase in savings and the decrease in consumption. The third channel has to do with the supply side since the restrictions hinder the production activities of the firms and negatively affect the supply chains and the labour demand that in turn increases the unemployment. Baldwin and Tomiura (2020) deliberate both the supply shock and the demand shock of COVID-19 on international trade of goods and services. Based on their study the supply disruptions and demand shocks of large economies such as US, China, Japan, Germany, UK, France, India, Italy, Brazil and Canada will depressingly affect the global economy, especially the world trade will sluggish considerably.

Baqae and Farhi (2020) examine the supply and demand shocks in a disaggregated Keynesian model embraced by multiple sectors, several factors, input–output linkages, wage rigidities and credit constraints. They construct a model to investigate how the supply and demand shocks affect output, unemployment and inflation. They realize that negative sectorial supply shocks are stagflation, while negative demand shocks are deflationary that in effect, both can cause unemployment. Using the USA data, they find that supply and demand shocks explain about half of the reduction of real GDP because of COVID-19 crisis.

König and Winkler (2020) inspect how the anti-crisis policies undertaken by governments influence cross-country differences, regarding the economic impact of COVID-19 pandemic as projected by different international institutions such as IMF, World Bank and OECD. They measure policy quality using the Economist Intelligence Unit index and a COVID-19 Misery index, combining the strictness of government-imposed distancing measures with the COVID-19 fatality rate. Besides, they scrutinize for international spillovers apprehended by trade openness and export acquaintance to tourism. Their results for most specifications designate that good government performance pays off as the respective countries register less severe revisions of economic growth forecasts.

Eichenbaum et al. (2020) develop a canonical epidemiology model to analyse the interactions between economic decisions and epidemics. They find that epidemic produces both supply and demand upshots on the economic activity. The mitigation measures cause the aggregate consumption to fall by 9.3% over a 32-week period. On the other side, labour supply appears in a U-shaped pattern, by a peak deterioration of 8.25% in the 32nd week from the beginning of the pandemic. The chief note of their analysis is that there is an unavoidable trade-off between the severity of the short-run recession triggered by the epidemic and the health consequences of that epidemic. Consequently, the policymakers deal with this trade-off.

Eppinger et al. (2020) employ a quantitative multi-country multi-sector trade model with input–output relations for a set of countries to estimate the influence

of COVID-19 supply shock on global value chains (GVCs). They find considerable welfare losses in China more than 30% because of supply shock, but only moderate welfare effects in other countries, fluctuating from -0.75 to $+0.12\%$.

Lewis et al. (2020) built regression models using a weekly economic index and incorporating 10 different economic variables to examine the economic effect of covid-10 in the US. Based on the analysis, it was found that from March 21 to March 28, the weekly economic index fell by 6.19%. This came because of the decrease in fuel sales, the decrease in consumer confidence, as well as from the change of other variables. The authors point out that in normal times macroeconomic aggregates accurately present the economic situation with a modest delay, while in times like the pandemic some data sources can provide an informative and timely signal of the economic situation. This means that the weekly economic index provides an accurate summary of that signal.

Chetty et al. (2020) built a database that tracks economic activity in real time and using anonymized data from private companies. There, the authors report weekly statistics on business income, consumer spending, employment rates and more. Then the authors analysed the effect of COVID-19 on the economy considering the heterogeneity and its impact on groups with different incomes. The study highlights that people with high incomes significantly reduced their expenses at the beginning of the pandemic, which greatly affected the decrease in the income of small businesses in wealthy areas, and as a result many workers were laid off. Even in the moments when the economy started to recover somewhere from the end of December 2021, the labour supply was low for low-wage jobs. The authors even reveal that the stimulating fiscal policies had a positive effect in stimulating demand at the beginning of the pandemic, but much less later.

König and Winkler (2021) investigate the influence of obligatory social distancing required by lockdown policies and social distancing caused by COVID-19 fatality rates on economic growth including 42 countries in their sample. According to OLS and IV results, it was found a significant effect of fatality rate. Regarding the panel regressions, it was confirmed that lockdown strictness affected the most the economic growth. Models with lagged variables reveal that more restrictive measures lead to lower GDP growth in the same quarter then are linked with a positive and recovery effect in the subsequent quarter.

Asahi et al. (2021) evaluate the impact of restrictive measures on local economic activity using econometric techniques and a broad data base for the country of Chile. Their analysis is based on the measurement of economic activity based on the collection of taxes at the municipality level. The results show that those municipalities that had strict restrictive measures were accompanied by a 10–15% decrease in local economic activity, which is twice the decrease in local economic activity compared to municipalities that were not under isolation. This shows that three to four months of isolation had a similar effect on economic activity as a year of the recession of global financial crisis of 2009. They also found that costs are proportional to the population under lockdown, with no differences when congestion was measured at the municipality or city levels. Their findings imply that localized foreclosures have a large effect on local economic activity, but these effects are proportional to the

population under foreclosure. This means that epidemiological criteria and isolation decisions should be based on the optimal size of isolated areas.

Danielli et al. (2021) conducted an analytical study reviewing the existing information related to economic interventions and government measures to mitigate the negative effects of COVID-19. They found that government measures have been substantial for some countries, ranging from 2.5 to 50% of Gross Domestic Product.

This study is different from those reviewed above as it analyses the effect of COVID-19 on economic developments from another perspective, i.e. alongside the analysis of the effect and its size, which will be an added value to the existing literature on this topic.

3 Methodology and Data

The methodology of this research consists of panel regression analysis and the estimation method used is two-stage least squares (2SLS). It is based on the reduced form of the model equations, representing the dependent variable as a function of only predetermined variables (exogenous and lagged variables) and a disturbance term, thus avoiding the potential bias that will occur if ordinary least squares method were used (Gujarati and Porter 2009, p. 673).

Due to availability of data for this set of countries, the study uses annual data for the period 2001–2021, obtained from the World Bank's database, for 6 Western Balkan countries, namely, Albania, Bosnia and Hercegovina, Kosovo, Montenegro, North Macedonia and Serbia. In other words, it is a panel data, with 6 cross section units (countries) and 21 time periods (years), providing a sample of maximum of 126 observations. However, due to missing data, the final data sample, after adjustments, is 106 observations. To prevent further loss of degrees of freedom because of missing data, the moving average method was used to supplement some of those missing observations, mostly for Kosovo and Montenegro. This is one of the statistical techniques available for tackling issues with missing data, which is simple to apply, yet most suitable for this case.

The empirical analysis is concentrated on the real sector. Specifically, the impact of COVID-19 on the real sector in the sample countries is observed through three-panel regression models, i.e. the dependent variables are considered the annual GDP per capita growth rate, the unemployment rate and the inflation rate, respectively. The GDP growth rate refers to the overall economic activity using the per capita economic growth in the country. On the other hand, the unemployment rate is specifically focused on the utilization of the labour force potential. Another important aspect necessary to cover all aspects affecting real sector is price stability. Although one might argue that it is primarily a monetary phenomenon, it undoubtedly has strong influence on the economy in general, especially private consumption and investment. Therefore, the inflation rate is also taken as a proxy indicator for the real sector.

To isolate the impact of COVID-19 and to prevent potential omitted variable bias, several variables are used in the models as exogenous, or control variables.

Table 1 Exogenous (control) variables used in the analysis

Control variables	Indicator	Proxy indicator
GDP_PC	GDP per capita (constant 2010 US\$), $t - 1$	Economic development
CAB	Current account balance (% of GDP)	International integration
TRADE	Trade (% of GDP)	
MONEY	Broad money (% of GDP)	Financial stability
RIR	Real interest rate (%)	
LIQUID	Bank liquid reserves to bank assets ratio (%)	Stability of the banking sector
SAVINGS	Gross domestic savings (% of GDP)	Credit base
FCE_GG	General government final consumption expenditure (% of GDP)	Government intervention
DCPSB	Domestic credit to private sector by banks (% of GDP)	Economic activity
GFCF	Gross fixed capital formation (% of GDP)	
POP	Population, total	Labour force

These variables represent different factors related to the real sector, such as the level of economic development, international integration, macro-financial stability, economic activity and economic potential, as well as the government intervention.

As key independent variable used in the analysis, dummy variable for the COVID-19 crisis, taking values 1 for the years of 2020–2021 and 0 otherwise, is used in the three econometric models. The coefficient of this variable represents the effect of the COVID-19 crisis on the observed dependent variables, i.e. it investigates if there is any structural change between the two time periods. It is represented in all models, and it is of primary interest and importance for this empirical analysis.

The selection of the control variables is done based on the conventional macroeconomic wisdom, as well as the empirical literature in the area. In its early phase, the analysis covered more control variables that potentially affect the endogenous variables, however, due to various reasons (missing data, or statistical insignificance), they were narrowed down to the following, presented in Table 1.

3.1 Specification of Econometric Models

The three models used for estimating the effects of COVID-19 pandemic on the real sector are specified as in the following three equations. In the first model GDP per capita growth is well-thought-out as dependent variable. In the second and third models, unemployment rate and inflation are considered as dependent variables, respectively.

$$\begin{aligned} \text{GDP}_g = & \beta_{1.0} + \beta_{1.1}\text{DUM} + \beta_{1.2}\text{UN} + \beta_{1.3}\text{INF} + \beta_{1.4}\text{RIR} + \beta_{1.5}\text{FCE}_{gg} \\ & + \beta_{1.6}\text{CAB} + \beta_{1.7}\text{TRADE} + \beta_{1.8}\text{GFCF} + \beta_{1.9}\text{DCPSB} + u_1 \end{aligned} \quad (1)$$

$$\begin{aligned} \text{UN} = & \beta_{2.0} + \beta_{2.1}\text{DUM} + \beta_{2.2}\text{Log}(\text{GDP}_{pc_{t-1}}) + \beta_{2.3}\text{INF} + \beta_{2.4}\text{FCE}_{gg} \\ & + \beta_{2.5}\text{GFCF} + \beta_{2.6}\text{DCPSB} + \beta_{2.7}\text{TRADE} + \beta_{2.8}\text{Log}(\text{POP}) + u_2 \end{aligned} \quad (2)$$

$$\begin{aligned} \text{INF} = & \beta_{3.0} + \beta_{3.1}\text{DUM} + \beta_{3.2}\text{UN} + \beta_{3.3}\text{GDP}_g + \beta_{3.4}\text{MONEY} + \beta_{3.5}\text{LIQUID} \\ & + \beta_{3.6}\text{RIR} + \beta_{3.7}\text{SAVINGS} + \beta_{3.8}\text{DCPSB} + \beta_{3.9}\text{CAB} + u_3 \end{aligned} \quad (3)$$

If omitting relevant independent variable of the model causes biased coefficient estimates, including redundant independent variable affects their efficiency. Namely, obtained estimates do no longer have smallest variance. For this purpose, stage 2 in the estimation process of the above theoretical model would be exclusion of statistically insignificant control variables. In other words, a restriction would be imposed to the theoretical model, equating the insignificant coefficients. The goal is to end up with estimated model with only statistically significant control variables and the key independent (dummy) variable, to objectively assess its impact and derive reliable conclusions.

The two-stage least squares method requires including enough instruments, in order for the model to be identified and possible to estimate. In this regard, the analysis takes all control variables from the system as instruments for estimation of each model equation, plus the key independent (dummy variable).

In addition, given that the analysis is focused on a group of countries, rather on a single country at a time, one should encompass this information properly in the model. In this regard, panel data analysis offers three different estimation techniques: pooled regression, fixed effects model and random effects model. Pooled regression basically disregards the aforementioned information and treats the data as a single time series. On the other hand, fixed and random effects model utilizes it, but in a different way. Namely, fixed effects model is based on a country specific dummy variable, further related to the intercept in the equation, whereas random effects model encompasses the country specifics in the error term, while using generalized least squares method for coefficient estimation (Brooks 2008, pp. 490–493). In practice, the Hausman test is most often used to decide which estimation technique is more appropriate. However, since the number of cross-sections is significantly lower than the number of time periods in the dataset, as well as the number of parameters in the equations, it is impossible to apply random effects model in this case. Therefore, the analysis is based on the fixed effects model, as the only applicable solution.

4 Empirical Analysis and Findings

Based on the obtained results of the model estimation, presented in the following table, we can see that the theoretical (unrestricted) model for per capita GDP growth rate is statistically significant (F -statistics = 10.18, with p -value = 0) and it is well fitted (R -squared coefficient = 0.64 and Adjusted R -squared coefficient = 0.59). Also, regarding the selection of instrument variables, estimated Sargan J -statistics is statistically insignificant (p -value = 0.6940), meaning that the over-identifying restrictions are valid (Sargan 1958).

However, one can note that there are several insignificant variables in the unrestricted model, or variables whose coefficients have p -values greater than 0.05. Therefore, these variables are gradually excluded from the model. After exclusion of these redundant variables, the overall statistical significance and model fit have significantly improved. The F -statistics in the restricted model is 16.98, whereas the adjusted R -squared coefficient jumped to 0.63 (Table 2).

According to the restricted (final) model, GDP growth rate in the Western Balkan countries primarily depends on factors related to international trade and integration, whereby external balance of goods and services and trade have positive impact on the economic growth, whereas current account balance has negative impact. Furthermore, investments (GFCF) have significant positive impact on the economic growth in the Western Balkan countries, with estimated coefficient of around 0.7, meaning

Table 2 Equation 1—GDP growth rate—estimated coefficients

DV: GDP_G	Unrestricted		Restricted	
Variable	Coeff.	P -value	Coeff.	P -value
C	−34.0015	0.0943	−13.5119	0.0977
DUM	−2.1422	0.0342	−4.8115	0.0000
CAB	−0.5221	0.0881	−0.5282	0.0011
TRADE	0.9272	0.0254	0.1107	0.0000
GFCF	0.7760	0.0022	0.6612	0.0032
DCPSB	−0.4115	0.0451	−0.4008	0.0000
FCE_GG	0.7211	0.9442		
UN	0.3266	0.1510		
INF	−0.4550	0.5201		
RIR	−0.1923	0.3817		
R -squared	0.64		0.76	
Adjusted R -squared	0.59		0.63	
F -statistic	10.18		16.98	
Prob (F -statistic)	0.0000		0.0000	
Prob (J -statistic)	0.6940		0.5511	

Source Author's calculation

that increase of the gross fixed capital formation of 1 percentage point would cause average increase in the GDP growth rate in the Western Balkan countries of 0.7 percentage points. However, indebtedness of the private sector might be potential growth jeopardizing factor in the Western Balkans. Namely, further increase in the domestic credit to private sector for 1 percentage point would cause average decrease in the GDP growth rate of around 0.40 percentage points. In contrast, monetary factors like interest rates, or inflation rate, as well as government final consumption and unemployment rate, do not have statistically significant impact on the GDP growth rate. There might be various reasons for this, beyond the scope of this master thesis.

Most importantly, estimated coefficient for the introduced dummy variable related to the COVID-19 pandemics is negative and statistically significant. This means that during the last year, Western Balkan countries experienced average decline in the GDP growth rate of -4.8% , holding other factors constant.

Regarding the unemployment rate, estimated model has significantly higher fit, compared to the GDP growth rate model. Namely, *R*-squared coefficient is around 0.83, meaning that 83% of the variations in the unemployment rate are explained by the selected independent variables.

Similarly, as in the GDP growth rate model, government final consumption expenditure and inflation rate do not have significant impact on the unemployment in the Western Balkans. On the other hand, population growth, as a labour force potential, has negative impact (decreases) on unemployment, along with the level of economic development, as observed through the previous year GDP per capita. Investments, international trade, as well as trade in general, also have negative impact (decrease) on unemployment, unlike domestic credit to private sector, which is another evidence in favour of the intuition for the negative macroeconomic implications of further indebtedness of the private sector (Table 3).

Regarding the impact of COVID-19 on unemployment in the Western Balkans, it has significant, but negative impact. Unlike the initial thoughts, COVID-19 not only did not increase unemployment, but decreased for almost 4.0 percentage points on average. This finding goes in favour of the effectiveness of the governments' recovery measures aimed at preventing job losses. Another important aspect might be the ability of the domestic companies to shift their business processes remotely, which is also an indicator of the technological progress of the region, in terms of technological advancement and ICT infrastructure. However, the reasons for this finding should be sought in the individual country specifics of each country.

Keeping the trend of decreasing the unemployment rate in the Western Balkan region might be the key for fast economic recovery in the post-COVID period. Namely, despite the significant fall in the economic activity, decreasing unemployment rate prevents further aftershocks on the demand side, caused by drop in the final consumption of the private sector. Furthermore, it can be a basis for future development and faster economic growth in the years to come.

In line with the initial assumptions based on the data visualization, COVID-19 does not have significant impact on the average price level, as observed through the average inflation rate in the Western Balkan countries. The estimated model for

Table 3 Equation 2—unemployment rate—estimated coefficients

DV: UN	Unrestricted		Restricted	
	Coeff.	Prob.	Coeff.	Prob.
A				
C	8.2610	0.1423	15.7150	0.0346
DUM	-3.1321	0.0127	-3.9171	0.0041
LOG(GDP_PC(-1))	-11.3312	0.0012	-9.3348	0.0005
GFCF	-0.4277	0.0033	-0.7341	0.0017
DCPSB	0.3221	0.0585	0.3277	0.0221
TRADE	-0.7843	0.0000	-0.2721	0.0000
LOG(POP)	-9.1843	0.0310	-6.1151	0.0032
INF	-0.0993	0.5210		
FCE_GG	-0.2355	0.3245		
<i>R</i> -squared	0.77		0.83	
Adjusted <i>R</i> -squared	0.71		0.74	
<i>F</i> -statistic	43.25		52.62	
Prob (<i>F</i> -statistic)	0.0000		0.0000	
Prob (<i>J</i> -statistic)	0.8723		0.6572	

Source Author's calculation

Eq. 3 shows that the coefficient for the introduced dummy variable is insignificant at 0.05 significance level. In other words, we cannot reject the null hypothesis that the coefficient is equal to zero. Namely, in the estimated unrestricted model, this coefficient is negative and insignificant (-0.65), whereas in the restricted model, it is -0.9 but again statistically insignificant. Thus, the coefficient of interest of this study implies that COVID-19 pandemics did not cause any significant impact on the inflation rate in the Western Balkan countries (see Table 4).

The overall goodness of fit for this estimated model is 52% (*R*-squared coefficients), which implies that there might be factors, probably monetary, that affect the inflation rate, but are not included in the model as independent variables. Here pops out the limitation regarding data availability. Namely, the collection of many financial development and monetary indicators started after the global financial crisis of 2008, which emphasized the importance of such indicators. On the other hand, in the unrestricted model there are several factors that do not have significant impact on the average inflation rate, such as the economic growth rate, domestic credit to private sector, stability of the banking sector observed through the amount of liquid assets and surprisingly the monetary base. Namely, monetary base in the country is in direct control of the National bank, and it serves as an operative target for achieving higher monetary goals, among which is the inflation rate (Mishkin 2011).

In any case, the obtained results show that average inflation rate in the Western Balkan countries primarily depends on factors related to international trade, such as external balance of goods and services and current account balance, monetary factors, such as savings and interest rates, as well as unemployment.

Table 4 Equation 3—inflation rate—estimated coefficients

DV: INF	Unrestricted		Restricted	
	Coeff.	Prob.	Coeff.	Prob.
C	-22.2131	0.0183	-15.1207	0.0731
DUM	-0.6531	0.5731	-0.9251	0.1702
UN	0.5482	0.0021	0.5172	0.0013
RIR	-0.2537	0.0005	-0.3990	0.0011
SAVINGS	0.1994	0.0260	0.2871	0.0420
CAB	0.7342	0.0012	0.8291	0.0010
GDP_G	-0.0502	0.5518		
DCPSB	0.3511	0.5441		
MONEY	0.2581	0.6120		
R-squared	0.52		0.63	
Adjusted R-squared	0.47		0.59	
F-statistic	17.32		24.11	
Prob (F-statistic)	0.0000		0.0000	
Prob (J-statistic)	0.2513		0.2451	

Source Author's calculation

When it comes to the relationship between inflation and unemployment, it has special treatment in the economic literature, known as Phillips curve. Namely, the literature suggests inverse relationship, meaning that higher inflation rate is associated with lower unemployment rate and higher economic growth, and vice versa (Dorm 2020).

Phillips curve is highly disputed Keynesian concept in the empirical literature, which happened not to be true for the Western Balkan region as well. One of the reasons for this might be the constantly decreasing trend of the unemployment rate in the past years, which started with extremely high rates of unemployment in the transitional years of the 1990s. However, those aspects of the analysis go beyond the scope of this study, and therefore, would not be discussed any further.

4.1 Limitations of the Study

The methodological approach has two major limitations. Namely, quality of the data might significantly affect the obtained results. Missing data, primarily for Kosovo and Montenegro, leads to significant decrease in the sample size, thus losing valuable degrees of freedom. Also, missing data for some finance variables, such as non-performing loans and capital adequacy ratio, significantly narrow the analysis, which can cause omission of relevant variables from the models.

Another aspect related to data quality is comparability. Countries might use different calculation methodologies for same indicators, jeopardizing cross-country comparison. To tackle this issue, the entire dataset is obtained from one reliable source, the World Bank's database. However, the risk of incomplete comparability is still not completely removed.

5 Conclusions

This empirical study reveals that COVID-19 had strong negative impact on the real sector in the Western Balkan countries, mostly affecting the countries' output, while causing slight increase in the average unemployment rate and keeping the average price level stable. Western Balkan countries experienced sharp decline in the economic activity. However, some countries had relatively easier consequences, unlike others, that were hit harder.

On average, COVID-19 impact caused decrease in the GDP growth rate in the Western Balkan countries by 4.8 percentage points.

As for the unemployment rate, the trend of constant decrease over the last two decades is evident. However, COVID-19 pandemics slightly increased unemployment rate in some Western Balkan countries (Kosovo, North Macedonia and Bosnia and Hercegovina), whereas Serbia, on the other hand, managed to keep the downward trend. The estimated coefficient in the structural equation for the unemployment rate is statistically significant and negative. This means that COVID-19 pandemics not only did not increase unemployment rate but affected it reversely. There are two possible reasons behind the resilience of the unemployment rate on the COVID-19 impact. One aspect is the effectiveness of the governments' recovery measures aimed at preventing job losses, and other is the ability of the domestic companies to shift their business processes remotely, which is also an indicator of the technological progress of the region, in terms of technological advancement and ICT infrastructure.

Regarding the overall stability of the price level, one can conclude that inflation rate in the Western Balkan countries is far less volatile in the past decade, in comparison with the period before the global financial crisis. During the years of 2020 and 2021, because of the lower economic activity, inflation rate in the Western Balkan countries was around 0, but it is expected to grow this and the next year, due to the undertaken economic recovery measures as well as the war in Ukraine and energy crisis. Estimated coefficient of the COVID-19 dummy variable in the structural equation for the inflation rate is statistically insignificant, meaning that COVID-19 pandemics did not affect the overall price level stability in the Western Balkan countries.

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The Importance of Monitoring Contagious Diseases in Cross-Border Areas



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Abstract The practically free travelling between Greece and Bulgaria raises the issue of adequate and timely monitoring and exchanging of reliable data and information on contagious diseases, parasitic and other diseases, in order to protect public health. The objective of this article is to approach the preparation of a Joint Cross-Border Action Plan, which will contribute to the improvement of the health status in the intervention area. We collected directly information from executives in both countries, also during joint meetings, analysed and prioritised certain diseases and infections, studied related literature and also included through update on the approach to COVID-19 pandemic, to reach a proposed joint Cross-Border Greece-Bulgaria action plan including objectives and selected performance indicators. Based on the views of the healthcare and authorities' executives and our research, it was found that the cooperation through a specific plan, supported by a Joint Cross-Border Advisory Board could contribute significantly to the protection of public health.

Keywords Public health · Contagious diseases · Joint action plan · Greece · Bulgaria

Classification Codes I18: Government Policy · Regulation · Public health

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1 Introduction

Contagious diseases are a threat to communities, especially in Cross-Border areas with increased mobility of the population. That was clearly perceived in the COVID-19 pandemic. The risk of spread of contagious diseases is significant if measures are not taken, information is not exchanged, the population is not getting the appropriate information in simple language, with socio-economic consequences that could be severe sometimes, especially for communities that face high mobility due to business or tourism.

The confrontation of communicable diseases is a key factor for the improvement of public health, in countries with non-modern healthcare systems, but also for countries with more advanced healthcare systems. That is even more important in neighbouring counties and their Cross-Border areas, in order (i) to protect the people who move from one place to another; (ii) to protect the local population from diseases brought by commuters and travellers and (iii) to prevent epidemics that could affect negatively also the tourism and other economic activities.

The actions to minimise the risks for the spread of contagious diseases in Cross-Border areas have to be part of a general joint Cross-Border action plan, which (i) will have been prepared through the cooperation of specialists of the involved counties; (ii) will have selected the diseases that would be monitored; (iii) will have set the objectives of the joint action plan; (iv) will have set the indicators that would be measured and the joint measurement model; (v) will have set the cooperation and response network and (vi) will have set the modes of communication. Such an action plan could be a precious part of the toolkit for the Cross-Border networking for the coordination, prevention, surveillance and early warning and control of contagious, infectious, parasitic and other diseases with Cross-Border nature. It could assist the medical authorities and executives, as well as decision makers, to have exchange of valuable information, on time and with accuracy, in order to take the appropriate measures when needed, for the prevention of disasters due to contagions, in public health and local economies. The main purpose is to contribute to the improvement of the healthcare status and public health, in the referred Cross-Border area. According to Lanford et al. (2022), it is important for the stakeholders in healthcare, public health, social services and other authorities to collaborate; however, such collaborations should develop communication and cooperation systems in (i) governance; (ii) shared purpose; (iii) finance and (iv) shared data, in order to be durable with positive impact in the local communities. According to Maessen et al. (2019), the experience of past international outbreaks documented that it is inevitable to be managed by multiple organisations together, through active networks of cooperation. That is also justified by Bdeir et al. (2013), who state that outbreaks have rates of infection and transmission within the community that may vary significantly, even in adjacent areas or places with similar demographics, like the H1N1 case in 2009 in Australia with variations being up to 8 times higher/lower, which means that as long as the pathogen was the same, and at the same time in areas with similarities in demographics the spread varied significantly, then the factor of response coordination was of essence.

Furthermore, according to Kluytmans-Vanden Bergh et al. (2005) and Willemsen et al. (2015), as cited in Maessen et al. (2019), there is a significant risk of Cross-Border outbreaks of multidrug resistant microorganisms, as an increasing number of bacteria have developed such resistance to antibiotics. Only in U.S.A. “*More than 2.8 million antibiotic-resistant infections occur in the United States each year, and more than 35,000 people die as a result. In addition, nearly 223,900 people in the United States required hospital care for C. difficile and at least 12,800 people died in 2017*” (Centers for Disease Control and Prevention—CDC 2019). That, in combination with the increased number of travellers that Cross-Borders, leads to serious hazard for spread of infections.

Although the era of COVID-19 pandemic has taken the vast columns of news since February 2020, other outbreaks existed and continue to exist, e.g. influenza (swine flu) pandemic (2009) in Mexico, which spread to the USA and then globally, with the main sources being Mexico and USA, as referred by Jombart et al. (2009) and National Health Service (NHS) (2019); E.coli outbreak in the Cross-Border area The Netherlands-Germany, as referred by Kuijper et al. (2011); Ebola outbreak in countries of West Africa, as referred by Mate et al. (2018) measles outbreak in New Zealand, as referred by the Ministry of Health of New Zealand (2019). Epidemic situations require (i) prevention and control measures, and (ii) outbreak response systems being ready for action in case of occurrence, in order to minimise the damages in the various socio-economic sectors of the Cross-Border communities.

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2 Literature Review

The regions around borders in the European Union, according to Beck (2018a), cover a significant part of the Union, which is 40% of the whole EU territory, while near 30% of its population live there. Lambertz (2010, as cited in Beck 2018a), refers to the regions on the borders, as laboratories.

Reference to Cross-Border cooperation in all topics, thus also in public health and healthcare, always raises the issue of governance. According to Rhodes (1997, as cited in Leloup 2021), public problems could be dealt with a variety of approaches and new types of procedures could be sought out. With mutual trust, cooperation between operators could “*be undertaken by networks of operators of various types, including public authorities working at different scales, associations and private actors depending on the problem or the area concerned*” (Leloup 2021). Typical forms of governance are not workable in transnational cooperation schemes, while the regulations in the different countries and the specific management systems most usually do not match. Even worst, if a significant number of actors from both sides of the borders are involved. For Eisenberg (2007) that is a challenge for the Cross-Border governance of networks, as, among others, important cultural differences

occasionally prevent the different country entities to agree even to basic governance terms, such as “project”, “cluster”, “actors”, “civil society”, “networks”. Even “the definition of the term governance is quite often not clear in its use” (Beck 2018b). According to Anderson et al. (2002), in order to standardise cooperative actions between Cross-Border organisations, it is inevitable to approach that collaboration specifically and with innovative organisational perspective. Coordination of different organisations and different specialties, here meets the definition of “the act of managing interdependencies between activities performed to achieve a goal” (Malone and Crowston 1990), while for Leloup (2021), the preparation of constructive Cross-Border cooperation environment among stakeholders of the two sides of the borders, requires some time, due to cultural and social differences.

Particularly in disasters and public health crisis such as a disease outbreak, according to Comfort et al. (2001, as cited in Bdeir, Hossain and Crawford 2013), management is complicated as many different organisations are involved in the confrontation and have to act at the same time. According to Neal and Philipps (1995, as cited in Bdeir, Hossain and Crawford 2013), typical schemes of management are not always the best options to deal with such critical situations. Significant needs for instant communication, joint reactions and interactions and collaboration in general are generated and the organisations have to be ready and react optimally. Bdeir, Hossain and Crawford (2013) distinguish acts of God from the disease outbreaks for a series of reasons. While such operation of multiple organisations is already complicated in a country with standardised regulations and procedures for all in-country actors, it becomes even more complicated in the Cross-Border areas, where different systems operate and would have to confront the same situation (e.g. an infection outbreak) many times without having already built “a common understanding about the task in hand” (Bdeir, Hossain and Crawford 2013). Moreover, projects, activities and actions, such as the preparation of action plans, face even more difficulties on the “governance of healthcare related Cross-Border projects, as healthcare is strictly regulated according to national laws. Member States are responsible for defining and implementing their health policies, as well as organising and delivering health services and medical care, while the European Union complements the Member States’ actions, as set in the TFEU”¹ (Leloup 2021). According to Kapucu (2005), it is complicated and difficult to build networks that can perform well in dynamic environments, such as the ones in disasters. However, “extreme events trigger greater density of communication and interaction among organizations that stimulates collective action” (Kapucu 2005) while according to the same paper, “interorganizational networks in emergencies can play an important role in facilitating the flow of information across organizational boundaries.”

There is a variety of Cross-Border cooperation schemes in the European Union, based on different approaches and objectives. Among others, such may include limited cooperation of Medical Units in the neighbouring countries, for specific tasks, as the example of the German-French partnership agreement signed between hospital cardiology units in Forbach (FR) and Voelklingen (DE) in 2013, limited

¹ TFEU: Treaty on the Functioning of the European Union.

only to diagnostic activities of very specific cases, or the Cross-Border scheme of *Euroregio Meuse-Rhine incident control and crisis management* (EMRIC) with focus on technical assistance, medical care for emergencies, etc. covering neighbouring regions of Germany, The Netherlands and Belgium, as both are referred by Delocosse et al. (2017), and others. Another important form of cooperation is the “*Cross-Border health observatory*” (Leloup 2021), with relatively similar objectives to our proposed Joint Cross-Border Action Plan and the Joint Cross-Border Advisory Council. According to Leloup (2021), the observatory focuses on connecting medical staff and authorities close for improved cooperation and capacity building, and also to collect data on specific topics.

The case of the swine flu (H1N1)/novel H1N1 outbreak in 2009 began in Mexico and was rapidly spread to California, Texas and other areas in the USA and then to the World, and the reaction in the two neighbouring countries (Mexico and USA) provides lessons for the set of bilateral Cross-Border networks in the health sector. According to Banicki (2010), with the progress of the disease, most of the cases were reported and confirmed in counties in the borders, as so were the seriousness of the cases and the mortality rates. In Texas, they deployed a set of tools to monitor the novel H1N1, including (i) Surveillance Network supported by CDC² with frequent reports and information; (ii) Laboratory surveillance for influenza with sample controls from different medical units; (iii) Monitoring of influenza deaths of children and adolescents and (iv) reports from local counties. “*Infection control and social distancing*” (Banicki 2010) were the essential strategies. Among the lessons learned, according to Banicki (2010), also (iv) reports from local counties. “*Infection control and social distancing*” (Banicki 2010) were the essential strategies. Litaker et al. (2010), observed the need for responsiveness in the international borders when designing the response to disease outbreaks and recommended the continuation of the cooperation between the executives of the medical authorities on the Mexican and US sides of the border, particularly with focus on surveillance of diseases and control of outbreaks. The lessons learned from the H1N1 flu pandemic in EU were summarised by European Medicines Agency (2011) which, among others, included (i) adjusted preparedness plans; (ii) extensive availability of data on different variants of the novel virus; (iii) further cooperation with various stakeholders, along with the respective national agencies, as before the H1N1 outbreak there were no established connections with the public health authorities; (iv) improved communication activities with the public and the medical professional. Snacken (2010), among others, pointed out the issue of appropriate measurements, using common methodology, in order to avoid misleading figures.

According to the European Court of Auditors (2018), the health sector in EU represents the 10% of its GDP³ and 8% of its total labour force, while the average health expenditure in EU is 9.9% of its GDP, with Germany on the top with 11.1%, Bulgaria and Greece below the average, with 8.3% and 8.2% respectively.

² CDC: Centers for Disease Control and Prevention.

³ GDP: Gross Domestic Product.

As justified in the literature, the collaboration of the stakeholders in the Cross-Border areas, including all prime stakeholders, is a prerequisite for the preparedness and the readiness for quick response in case of alert signals of indicators during control and monitoring, in order to minimise the effect of disease outbreaks and mitigate socio-economic effects in the local communities. Preparedness, Epidemiological Surveillance and Early Warning and Response System were envisaged by the European Commission as referred by Lanaras (2018). After the COVID-19 pandemic, that was more clear than ever and is now it is stated by the Council of Europe (2022), which promotes the new legislation on threats to health in Cross-Border areas, including, among others: (i) better communication between different countries; (ii) national plans and (iii) early warning and risk management.

3 Methodology

This article presents the importance of Cross-Border cooperation in monitoring contagious diseases, by a proposed joint action plan and a Joint Advisory Council, in the Cross-Border area of Greece and Bulgaria.

The procedure and methodological approach to the preparation and the design of the action plan included the cooperation and discussion between specialists and executives of the two neighbouring countries, during physical meetings (prior to the COVID-19 pandemic) in the town of Gotse Delchev in Bulgaria (Lead Beneficiary of the funded project) and the town of Eleftheroupolis-Paggaios in Greece (Partner of the funded project), while it was also conducted electronically online (voice over IP) ones (during COVID-19 restriction measures) and selection of diseases to be monitored jointly, based on data of the last years. In total, there were six meetings between the involved partners and the prime stakeholders in their respective areas, with an average of approximately fifteen representatives; one meeting between Greek executives and stakeholders in Eleftheroupolis, Greece; and one meeting between the Greek partners and the Ministry of Health of Greece, through its branch being responsible for the area of Macedonia and Thrace (4th YPE), in Thessaloniki. That approach is in line with the approach of Beck (2011), who describe the prerequisites and multiplying effects of alliance through preliminary meetings and discussions, sharing of information, fair distribution of roles. That process definitely sets the base for mutual trust to be established and continue with more organisational concepts, including decision-making, processes, etc. which could to durable networking with commitment in the joint objectives set in the alliance in each case.

Furthermore, the data for the selected diseases were examined more carefully and with focus on the Cross-Border area of Greece and Bulgaria, through the literature, previous surveys and official sources, to justify the importance of the selection of the infections for monitoring and exchange of information. Thus, the results and the approach to the action plan were based both on qualitative data through the opinion of specialists and executives and the exchange of views between them, and

quantitative data collected through the study of published previous researches and officially recorded data.

The procedure was continued with the finalisation of the approach of the action plan; the key contents of the selected joint actions; its internal and external communication, objectives and tools; the list of indicators of achievements; the follow up and the monitoring and assessment of it.

The approach was updated to include a brief analysis of COVID-19 pandemic, however, not for specific monitoring as general databases have already deployed and are in use.

4 Outputs

The cooperation of the partners of the two sides of the borders, Greece and Bulgaria, did lead to the set of factors and parameters of the Joint Cross-Border Action Plan for the assistance of medical authorities and executives, as well as decision makers, to have exchange of valuable information, on time and with accuracy. The set in place of the Action Plan, the coordination, prevention, surveillance and early warning and monitoring of contagious, infectious, parasitic and other diseases with Cross-Border nature along with the use of other tools such as networking with other areas and the state medical authorities could become a tool for on-time decisions to prevent disasters due to contagions, in public health and local economies. The implementation of the Action Plan will have to be coordinated by existing structures in the two countries, on an equal basis, with the support of the Joint Cross-Border Advisory Council (JCBAC), which will include medical staff—public servants, from both sides of the borders and also appointed members by decision makers of local and regional authorities. The role of the JCBAC will be to follow up the progress and suggest corrections or modification of the Action Plan, in order to be better adjusted. Furthermore, it will have the role of communicating and exchanging information with other entities in the Cross-Border area and contribute to concepts for future joint projects in the health sector. Its operation is expected to contribute to improvements in the health status of the population in the Cross-Border area and also the primary health systems. JCBAC will also assess, from its perspective, the progress of the implementation of the Action Plan.

During the preliminary analysis, prior to the COVID-19 pandemic, two main infectious and contagious diseases were considered of high importance for the area of intervention and particularly for the Cross-Border area. Those were Tuberculosis and Measles. Especially for measles, it was realised that in the last years a number of infections was monitored, mainly due to some activations in the community, against vaccination such as MMR which prevents from Measles, Mumps and Rubella.

State of Play of the Selected Common Diseases

Tuberculosis

Active tuberculosis (TB) is a bacterial infectious disease caused by *Mycobacterium tuberculosis* and it most often affects the lungs. The WHO⁴ (2016, 2017), estimated that 10.4 million people fell ill with TB and 1.4 million died from TB in 2015, while in 2019 the estimated figure was 10 million people fell ill with tuberculosis (TB) worldwide. 5.6 million men, 3.2 million women and 1.2 million children and 1.4 million people died from tuberculosis (WHO 2020), making it a leading cause of death worldwide, causing more deaths than human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS). Tuberculosis is the leading cause of death of people with HIV and also a major contributor to antimicrobial resistance. As per the WHO (2020) report, of the 1.4 million dead people from tuberculosis, 208.000 had HIV. However, there's some progress with an average 2% reduction per year between 2015 and 2019, although not as envisaged (9% instead of the goal of 20% reduction by 2020). It's worth stating that as per WHO (2020), between 2000 and 2019, an estimated 60 million lives were saved through tuberculosis diagnosis and treatment.

As WHO (2020) reports, tuberculosis is mainly found in poor countries (87% of the cases is in 30 countries and 66% in just 8 countries (from worst to less bad position for tuberculosis: India, Indonesia, China, the Philippines, Pakistan, Nigeria, Bangladesh and South Africa) and in general more than 95% of cases and deaths are in developing countries).

According to ECDC⁵ (2018), when people with infectious tuberculosis (TB) cough, sneeze or otherwise exhale droplets, they expose others to *Mycobacterium tuberculosis*.

Exposure to *M. tuberculosis* may result in latent tuberculosis infection (LTBI), a state in which the host immune system controls the replication of the bacillus to the extent that progression to TB disease is prevented (van Kessel et al. 2018). According to Getahun et al. (2015, as cited in van Kessel, Oordt-Speets and Noordegraaf-Schouten 2018), persons with LTBI do not have any symptoms and cannot spread the infection to others. LTBI may progress to TB disease, especially if the immune system is compromised (Lillabaek et al. 2002; Barry et al. 2009, as cited in van Kessel, Oordt-Speets and Noordegraaf-Schouten 2018). “*People with LTBI represent a large human reservoir for TB, which is why management of LTBI is a crucial step towards TB elimination*” (ECDC 2018).

According to ECDC (2018), around 60.000 cases of TB are reported annually in the European Union/European Economic Area (EU/EEA),⁶ with most countries in the region characterised by low incidence of the disease (fewer than ten tuberculosis cases per 100.000 population). According to a recent estimate published in PLoS

⁴ WHO: World Health Organisation.

⁵ ECDC: European Centre for Disease Prevention.

⁶ According to the ECDC data of 2018 (reported in November 2020) the cases of tuberculosis (TB) in 2018 in EU/EEA were in total 52,862 (ECDC, 2020a, b, c, d, e).

Medicine 1.7 billion people globally have LTBI—almost a quarter of the world’s population. In low incidence countries, a majority of TB cases occur due to the progression of LTBI from passive to active disease. This is why it is crucial to improve management of LTBI in Europe.

ECDC (2020a) reported the geographical distribution of the tuberculosis cases in 2018 in EU/EEA and the rates per 100,000 inhabitants, age standardised rates and confirmed cases as follows (Table 1).

The data show that the confirmed cases in 2018, in Bulgaria were 618 and in Greece, 225.

A Notification rate map of EU/EEA by ECDC (2020a) presented the situation virtually (Fig. 1).

The TB distribution by age and gender, according to the ECDC (2020a) is in Fig. 2

From the diagram it is realised that boys and girls until the age of 14 have similar rates, while then boys and men on average, have near double rates compared to girls and women.

The latest available data for Greece, as per the survey of WHO (2019), ECDC (2019), lead to the following results (Table 2 and Figs. 3, 4, 5 and 6).

Measles

Measles is one of the world’s most contagious diseases, caused by a virus in the paramyxovirus family and it is normally passed through direct contact and through the air. The virus infects the respiratory tract, then spreads throughout the body. The measles virus was identified in 1954 and a vaccine was introduced in 1963. According to data from WHO (2019), between 2000 and 2018, global measles deaths decreased by 73%, and 23 million deaths were prevented due to vaccination. Before the introduction of measles vaccine in 1963 and the vaccination campaign, according to WHO (2019), major epidemics were occurring every 2–3 years and measles was causing an estimated 2.6 million deaths every year. In 2018, more than 140,000 people died due to measles, mainly children under the age of 5, according to WHO (2019).

As reported by the ECDC (2020b), Bulgaria (along with Romania) is in less favourable situation for measles in EU/EEA, while Greece is in a better position (Fig. 7).

The above is presented in detail in monthly figures for the period of November 2019–October 2020, by the ECDC (2020b) (Table 3).

The distribution of Measles per country in the EU/EEA countries in 2019 is presented below (ECDC 2020d) (Fig. 8).

The distribution of Measles as per age group is provided below, as per the ECDC (2020c) (Fig. 9).

The distribution of Measles per age and gender group is provided below, as per the ECDC (2020d) (Fig. 10).

It can be assessed from the data, that in general boys, are more vulnerable than girls in measles and the most critical age is under 1 year old, then between 1 and 4.

The evolution of cases in EU/EEA countries and notification rates per 1,000,000 population by country, in 2015–2019, as reported by ECDC (2020d) (Table 4).

Table 1 Distribution of tuberculosis cases and rates per 100,000 population by country, EU/EEA 2014–2018 (ECDC 2020a)

Country	2014		2015		2016		2017		2018		Confirmed cases
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	
Austria	586	6.9	583	6.8	634	7.3	569	6.5	482	5.5	365
Belgium	949	8.5	977	8.7	1042	9.2	967	8.5	981	8.6	730
Bulgaria	1872	25.8	1660	23.0	1603	22.4	1463	20.6	1358	19.3	618
Croatia	499	11.7	488	11.5	464	11.1	378	9.1	372	9.1	325
Cyprus	41	4.8	63	7.4	60	7.1	53	6.2	52	6.0	40
Czechia	511	4.9	517	4.9	516	4.9	501	4.7	444	4.2	361
Denmark	320	5.7	357	6.3	330	5.8	275	4.8	291	5.0	221
Estonia	248	18.8	217	16.5	192	14.6	175	13.3	147	11.1	125
Finland	263	4.8	272	5.0	233	4.2	246	4.5	230	4.2	194
France	4888	7.4	4744	7.1	5735	8.6	5005	7.5	5092	7.6	2234
Germany	4524	5.6	5837	7.2	5926	7.2	5495	6.7	5429	6.6	4127
Greece	519	4.7	482	4.4	440	4.1	467	4.3	432	4.0	225
Hungary	851	8.6	906	9.2	786	8.0	685	7.0	640	6.5	367
Iceland	9	2.8	7	2.1	6	1.8	14	4.1	8	2.3	2
Ireland	311	6.7	283	6.1	315	6.7	305	6.4	314	6.5	228
Italy	3916	6.4	3769	6.2	4032	6.6	3944	6.5	3912	6.5	2728
Latvia	761	38.0	721	36.3	660	33.5	552	28.3	NR	NR	NR
Liechtenstein	1	2.7	2	5.4	2	5.3	1	2.6	1	2.6	1
Lithuania	1607	54.6	1507	51.6	1442	49.9	1387	48.7	1142	40.7	992
Luxembourg	24	4.4	30	5.3	29	5.0	32	5.4	42	7.0	35

(continued)

Table 1 (continued)

Country	2014			2015			2016			2017			2018		
	Reported cases	Rate	Confirmed cases	Reported cases	Rate	Confirmed cases	Reported cases	Rate	Confirmed cases	Reported cases	Rate	Confirmed cases	Reported cases	Rate	Confirmed cases
Malta	46	10.7	34	32	7.3	50	42	11.1	55	9.1	34	11.6	55	11.6	34
Netherlands	814	4.8	560	862	5.1	887	783	5.2	806	4.6	560	4.7	806	4.7	560
Norway	323	6.3	170	313	6.1	295	261	5.7	209	5.0	170	3.9	209	3.9	170
Poland	6698	17.6	4075	6430	16.9	6444	5787	17.0	5487	15.2	4075	14.4	5487	14.4	4075
Portugal	2278	21.8	1527	2196	21.2	1936	1800	18.7	2137	17.5	1527	20.8	2137	20.8	1527
Romania	15,879	79.6	8720	15,183	76.4	13,601	12,997	68.8	12,205	66.2	8720	62.5	12,205	62.5	8720
Slovakia	336	6.2	146	317	5.8	296	249	5.5	281	4.6	146	5.2	281	5.2	146
Slovenia	144	7.0	92	130	6.3	118	112	5.7	99	5.4	92	4.8	99	4.8	92
Spain	4913	10.6	3250	5020	10.8	5070	5690	10.9	4648	12.2	3250	10.0	4648	10.0	3250
Sweden	659	6.8	408	815	8.4	714	519	7.2	491	5.2	408	4.9	491	4.9	408
UK	7030	10.9	3147	6229	9.6	6117	5537	9.4	5075	8.4	3147	7.7	5075	7.7	3147
EU/EEA	61,820	12.1	36,047	60,949	11.9	59,975	56,291	11.6	52,862	10.9	36,047	10.2	52,862	10.2	36,047

ASR: Age-standardised rate

NR: No data reported

Confirmed cases are based on the EU case definition: culture-positive OR microscopy-positive and nucleic acid amplification test-positive

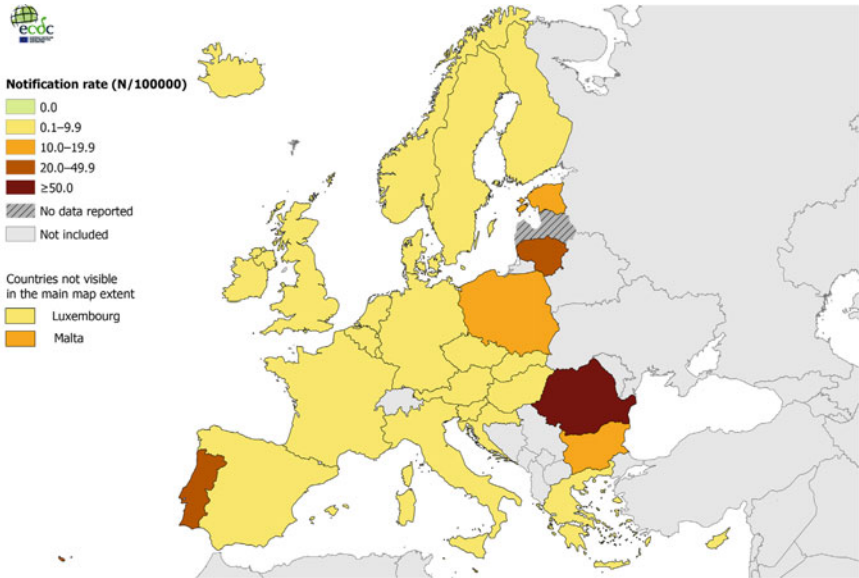


Fig. 1 TB distribution: cases per 100,000 population by country, EU/EEA 2018 (ECDC 2020a)

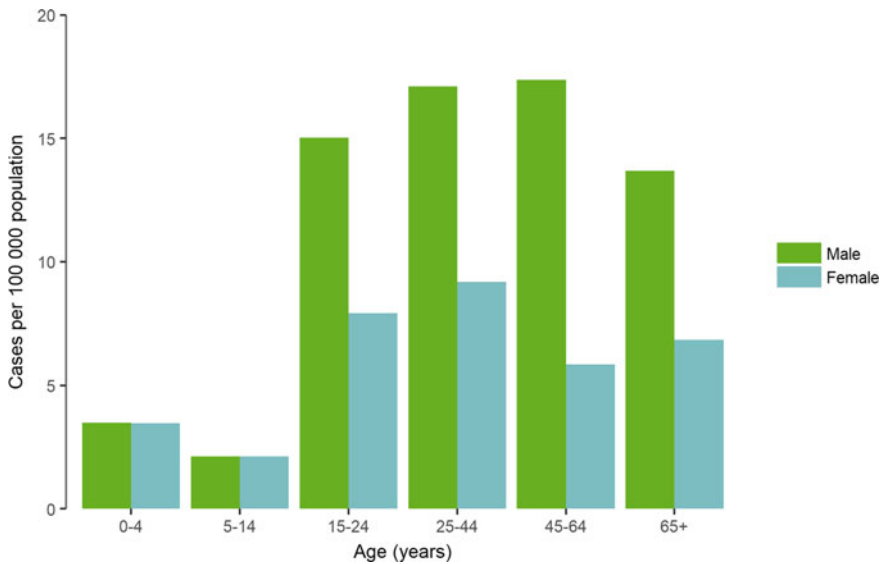


Fig. 2 Distribution of TB cases/100,000 population, by age and gender, EU/EEA, 2018 (ECDC 2020a)

Table 2 TB cases in Greece, 2017 (ECDC 2019)

TB case notifications, 2017			Drug resistance surveillance and TB/HIV coinfection, 2017		
Total number of cases	467		Completeness of DRS data ^b	Yes	
Notification rate per 100 000	4.3		Completeness of HIV data ^c	Yes	
New ^a and relapses	434		Case-linked data reporting	Yes	
			Cases with DST results	191	(72.1%)
			Estimated RR-TB among notified pulmonary cases N (best–low–high)	10–0–24	
New ^a and relapses notification rate per 100,000	4.0		Pulmonary MDR-TB cases notified	6	(3.6%)
			of which XDR-TB cases	1	(16.7%)
			Notified MDR-TB	7	(3.7%)
			of which XDR-TB cases	2	(28.6%)
Pulmonary of which microscopy-positive of which laboratory-confirmed	391	(83.7%)	TB cases tested for HIV	389	(83.3%)
	227	(58.1%)	HIV-positive TB cases of these on ART	13	(3.3%)
	233	(59.6%)		–	–
Laboratory-confirmed TB cases	265	(56.7%)			
Mean age of new native TB cases	62.8 years				
Mean age of new foreign TB cases	34.7 years				
Foreign origin of all TB cases	197	(42.2%)			
New (not previously treated)	414	(88.7%)			

^aCases with unknown previous treatment included in new cases

^bNational coverage 100% or culturing \geq 90%, C+/all TB cases >50%, DST done for C+ >75%, EQA \geq 95%

^cMore than 50% of TB cases with reported HIV status

The measles deaths in EU/EEA countries and the UK are as follows, as reported by the ECDC (2020e) (Fig. 11).

From the data above, it can be assumed that the disease is treated to eliminate measles deaths (there's a very limited number of deaths in Bulgaria).

In Greece, in the years 2017 and 2018 there was an epidemic of measles. According to the EODY⁷ (2020), in 2019 there were 45 measles cases recorded. The infected were mainly Greeks (28 cases/62.2%), mainly adults with a recent travel in countries

⁷ EODY: National Organisation for Public Health.

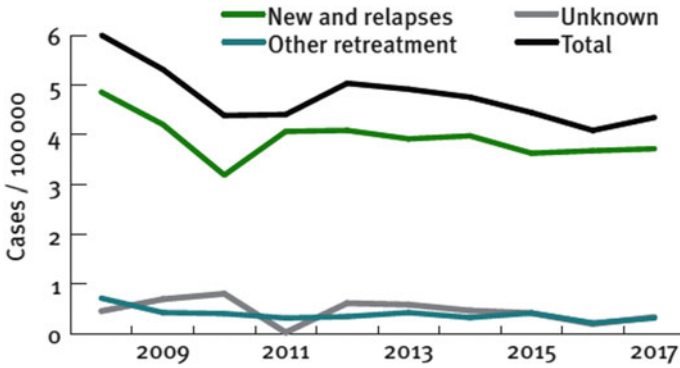


Fig. 3 TB notification rates by treatment history, 2008–2017 (ECDC 2019)

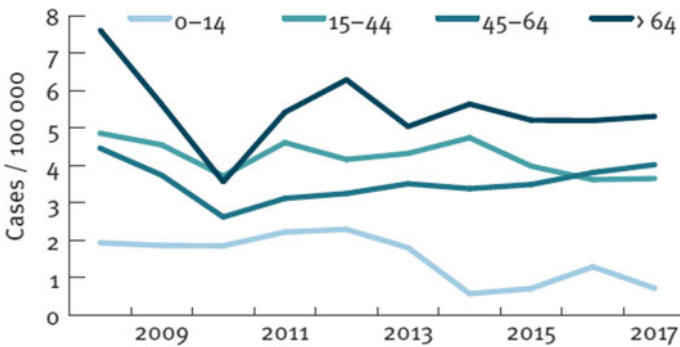


Fig. 4 New and relapsed TB cases—notification rates by age group (ECDC 2019)

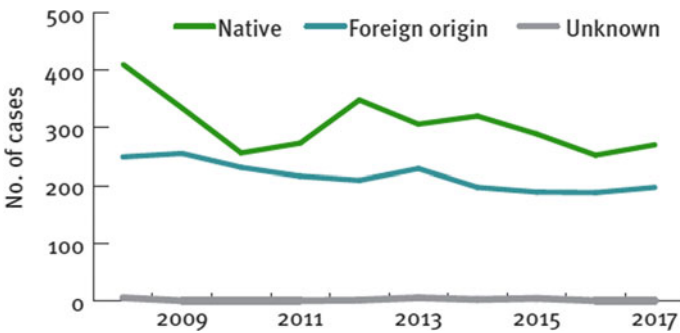


Fig. 5 TB cases by origin 2008–2017 (ECDC 2019)

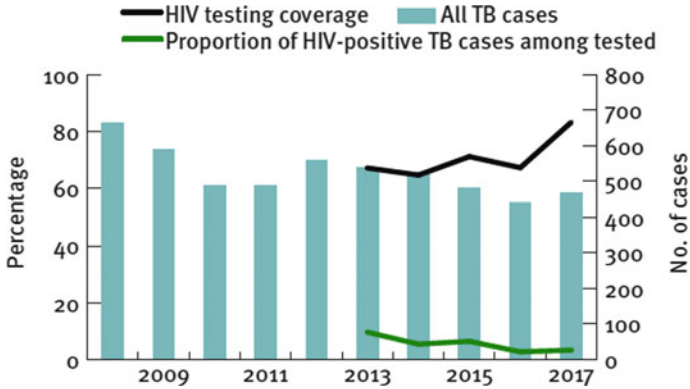


Fig. 6 TB/HIV coinfection 2008–2017 (ECDC 2019)

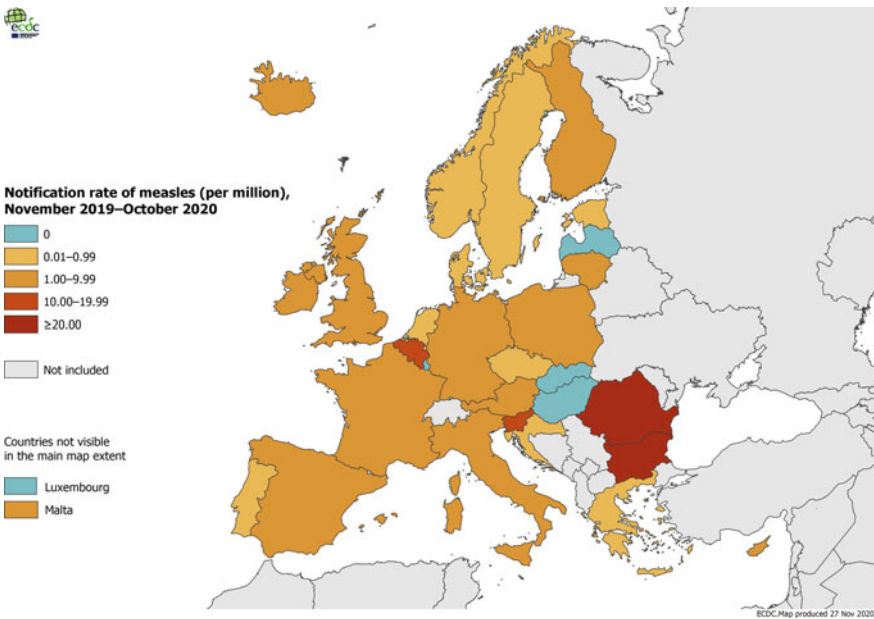


Fig. 7 Measles notification rate per million population by country, EU/EEA and the UK, November 2019–October 2020 (ECDC 2020b)

with high rates and children of Roma communities (11 cases/24.4%) and some non-Greek nationality people (17 cases/37.8%, of which 9 were of Albanian Roma). Regarding the age rate, 22 out of 45 (48.9%) were children of 0–14 years of age (9 cases at the age range 10–14 years of age). 10 of the 11 cases in Greek Roma (90.9%) were children 0–14 years old and mainly 10–14 years old (4 out of 11 cases/36.4%). The vast majority of the non-Roma infected Greeks was adults over 25 years old

Table 3 Number of measles cases by month and notification rate per million population by country, EU/EEA and the UK, November 2019–October 2020 (ECDC 2020b)

Country	2019	2019	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	Total cases	Cases per million	Total lab-positive cases
	November	December	January	February	March	April	May	June	July	August	September	October	October	October	October	October	October	October			
Austria	2	3	2	7	16	0	0	0	0	0	0	0	0	0	0	0	0	0	30	3.39	25
Belgium	34	22	32	15	2	3	0	1	4	2	2	2	2	2	2	2	2	3	120	10.48	41
Bulgaria	21	34	81	82	69	23	2	0	0	0	0	0	0	0	0	0	0	0	312	44.57	289
Croatia	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.25	1
Cyprus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.14	1
Czechia	4	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8	0.75	7
Denmark	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.69	4
Estonia	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.75	1
Finland	2	2	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	9	1.63	9
France	49	40	86	76	61	3	1	0	0	1	0	0	0	0	0	0	0	2	319	4.76	210
Germany	6	6	17	29	23	5	0	0	0	0	0	0	0	0	0	0	0	0	86	1.04	64
Greece	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.37	4
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Iceland	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.80	1
Ireland	7	3	1	12	4	1	0	0	1	1	1	1	1	1	1	1	1	2	33	6.73	4
Italy	10	12	52	41	9	0	0	0	0	0	0	0	0	0	0	0	0	0	124	2.05	100
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Lithuania	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1.43	4

(continued)

Table 3 (continued)

Country	2019		2020		2020		2020		2020		2020		Total cases	Cases per million	Total lab-positive cases
	November	December	January	February	March	April	May	June	July	August	September	October			
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Malta	1	0	0	2	0	0	0	0	0	0	0	0	3	6.08	3
Netherlands	4	0	1	1	0	0	0	0	0	0	0	0	6	0.35	6
Norway	0	0	3	1	0	0	0	0	0	0	0	0	4	0.75	4
Poland	2	8	6	10	9	1	1	1	0	0	1	0	39	1.03	20
Portugal	0	1	4	2	0	0	2	0	0	0	0	0	9	0.88	8
Romania	79	90	280	289	203	133	67	27	1	0	0	0	1169	60.21	601
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0
Slovenia	7	22	5	1	0	0	0	0	0	0	0	0	35	16.82	35
Spain	3	10	35	31	4	0	0	3	0	0	0	0	86	1.83	84
Sweden	0	0	2	3	0	0	0	0	0	0	0	0	5	0.49	5
UK	15	26	50	-	-	-	-	-	-	-	-	-	91	-	-
EU/EEA 30	250	282	665	-	-	-	-	-	-	-	-	-	1197	-	-
EU/EEA 29	235	256	615	608	402	170	73	33	6	4	4	7	2413	5.33	1531
UK	15	26	50	23	9	0	2	0	0	0	0	0	125	1.88	125

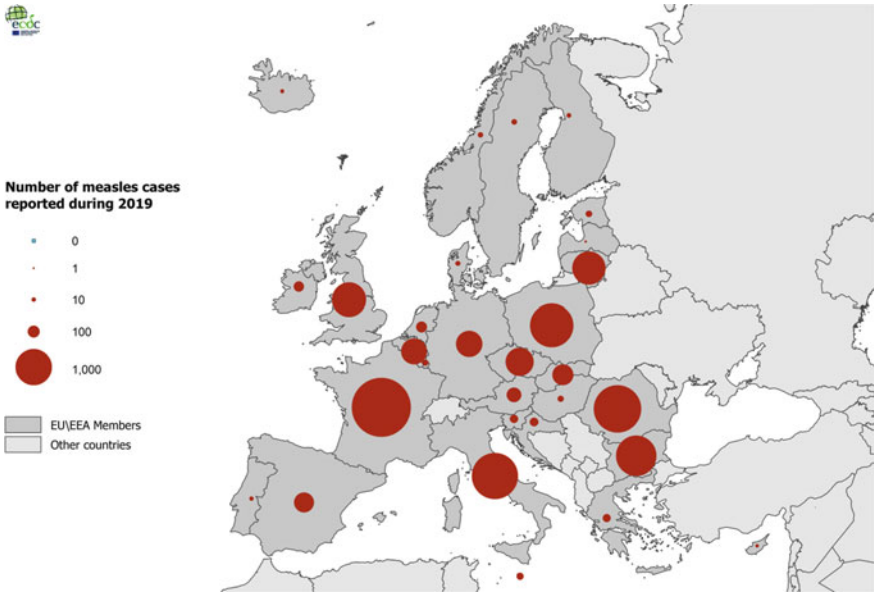


Fig. 8 Distribution of measles cases by country, EU/EEA 2019 (ECDC 2020d)

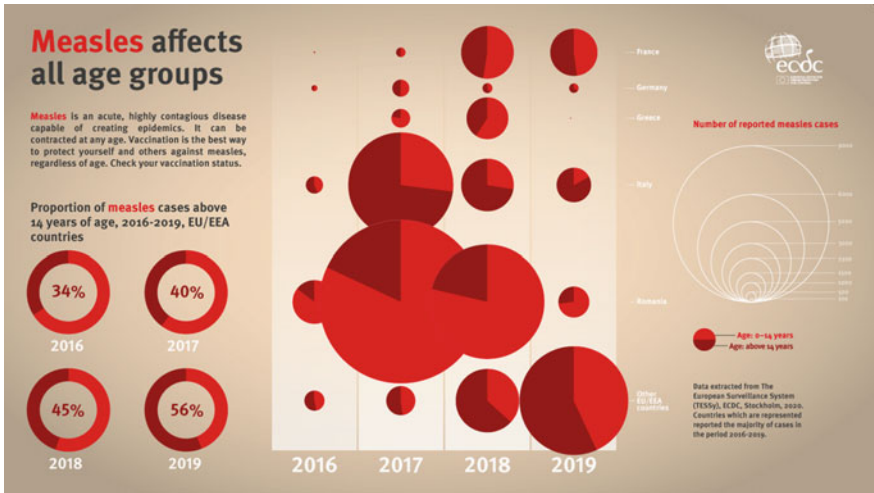


Fig. 9 Distribution of Measles as per age group, as per the ECDC (2020c)

(14 out of 17 cases/82.4%). Of the 45 measles cases in 2019, 30 (66.7%) were not vaccinated while 10 (22.2%) had a non-completed measles vaccination background. All cases were treated and healed, with 11 cases (24.4%) having also side effects, mainly pneumonia.

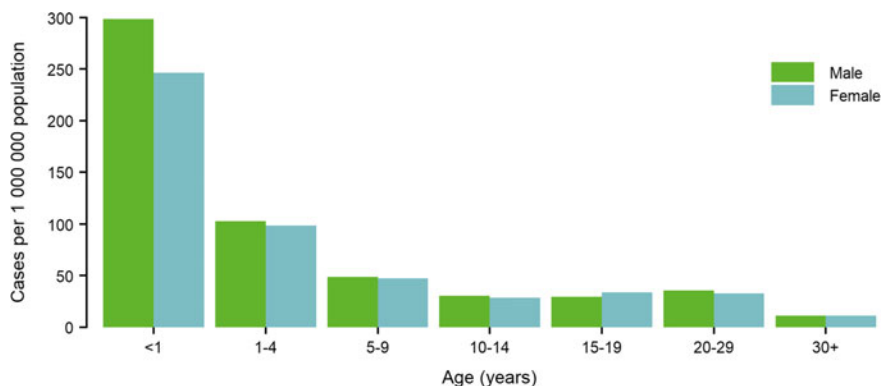


Fig. 10 Notification rates of measles, by age and gender, EU/EEA 2019 (ECDC 2020d)

The graph of the distribution (nationality/group of population/age) is given in Fig. 12.

The distribution per Region in Greece (2019) is provided in Fig. 13.

The epidemic monitoring of the disease and the on-time prevention measures (vaccination) are the recommended measures for the control of the disease. For that, it is a necessity to have the practitioners alerted and intense the vaccination and keep the local and national authorities watchful.

The Action Plan

The action plan of the Cross-Border public health network approaches: (a) prevention measures; (b) monitoring of the selected diseases; (c) improvement of the health status of the population in distant areas; (d) exchange of data and information and (e) advises and suggestions for future projects.

- (a) Prevention measures: Promotion to the population of the measures that prevent the diseases (the selected joint monitoring diseases of tuberculosis, measles and other contagious diseases such as brucellosis).
- (b) Monitoring of the selected diseases: Keeping records of the cases and statistics of the selected diseases in the Cross-Border area Greece-Bulgaria.
- (c) Improvement of the health status of the population in distant areas: Promotion of healthy living in the area of intervention, through good practices and examples and specific information campaigns, for the improvement of the lives of the local population.
- (d) Exchange of data and information: Exchange of collected data and analyses of the two sub-areas of intervention for the selected diseases and other contagious diseases, in order to eliminate the risks of spread and also about ideas for actions that enhance the health status at local level.
- (e) Advises and suggestions for future projects: Inception of ideas for new projects in the health sector, that could improve further the health status. Projects could be designed to be implemented either through national or transnational funding

Table 4 Distribution of measles cases and notification rates per 1 000 000 population by country, EU/EEA 2015–2019 (ECDC 2020d)

Country	2015		2016		2017		2018		2019		Confirmed cases	
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate		
Austria	309	36	27	3.1	95	10.8	77	8.7	151	17	17.6	140
Belgium	46	4.1	78	6.9	367	32.3	117	10.3	496	43.3	41.9	382
Bulgaria	0	0	1	0.1	165	23.2	13	1.8	1235	176.4	192.5	1119
Croatia	219	51.8	4	1	7	1.7	23	5.6	52	12.8	13	52
Cyprus	0	0	0	0	3	3.5	15	17.4	6	6.9	6.9	5
Czechia	9	0.9	7	0.7	146	13.8	207	19.5	590	55.4	55.4	511
Denmark	9	1.6	3	0.5	4	0.7	8	1.4	15	2.6	2.5	15
Estonia	4	3	2	1.5	1	0.8	10	7.6	27	20.4	20.6	26
Finland	2	0.4	4	0.7	10	1.8	15	2.7	12	2.2	2.2	12
France	364	5.5	79	1.2	518	7.8	2919	43.6	2636	39.3	37.7	1659
Germany	2466	30.4	326	4	929	11.3	543	6.6	514	6.2	6.5	405
Greece	1	0.1	0	0	967	89.8	2293	213.5	45	4.2	4.4	28
Hungary	0	0	0	0	36	3.7	14	1.4	23	2.4	2.3	23
Iceland	0	0	1	3	3	8.9	0	0	9	25.2	24	9
Ireland	2	0.4	43	9.1	25	5.2	77	15.9	74	15.1	13.3	42
Italy	256	4.2	861	14.2	5399	89.1	2686	44.4	1620	26.8	28.4	1427
Latvia	0	0	0	0	0	0	25	12.9	3	1.6	1.6	3
Liechtenstein	–	–	–	–	–	–	–	–	–	–	–	–
Lithuania	50	17.1	22	7.6	2	0.7	30	10.7	834	298.5	295.4	834
Luxembourg	0	0	0	0	4	6.8	4	6.6	25	40.7	40.8	25

(continued)

Table 4 (continued)

Country	2015		2016		2017		2018		2019		Confirmed cases	
	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate	Reported cases	Rate		
Malta	1	2.3	0	0	0	0	5	10.5	32	64.8	64.4	32
Netherlands	7	0.4	6	0.4	16	0.9	24	1.4	84	4.9	4.8	70
Norway	14	2.7	0	0	1	0.2	12	2.3	17	3.2	3.1	14
Poland	48	1.3	133	3.5	63	1.7	340	9	1423	37.5	18.1	951
Portugal	0	0	0	0	34	3.3	171	16.6	10	1	1	10
Romania	7	0.4	2432	123.1	9076	462	6398	327.6	1706	87.9	88.5	1270
Slovakia	0	0	0	0	6	1.1	565	103.8	319	58.5	57.3	273
Slovenia	18	8.7	1	0.5	8	3.9	9	4.4	48	23.1	23.4	48
Spain	55	1.2	38	0.8	157	3.4	226	4.8	292	6.2	6.6	276
Sweden	22	2.3	3	0.3	41	4.1	43	4.2	20	2	1.9	19
United Kingdom	92	1.4	571	8.7	280	4.3	953	14.4	882	13.2	12.5	881
EU/EEA	4001	7.8	4642	9	18,363	35.5	17,822	34.4	13,200	25.4	24.3	10,561



Fig. 11 Number of measles deaths by country, EU/EEA and the UK, November 2019–October 2020 (ECDC 2020e)

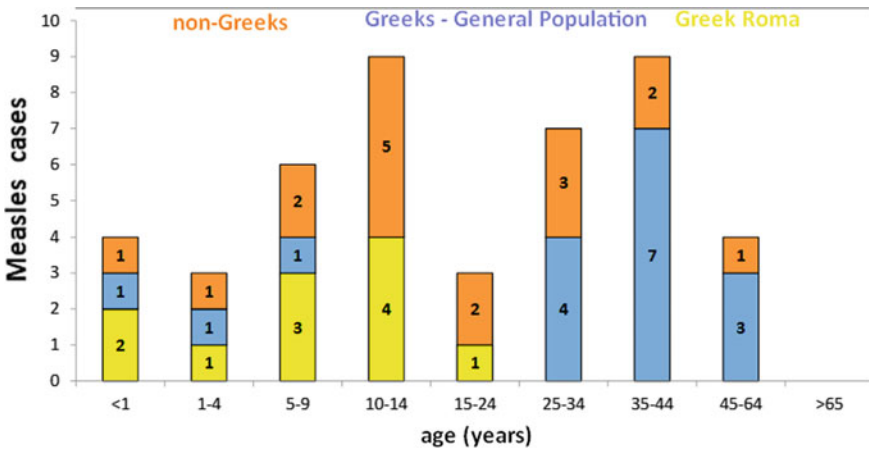


Fig. 12 Measles cases in Greece (2019), as per age/nationality and population group (EODY 2020)

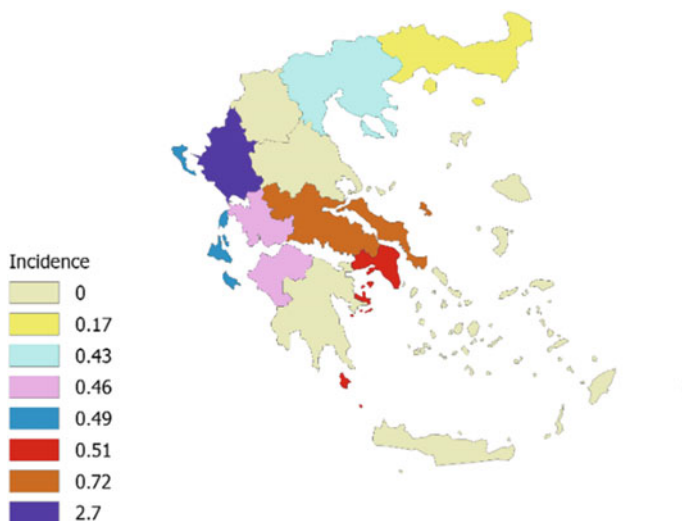


Fig. 13 Distribution per region of the measles cases in Greece (2019) (EODY 2020)

programmes, including approaches for interventions in either sub-areas or joint ones.

Selected Actions

See Table 5.

Communication of the Action Plan

The communication of the Joint CB Action Plan is considered as an important part of the Action Plan as it can sensitise the citizens on the important public health issues and also enhance the networking of the two project areas. Its main objective is to ensure extended dissemination of actions and results of the project to the stakeholders and the general public, including the priorities set in the Action Plan. The appropriate and extended publicity is of key importance to maximise the exploitation of the outputs during and after the life of the project and particularly the Action Plan and also for the capitalisation of the project and ultimate benefit for the stakeholders.

The target groups of the communication of the action plan are The Local Authorities; the Regional Authorities; the Health Authorities; Healthcare NGOs; Private Medical Units and Managing Authorities of Funding Programmes.

The criteria for the selection of the target groups are presented in Table 6.

Table 5 Selected actions

Action	Short description
A01. Joint monitoring of selected diseases	Monitoring and keeping data and statistics at local level and exchange of information with the Cross-Border network. The activity will be supplementary to the national plans for prevention of the contagious diseases and in compliance with the existing norms and national procedures
A02. Measures to prevent spread of the COVID-19	Taking measures at local level, additional and supportive to the ones at national level, to prevent the spread of the novel coronavirus. Such measures to include extra restrictions, support of the tracking system, contribution in the tests (through purchase of test items (rapid tests, PCR devices, etc.), equipment for disinfection of public spaces (entrances and offices of public buildings that people visit for various reasons), etc
A03. Epidemiological studies	Design and execution of research and studies at local level, for specific diseases and the evolution in time, at local level, in different times of the year, including the tourism season, etc. The actions would be implemented in cooperation with medical entities and organisations and/or medical universities
A04. Setting up hotline (s)	Setting up hotlines for people to communicate, in case of worrying or anxiety or lacking of information, when epidemics or pandemics occur. This is a critical point to be covered by the network partners as it is proven that the centralised ones (at national level) are usually insufficient
A05. Information Campaigns	Preparation of information campaigns for (a) healthy living; and (b) prevention of contagious diseases, including the selected ones for joint monitoring and others. The campaigns could include lectures by specialists (doctors, nutritionists, etc.), creation of communication material like thematic leaflets, etc. Especially for COVID-19, that includes a wide spread of information and the official scientific view, which prevents diffusion of myths and fake news
A06. Campaign on vaccination to prevent diseases	Promotion of the vaccination culture, for the mandatory and the non-mandatory vaccination. This is a critical action, especially in a period that through the use of social media, several sources promote the opposite, mostly based on non-real information they spread
A07. Telemedicine	Promotion of the telemedicine and use of purchased and other new (future) devices to enhance the level of health of the population, especially in distant areas
A08. Care at home	Improvement of the services provided to people in need (e.g. elderly or disabled people), through the relevant municipal services. Indicative: capacity building of the staff, increment of the number of staff, improved tools, more vehicles for the services, means of personal protection (for the staff), etc
A09. Advising on new projects	Contribution in the preparation of new projects, through national and Cross-Border funding programmes, as per the needs and priorities of the two sides of the borders

Table 6 The criteria for the selection of the target groups

The local authorities	The local authorities would have a clear and comprehensive picture of the action plan deployment at all stages They will be receiving feedback which would allow better decision-making and future planning Understand the high importance of the objectives of the Joint CB Action Plan Respond in time when needed Communicate and promote to the state authorities, health care issues of primary interest
The regional authorities	The regional authorities, would have a clear and comprehensive picture of the action plan deployment at all stages The progress of the deployment of the joint CB action plan will provide significant information for the design of the next intervention actions of the Regional Operational Programme and other Regional initiatives
The health authorities, in the cross-border areas	The Health Authorities would benefit from the feedback of the deployment of the action plan and could use the information provided for optimising specific aspects of their priorities
Healthcare NGOs	Receive information about the provided health services in the areas of intervention, the priorities of the joint cross-border action plan and its goals and achievements Get inspiration for the design of projects that would contribute to the improvement of the health care services provided in the area of intervention Get motivation for networking in the cross-border area
Private medical units	Receive information about the provided health services in the Cross-Border area, the priorities of the joint cross-border action plan and its goals and achievements Promote the idea of exchanging information on medical statistics, with respect to the medical confidentiality and GDPR rules Become aware of the new equipment in the local primary healthcare units in the area of intervention Get motivation for networking in the Cross-Border area
Managing authorities of funding programmes	Managing Authorities of Funding Programmes would have a clear picture of the achievements and the contribution to the programme objectives and indicators The deployment of the joint action plan would provide significant information for the specialisation of the respective Investment Priorities of the funding programmes

Indicators of Achievements of the Action Plan

Below are provided the selected indicators to be measured, in order to assess the progress of the Joint Cross-Border Action Plan:

- I1—Number of Meetings of the JCBAC;
- I2—Number of Notices of annual activities;
- I3—Number of proposals and suggestions for improvement of the primary health sector;
- I—Number of new health projects (national, Cross-Border);

Table 7 Target values cumulative for every following year

Indicator	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
I1	2	4	6	8	10	12	14
I2	1	2	3	4	5	6	7
I3	2	4	8	10	10	10	12
I4	2	2	3	4	4	5	5
I5	2	4	7	10	12	14	16
I6	1	1	2	2	3	3	3
I7	2	3	4	4	5	5	6

- I5—Number of informational campaigns;
- I6—Number of epidemiological studies;
- I7—Number of staff (a) medical; (b) paramedics; (c) other health-social services; (d) administration in health-social services.

The target values are presented in the following Table 7 (cumulative for every following year).

Follow Up and Assessment

The Joint Action Plan and the JCBAC will be monitored, motivated and supported by the Principles of the partners of the network, in order to add further value to the primary health sector in the Cross-Border area. Furthermore, it is expected that the JCBAC will contribute significantly to the preparation of future projects to enhance the primary Health and eHealth capacity in the area.

The progress of the action plan will be monitored and assessed in order to make corrections or adjustments (if needed) due to new issues and data, etc. The assessment will be

- Internal by executives appointed by the partners of the network on annual basis;
- by the JCBAC which will assess from its point of view on a biannual basis and
- by external experts on annual basis. It is advisable that the assessment would cover the achievement of the indicators, the specific actions performed and their qualitative characteristics.

5 Conclusions

The convergence of partners from different countries, that have different health systems, as documented in the literature, to common texts and sets of actions and measurable indicators, is already an achievement, strengthened the collaboration capabilities and should be exploited further, stimulate extension of the cooperation and also promote the model of collaboration for transfer to other cross-border areas.

The Joint Cross-Border Action Plan was prepared through a procedure of cooperation of the stakeholders of public health of the two sides of the borders of Greece and Bulgaria. The complementarity of the stakeholders was a key factor for successful performance. Other success factors were the good communication, the participatory approach and the simplicity of the procedure. At its start, it selected to monitor on two serious contagious diseases, tuberculosis and measles, which were prioritised based on data of the last years and due to the seriousness of the infections.

The willingness of the partners of the network, and the directly involved executives and medical staff to take advantage of the project and the networking, for improvement of the health conditions in the area of intervention, will be the driving force for further positive impact on the local communities, especially the distant villages. That has already been proven to be true with the quick response of the network partners, in the COVID-19 pandemic that led to adjustments of the project to contribute to the fight to limit the spread of the novel coronavirus through its actions A08 with vaccination at home and A09 with adjustment to support the fight on the COVID-19 pandemic.

The JCBAC, guided by experts and decision makers, can be proven to be a precious asset for the network partners and contribute to the preparation of activities and investments that will have positive impact on the local communities.

The network of the Cross-Border partners will be exchanging information and collected data through the implementation of the action plan, that could prevent hazards of the spread of contagious diseases and enhance the public health status in the area.

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Meta Covid Era: Impact of COVID-19 on the Global Economy and Ecosystems and Opportunities for Circular Economy Strategies



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Abstract The provenance of COVID-19 across the world has continued to render severe consequence to both the economy, people and the environment. This literature review study sought to assess the general impact of COVID-19 on the different systems and the worldwide economy as well as establishing different opportunities for CE. This review revalued that the pandemic had both positive and negative influences on the macro and micro economic elements of the global economy. With most businesses closed, the economies in most countries were greatly affected. However despite the challenges associated with economic sustainability during Covid-19, the different ecosystems did not to some extent get affected since there were limited extreme threat to render a big threat on the natural environment. This review confirms that strategic economic growth model based on the different aspects of a Circular Economy that can help to revamp most economies and consequently ensure sustainability of ecosystems across the world. This paper provides different sector-specific recommendations on CE-related solutions as a major catalyst for global economic growth and development in a resilient post-COVID-19 world, based on evidence supporting CE as a great tool for balancing the complex equation of achieving profit with minimal environmental harms or consequences.

Keywords Rcular economy · COVID-19. Ecosystems · Global economy

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1 Background to the Study

COVID-19 was labeled a global pandemic by the Globe Health Organization on March 11 2020, and its impacts are still being felt throughout the world (Sabila et al. 2021). Patients first appeared in China and quickly spread over the globe, prompting foreign governments to take severe measures to isolate cases and halt the virus's spread. On the other hand, these policies have shattered the primary pillars of today's international economy, as global trade and cooperation have given way to a nationalist focus and a competition for finite resources. In light of this, this article provides a critical evaluation of the pandemic's negative and positive consequences, as well as recommendations for how the epidemic might be utilized to steer the economy toward a more resilient, low-carbon future (Mehran et al. 2021).

The fundamental goal, according to Ibn-Mohammed et al. (2021), is to address COVID-19's public health consequences. When governments throughout the world offer stimulus packages to help with recovery efforts, the nature of the equally vital economic recovery operations necessitates several key considerations. Should these packages be geared at supporting economic recovery and growth by resuming business as usual, or towards constructing a more resilient low-carbon CE? To address this problem, this study examines the relationship between COVID-19 and CE approaches, relying on current literature on COVID-19's public health, economical, and environmental effects (Tuerk and Sporysheva 2022).

COVID-19, like other economic sectors, has shown problems in business-as-usual practices in the built and natural environment leading to various low-quality buildings, affordability issues, and the rigidity of current building stocks (Ellen MacArthur Foundation 2020; Schröder and Raes 2021). Living in inadequate housing and small, inefficient houses led in viral transmission inside the family in other cases. This is particularly true in underdeveloped countries, where people have been unable to follow the best practices for preventing the spread of the disease owing to a lack of sanitary facilities. These challenges, together with growing concern and awareness about the sector's resource-wasteful nature, provide a strong case for reconsideration. The CE is in an excellent position to address these concerns (Abdul et al. 2021).

Ibn-mohammed et al. (2020) indicates that CE is effective in enabling a balance between the behavioral issues and opportunities of a country. Humans spend up to 90% of their time inside. As a consequence of the epidemic, people are spending more time at 'home' than at work, resulting in vastly underused office and company facilities, which are likely to rise as a result of continued social distance constraints or potentially as more firms discover the cost benefits of remote working. Insufficient ventilation in healthcare institutions, especially temporary hospitals, might increase the risk of infection for healthcare workers and vulnerable patients (Alvarez-risco et al. 2021; Arisman n.d.; Nikam and Nguyen 2021).

The impact of social distancing measures, which may demand a reduction in occupant density but an increase in ventilation rates, on the energy consumption of traditional buildings and healthcare facilities must be assessed. Despite the fact that energy recovery is a top goal for CE in the built environment, the requirement for

more mechanical ventilation for fewer people will increase the amount of energy used by buildings (Mcelwee et al. 2020; WHO 2018). Mechanical ventilation systems, according to some academicians, should not utilize recirculation and should instead use 100% fresh outside air. The existing global economic development paradigm, which is characterized by a linear economy system and supported by financial gains and power industrial operations, should be re-calibrated and rethought in favor of CE (Schröder and Raes 2021; Vetrova and Ivanova 2022). The article reviews the different literature in regard to the effect of COVID-19 on the world economy and ecosystems, as well as potential for different circular economy strategies.

1.1 Objectives of the Study

The major objective of the study is to analyze the impact COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies.

The study is also based in the following specific objectives;

- To assess the positive and negative effects of Covid-19 on global economies
- To determine the positive and negative effects of Covid-19 on the environment
- To establish ways through which the world can leverage the positive and negative effects of COVID-19 to build a new, more resilient and low-carbon economy
- To establish the role of a circular economy framework in the post-Covid-19 financial recovery across the world

1.2 Significance

This literature review study contributes to the scarce knowledge concerning the impact of COVID-19 on different ecosystems, global economy and the entire Circular economy cross the world. The findings will be utilized for future studies in the same area of study.

2 Methods

The study used a secondary research approach, in which a literature search was undertaken to find different studies or data that may aid in answering the study's many research questions. This research primarily used archival data, which included journal articles, documented news in the media, expert reports, government and relevant stakeholders' policy documents, accepted for publication expert interviews, and policy feedback literature, all of which are relevant to the world economy and ecosystems, as well as opportunities for circular economy strategies. The researcher focused on several practical ways of literary works searching utilizing appropriate keywords

related to this work, such as COVID-19 impact (positive and negative), circular economy, economic resilience, sustainable development, supply chain resilience, climate change, and so on, in order to find relevant archival data. After discovering articles and pertinent papers, the contents were assessed to determine which ones should be included and which should be excluded based on their relevance to the topic under research.

3 Results

3.1 Effective Policy Frameworks to Address COVID-19

During the pandemic's escalating severity and longevity, when resources were tight, several countries' approaches and strategies for dealing with COVID-19 altered. It's worth mentioning that COVID-19 harmed China, the United States, Korea, Japan, France, Italy, and the United Kingdom, which together account for 65% of world production and exports (UNCTAD 2021; United Nations 2020b). Given the degree of lack of preparedness and lack of resilience of hospitals, various policy emphases have gone into buying healthcare supplies such as personal protective equipment (PPE) and ventilators, due to international shortages (Temjanovski n.d.). Frameworks for rationing ventilators as well as bed spaces must be created in order to optimize the utilization of ventilators. Disruptions to operations and global commodity prices have affected other industries, such as CE-sensitive materials extraction and mining, producing shocks to their existence, productivity, and profitability (One Planet 2020; Shulla et al. 2021).

Abdul et al. (2021) indicates that unplanned buying, which happens as a consequence of national and individual uncertainty, is one of the psychological repercussions of COVID-19, as explained in the following sections. In both incidents, the current supply chain paradigm's instability, greed, and unsustainable nature have been emphasized. Given its obvious faults in dealing with key commodities, Abdul et al. (2021) questioned whether the world economy could afford to resort to the (JIT) supply chain structure advocated by the healthcare sector.

3.2 COVID-19 on the Global Macro Economy

Existing best practices in countries like the United States do not encourage the hoarding of critical medical equipment, which is a source of worry for the healthcare industry (ILO 2020; Nikam and Nguyen 2021; Vetrova and Ivanova 2022). Despite having vast funds, numerous governments were obliged to take extraordinary measures to protect their supply chains, prompting Ford and Dyson to join the ventilator design/production business (United Nations 2020b; Vetrova and Ivanova

2022). Hospitals and suppliers in the United States were compelled to enter the global market due to a recurrent lack of N95 masks and the necessity to obtain lower-cost equipment (United Nations 2020a). The production of these specialist masks is said to be dominated by China, which is where COVID-19 originally appeared, with Malaysia and Japan providing the majority of the EU's supply. The shortage was so acute that the US was accused of 'pirating' medical supplies intended for EU countries from Asian countries (Anbumozhi 2021; Guenther et al. 2021).

Tran and Nguyen (2021) indicates that global cooperation and scenario planning will always be necessary to complement these technologies. When states protested that federal authority was being exploited to interfere with orders, the EU designed a cooperative procurement framework to reduce competition among member states, while the US launched a ventilator exchange program. Even with trade agreements and cooperation frameworks in place, the global supply chain for crucial healthcare equipment cannot depend on imports—or contributions—and this awareness opens the door to manufacturing localization, which has beneficial environmental and social ramifications. This may be shown in the case of N95 masks, which became so popular overnight that private and commercial planes were used to transport them instead of traditional container shipping (Taherzadeh 2022; Vetrova and Ivanova 2022; WHO 2018).

Despite a significant reduction in emissions related with traditional shipping, there was a spike in the use of airfreighting due to despair and urgency of demand. Nonetheless, many countries are being pushed to rethink their global value chains as a result of the COVID-19 outbreak (OECD 2021). This is due in part to national interests and protectionism emerging from the COVID-19 outbreak, as well as the fact that numerous eastern European or different Mediterranean countries have a competitive advantage over Chinese products (Alvarez-risco et al. 2021; Mcelwee et al. 2020; Kalogiannidis et al 2022a–c).

3.3 Covid-19 on the Micro-Economy

The microeconomy is mostly focused with distinct people's consumption behavior. A disconnect between consumerist wants and biophysical reality has existed for a long time. COVID-19, on the other hand, has emphasized the need of considering the social implications of individual decisions. At one point, consumer behavior in many countries was alarmist, with a lot of panic buying of food and sanitary goods (Amato 2022; Shulla et al. 2021). On a personal level, consumer opinion is evolving as well. As a consequence of challenging access to goods and services, citizens have been forced to reconsider their purchasing patterns and needs, with a focus on the most critical necessities. Alvarez-risco et al. (2021) argued that the linear market model, which anticipates a four-year average life for mobile phones supposing that manufacturing and repair services are constrained by financial shutdowns and lockdowns, is likely to be affected by product obsolescence of new products caused by rapid

innovation and individual consumerism (Kalogiannidis et al. 2021; Kontogiorgos et al. 2017a, b).

Patenting, on the other hand, is an issue in a profession like healthcare, where mass production and use of crucial equipment might be profitable (Mcelwee et al. 2020; One Planet 2020). To put matters in perspective, COVID-19 indicated that many countries' PPE manufacturing capacity is limited, with some countries having to ration facemask production and distribution in the industry. Unsurprisingly, the DIY facemask industry has increased in significance not just for large-group safety, but also for controlling shortages and as part of a post-lockdown escape strategy (United Nations 2020a; Kalogiannidis 2021).

Nikam and Nguyen (2021) indicates that a rebirth of cottage industry manufacture of equipment and basic but necessary items like facemasks might have a long-term impact on global production, most likely resulting in a decline in consumerist impulses. Given the high likelihood that companies will take short-term views and cancel long- and medium-term R&D in favor of short-term product development and immediate cash flow or profit, as has been the case in the automotive and aerospace sectors during recession periods, this pandemic will have an impact on R&D in the future (Shulla et al. 2021; Kontogeorgos et al. 2016).

3.4 Negative Macroeconomic Impact of COVID-19

Without a doubt, COVID-19 is a terrible pandemic and a human tragedy that has devastated the planet, resulting in a substantial health crisis, unbalanced social order, and enormous economic loss (Tuerk and Sporysheva 2022). It has had a major negative impact on the global economy, prompting governments, organizations, and individuals to seek answers. Indeed, the COVID-19 outbreak has thrown global operating assumptions off, revealing the dominant economic model's utter incapacity to respond to unanticipated shocks and crises (Arisman n.d.; Mcelwee et al. 2020). It has shown the weaknesses of over-centralization in complicated global supply and production chains networks, as well as the volatility of global economies and weak sectoral links (UNCTAD 2021).

The ensuing lockdown and border restrictions have had a direct impact on employment and raised the risk of food shortages for millions of people. The COVID-19 curve has flattened to some extent as a consequence of some of the interventional measures taken by governments throughout the world. Even while new instances are still being reported in different parts of the globe at the time of writing this paper, this has helped to prevent healthcare systems from being completely overburdened (Nikam and Nguyen 2021; Schröder and Raes 2021).

3.5 Positive Impact of COVID-19

This section explains the different areas where COVID-19 had a positive influence and these majorly included; improving air quality, and noise reeducation in the environment.

3.5.1 Air Quality Improvements

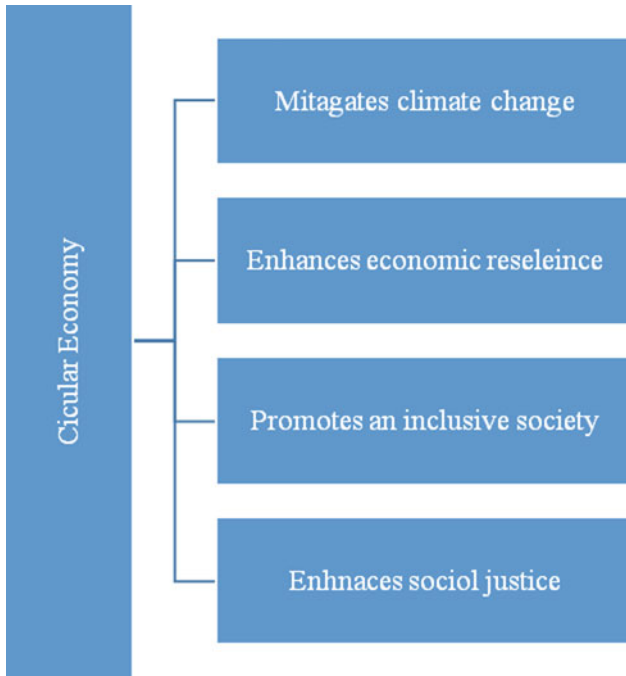
Al-muhannadi (2021) indicates that as a consequence of the COVID-19-induced lockdown, industrial activity has dropped, leading in significant reductions in air pollution from exhaust fumes from autos, power plants, and other sources of fuel combustion emissions in most cities throughout the globe, allowing for improved air quality. For example, China achieved a 20–30% reduction in air pollution, while India witnessed a 20-year low concentration of airborne particles; Rome, Milan, and Madrid saw a 45% reduction, with Paris witnessing a stunning 54% reduction (Alvarez-risco et al. 2021; Arisman n.d.).

It's worth noting that current lifestyles and a significant reliance on fossil transportation systems have serious environmental and, by extension, human health consequences. This pollution has resulted in an epidemic of respiratory disorders, coronary heart disease, lung cancer, asthma, and other illnesses, rendering many people more susceptible to the coronavirus's harmful effects (Amato 2022; Fonseca et al. n.d.; Shulla et al. 2021). Air pollution is a significant threat to human health and the environment. In the United Kingdom, long-term exposure to air pollution was linked to between 28,000 and 36,000 deaths each year. However, it has been reported that during the lockdown time, the reduction in air pollution and concomitant improvements in air quality saved more lives in China than COVID-19 had previously claimed (Jager 2020; Schröder and Raes 2021; Vetrova and Ivanova 2022).

3.5.2 Noise Reduction in the Environment

According to Muller (2020), environmental noise, most especially road traffic noise, is considered a very big environmental problem that is affecting the general health and well-being of millions of people across Europe. This is in addition to the impact if the environmental noise on lifestyles basics such as sleep disruption, general annoyance, and negative effects on the metabolic and cardiovascular systems, as well as cognitive impairment in children (Tuerk and Sporysheva 2022). Approximately 20% of Europe's population is subjected to long-term noise levels that are harmful to their health (Guenther et al. 2021).

3.6 The Role of Circular Economy



Jackson and Nelson (2021) indicate that for a long time, the industrial economy’s basic concept has been based on the classic linear economic system of extracting resources, manufacturing things from them, and disposing of product at the end of its useful life. Unrestricted exploitation of natural resources without regard for sustainability jeopardizes the planet’s resource supply’s elastic limit (Abdul et al. 2021). For example, 90% of the raw materials used in manufacturing become garbage before the finished product leaves the production facility, and 80% of produced items are discarded during the first 6 months of their existence (Abdul et al. 2021; Arisman n.d.). Similarly, Shulla et al. (2021) estimated that cities throughout the world create 1.3 billion tonnes of solid garbage each year, with a cost of approximately \$205.4 billion, and that this waste might expand to 2.2 billion tonnes by 2025, with a cost of \$375.5 billion (Ibn-mohammed et al. 2020).

The quest for an industrialized economic model that serves the various functions of decoupling economic development from resource usage, waste management, and wealth creation has heightened interest in circular economy ideas against this background (United Nations 2020a). The CE framework is based on three principles: reducing waste, preserving goods and resources, and renewing natural systems. CE focuses on prioritizing environmentally friendly manufacturing and recycling;

encouraging symbiotic collaboration between companies, consumers, and government to minimize inadvertent ecological deterioration; and promoting product repair (Taherzadeh 2022; Temjanovski n.d.).

Given the current COVID-19 epidemic, there has never been a better opportunity to think about how CE principles may be put into practice after the global economy recovers. This is significant because the pandemic has revealed the current dominant linear economy's limitations in terms of how it fails the planet and its inhabitants (Alvarez-risco et al. 2021). This is in addition to its impact on the global ecosystem's vulnerability to a variety of risks, such as climatic change breakdown, supply chain vulnerabilities and fragility, social inequality, and inherent brittleness (Taherzadeh 2022). The epidemic is highlighting humankind's worldwide interconnections as well as the interdependencies that exist across our natural environment, economic, and social systems (Government of Sweden 2020; Shulla et al. 2021).

3.6.1 Circular Economy in Climate Mitigation

Climate change mitigation measures are sometimes characterized as a "prohibition of the pleasant things of life," yet as demonstrated, a cut-off of such a large number of pleasurable things only results in an 8% decrease (Abdul et al. 2021; ILO 2020). International organizations and national environmental regulations have emphasized that a large reduction in GHG emissions cannot be accomplished alone by the use of renewable energy, but also with the use of CE methods (Ibn-mohammed et al. 2020; Schröder and Raes 2021). When CE principles such as Circular business models, and product material efficiency, are applied holistically, they provide realistic remedies to the bulk of the structural flaws identified by COVID-19, resulting in significant gains in competitiveness and long-term reductions in GHG emissions throughout value chains. Investments in climate-resilient infrastructure and the transition to a circular and low-carbon economy may create jobs while also benefiting the environment and economy (Anbumozhi 2021; Temjanovski n.d.).

3.6.2 Circular Economy in Social Justice and Inclusion

The introduction of the furlough plan in advanced countries has mostly focused on sustaining the buying power of families. Most emerging nations have taken a similar strategy, combining cost-cutting measures with a significant rise in social security expenditure. However, since the deployment of such techniques in advanced economies might damage impoverished nations and communities, these pandemic intervention strategies have highlighted social injustice and inequality between countries and communities (Abdul et al. 2021; WHO 2018).

According to Fonseca et al. (n.d.), different developing and underdeveloped economies face severe consequences than highly developed economies across the world, and this is majorly due to the fact that even if different social protection systems could fully replace income and also protect businesses from bankruptcy, it

may be difficult to enable sustainable access to essential commodities in such countries. It is important to note that most underdeveloped countries lack enough production capabilities and this makes it difficult for the general population to continuously access essential commodities in times of pandemics. Furthermore, in the developing world, working from home is very challenging owing to a lack of infrastructure, and access to health care is quite tough (Amato 2022; Shulla et al. 2021).

Shulla et al. (2021) said that CE has the potential to reduce current pressures and conflicts related to resource imbalances via the participatory forms of governance, which implies the engagement of local stakeholders in resource management projects. This may be accomplished by using CE strategies like as closed-loop value chains, in which wastes are converted into resources in order to minimize pollution while also assisting in the pursuit of social inclusion goals. This concept is already being used by a number of businesses. Another advantage of the CE as a facilitator of a socially equitable and inclusive society, according to Guenther et al. (2021), is that it is likely to be more labor-intensive because of the diversity of end-of-life goods and the high cost of automating their processing compared to manual work. As a result, CE can help create local employment and “reindustrialize” areas by substituting energy for manpower, materials for (local) labor, and local workshops for centralized factories, while also increasing the repair economy and local micro businesses (Muller 2020).

3.7 Barriers to CE in the Context of COVID-19

The first barrier are the different thermodynamic constraints and these may cut across the different material and energy combustion limits in recycling/remanufacturing. These have a negative impact on the transformation of the CE (Vetrova and Ivanova 2022; WTO 2021). Secondly, complexity of geographical and temporal limits can also be a barrier to the general progress of CE in Covid-19. This relates to a product’s material and energy footprints cannot be simply reduced to a single location in space and time for in-depth environmental effect study (Tran and Nguyen 2021; Vetrova and Ivanova 2022). Furthermore, consumer and organizational inertia is also a potential barrier to the Circular Economy, majorly in the context of Covid-19 and this may include a reluctance to adopt new ways of doing things owing to uncertainty regarding the viability of business models (Jackson and Nelson 2021). Fragile industrial ecosystems and these may include highlighting the challenges of creating and maintaining inter-organizational cooperation as well as engagement with local as well as different regional authorities. Tran and Nguyen (2021) also indicate that a lack of understanding of the various Rs. The Rs are normally regarded as; reuse, recycle, recover, repurpose, repair, refurbish, and remanufacture) implicit in the CE framework. Other studies have mentioned challenges in data exchange between product end points and stakeholders, supply chain complexity with uncertain specifics of product biography across time, and costly start-up investment costs as CE barriers as further presented in Table 1.

Table 1 Fundamental factors hindering the promise of CE in the Covid Era

Hindering factors	Description
Thermodynamic factors	Circular economy was limited by issues associated with issues if energy combustion majorly experienced during recycling or re-manufacturing processes
Consumer and organizational inertia	New innovations in CE were affected by uncertainty regarding the performance of business models, as well as the general fuzziness surrounding organizational culture and management styles that majorly depend on CE
Fragile industrial ecosystems	Considering the challenges of establishing and managing intra- or basically inter-organizational collaboration, as well as working with local or regional authorities
Lack of consensus on what the many Rs	The words namely; re-use, recycle, recover, repurpose, repair, refurbish, and remanufacture, are all effectively embedded in the CE framework and any lack of consensus in these may affect CE
Prohibitive start-up investment costs	Prohibitive start-up investment costs have also been identified as CE barrier in other climes

Shulla et al. (2021) indicates that COVID-19's paradox is that it provided a once-in-a-lifetime chance to effectively re-examine the general difficulty or complexity associated with different obstacles, but it also showed a new set of hurdles or barriers. Because of the behavioral shift included in "social distance," which is crucial to restrict the spread of the virus, many urban people now regard sharing economy models, which were previously acclaimed as exemplars of CE strategy, in a negative light (OECD 2021; Shulla et al. 2021). Although, if notions like access over ownership, had been fully operational, they may have been a substantial option for providing flexibility. COVID-19 has also been said to 'disrupt certain disruptors,' such as peer-to-peer (P2P) companies, which has seen a 4.16% decline in local bookings for every doubling of new COVID-19 instances (Governemnt of Sweden 2020; Nikam and Nguyen 2021). Commuters seeking to avoid COVID-19 exposure in mass transit systems like buses and trains may raise the demand for ride-sharing alternatives in transportation. However, the hazards of COVID-19 transfer from person to person have been observed, particularly when passengers or drivers in ride-hailing and car-sharing platforms such as Uber do not wear facemasks (Arisman n.d.; United Nations 2020b).

In the long run, reducing emissions will need significant investments in low-carbon technology and infrastructure from both the public and private sectors, in terms of both invention and dissemination (Amato 2022). Given the worldwide economic crisis caused by COVID-19, the likelihood of large low-carbon investments from the private sector has decreased dramatically compared to pre-COVID-19. As a result, after COVID-19, faster progress toward CE still necessitates a significant legal and financial victory by local, regional, and national governments and multi-domain innovation; Governments should also encourage green logistics and waste management legislation with fair incentives to help producers and manufacturers minimize losses while increasing the value (Governemnt of Sweden 2020; UNCTAD 2021).

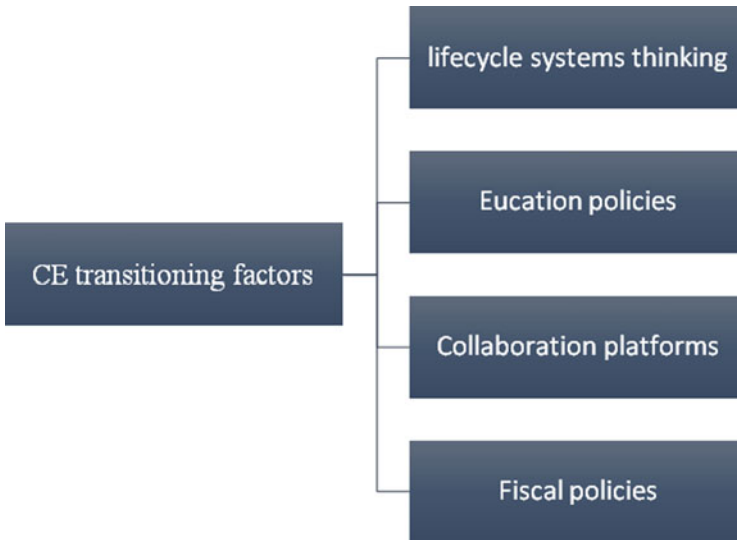
3.8 *Opportunities Associated with Circular Economy in Post COVID-19 Era*

COVID-19 has sparked a general focus concerning local manufacturing as a driver of a resilient economy and job creation; encouraged consumer behavior change; sparked the need for supply chain diversification; and demonstrated the power of public policy in addressing urgent socio-economic crises (Al-muhannadi 2021; Temjanovski n.d.). Creating a blueprint for a sustainable future will depend as much on the government's will to establish a new route to socioeconomic progress as it will on local companies collaborating with customers to make the transition to CE possible (Vetrova and Ivanova 2022). Governments throughout the globe have used a variety of financial policy tools to counteract the short-term impacts of the COVID-19 pandemic. Still, the adoption of circular economy concepts across multiple technology frontiers has the potential to bring about the required technical and behavioral transformation that will benefit many countries throughout the globe in the long run (Vetrova and Ivanova 2022). Adopting the CE principle, in particular, will mitigate some of the negative impacts of the COVID-19 pandemic in the coming future (Vetrova and Ivanova 2022). Some of the notable examples include: a systematic shift away from traditional polluting, energy-intensive, manufacturing-driven economy to a CE based on renewable energy, different smart materials, and digitalization will strengthen the fight against pollution; and the transformation to CE can also enable local job creation alongside transformation of other dimensions of society (Schröder and Raes 2021; Shulla et al. 2021) (Table 2).

Table 2 Opportunities associated with circular economy in post COVID-19 era

Opportunity	Description
National level adoption of CE	The general adoption of CE at the national level will lessen dependence on one country as the world's industrial powerhouse
Systematic shift away from emerging issues	A systematic change away from the conventional polluting, digitalization, as well as industrial production economy toward a CE based on renewable energy, may help to enhance the anti-pollution struggle
Local job creation	Local employment generation can easily be boosted as a result of the transition to CE along numerous axes of social demands

3.9 Ensuring Proper CE Transitioning



Ibn-mohammed et al. (2020) identified different key forms of policy intervention to enable, progress, and steer the transition to a CE by addressing either obstacles that attempt to rectify market and regulatory shortcomings or stimulate market activity in their examination of the political economy of the CE. The following are some of the policy intervention possibilities identified:

- education, appropriate information, and general awareness, which includes incorporating CE and lifecycle systems thinking into school curriculum, as well as public communication and awareness initiatives;
- establishing different collaboration platforms, such as public–private partnerships with ventures at different governance levels, thereby encouraging information sharing as well as value chain and inter-sectorial initiatives;
- the general implementation of sustainable procurement measures as well as infrastructure measures (Alvarez-risco et al. 2021);
- providing business or technical assistance schemes such as initial capital expenditure, incentive programs, and financial guarantees, as well as technical assistance, training, advising, and demonstration of different practices;
- fiscal structures, such as VAT as well as excise tax discounts for goods and services created according to CE principles (Temjanovski n.d.).

4 Discussion

This literature review study confirmed that COVID-19 had a significant impact on the macro and micro global economies most especially owing to the various restrictions that were employed by different countries across the world to control COVID-19 (Anbumozhi 2021; Shulla et al. 2021; Tuerk and Sporysheva 2022; United Nations 2020a). Relatedly the pandemic had an influence in the global ecosystems and the general quality of air as well as pollution levels across the globe (Abdul et al. 2021; Loske 2020; One Planet 2020). COVID-19 underscored the environmental absurdity of the ‘extract-produce-use-dump’ economic paradigm of the material and energy flows. Short-term solutions to the pandemic’s urgency are unlikely to be viable models in the long run (UNDP 2020; United Nations 2020a). Nonetheless, they bring to light critical issues that should be addressed, such as the clear link between pollution and mobility. The relevance of unfettered air travel in spreading pandemics, particularly viral influenza types, is apparent, with fewer passenger numbers hurting the tourism and aviation businesses (Alvarez-risco et al. 2021; Fonseca et al. n.d.). The ramifications will transform the aviation sector, which, like tourism, has been hit hard financially, but has a good influence on lowering negative environmental consequences (Ellen MacArthur Foundation 2020; Muller 2020).

Efforts to contain the pandemic resulted in an increase of infectious hospital garbage, however contemporary sterilization methods based on thermal, microwave, and biochemical processes may assist in the upcycling of discarded or rescued items and PPE (Tuerk and Sporysheva 2022; WHO 2018). Changes in consumer behavior as a consequence of social distance have necessitated a large increase in online purchasing, which has benefitted the main players but harmed SMEs that do not use the internet to supply their products and services (Schröder and Raes 2021; UNCTAD 2021). Regenerative agriculture, value recovery from organic nutrients through anaerobic digestion facilities, adoption of urban and periurban agriculture, and growing food collection, redistribution, and valorization facilities were determined to be essential for CE-based consumer food sector resilience (Temjanovski n.d.; Vetrova and Ivanova 2022).

CE is expected to aid in the creation of a more socially equal and inclusive society, owing to the requirement for resilience and sustainability goals, which might lead to an expansion in the bio-economy and sharing economy (Al-muhannadi 2021; Schröder and Raes 2021). The consequences would be felt in terms of global cooperation and mutual interests, as well as long-term planning and the need to strike the right balance between out-sourcing and local manufacturing. As a consequence of countries with raw resources utilizing the pandemic for long-term development, value chains are projected to reorganize, and a new global order will emerge that is not shaped by superpower technological superiority (United Nations 2020a; WHO 2018). During the lockdown, offices and commercial spaces were massively underutilized, and the need to enhance ventilation rates, such as in hospitals, has resulted in higher energy use. However, redesigning structures with movable barriers that may be utilized in a number of ways is a possibility (Ellen MacArthur Foundation

2020). The use of modular technologies for speedy construction of buildings that can be demolished and rebuilt to meet changing needs, as seen in China, is projected to increase. As existing buildings are given a new lease of life, renovation and refurbishment will experience a comeback, resulting in decreased carbon emissions and the creation of new jobs (ILO 2020). However, if all of these potential benefits are to be realized, integrating circularity through design thinking from the outset is important. Digital technology will be important in ensuring a low-carbon and energy-efficient future for the built environment (Taherzadeh 2022; Temjanovski n.d.; Vetrova and Ivanova 2022).

5 Conclusion

This study evaluated the impact of pandemic-driven advantages on reaching sustainable development objectives, emphasizing the general need for a significant, as well as fundamental structural shift in how we live. It makes the case for rethinking the current models of economic growth model, which is formed by a linear economy system and perpetuated by profiteering and energy-guzzling industrial processes. Based on the evidence in support of the entire Circular Economy as a vehicle for balancing the complex equation of achieving profit with minimal environmental harms, the paper lays out different sector-specific recommendations on CE-related solutions as a catalyst for global economic development and growth in a resilient post-COVID-19 world. Governments are recognizing the general impact on national CE policies in a variety of areas, including reducing over-reliance on other major economies for essential goods, as massive shortages forced the unwitting adoption of effective CE principles such as re-use; intensive research into different bio-based materials for the general production of biodegradable products and the promotion of the bio-economy; and legal structure for local, regional, and governmental authorities to promote environmental conservation.

6 Recommendations

It is important that as the world moves on with the Covid-19 era, resilience thinking should lead lessons learned, and circular thinking innovations should concentrate on the general well-being of the population rather than only on increasing the competitiveness, profitability, or development of firms and national economies. Since the flaws in the dominant linear economic model are now identified and the gaps to be filled, the post-COVID-19 investments required to accelerate the transition to more resilient, low-carbon, and circular economies should be included in the stimulus packages for improving economy promised by governments.

6.1 Areas for Future Research

The current review focused on establishing the role of COVID on the global economy and ecosystems. Further research should focusing on establishing the strategies to improve businesses and ecosystems in the post COVID-19 era.

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**COVID-19 Pandemic Effects
and Development Trends of Eastern
Europe and the Balkans Region Markets**

A Bibliometric Analysis on Energy Transition with Emphasis on Decarbonization of Lignite Towards a Post-Lignite Era



Ermelinda Toska , Fotios Chatzitheodoridis, Efstratios Loizou, and Achilleas Kontogeorgos

Abstract The last 2021 United Nations Climate Change Conference (COP26) in Glasgow through United Nations Framework Convention on Climate Change, reaffirmed for one more time the increased global concern for human-induced climate change and its adverse consequences. The reduction of anthropogenic greenhouse gas (GHG) emissions is one of the imperative targets of global commitments. The implementation of a strategy of a low-carbon energy transition and enhancement of decarbonization of lignite in crucial sectors such as the electricity production-supply sector, heating industry, and transport sector could significantly contribute. The study attempts to illustrate the international academic research in the field of decarbonization especially of lignite avoidance as a raw fuel in the energy supply sector and the challenges of the energy transition. Concretely, attempts to review scientific literature are achieved by the use and analysis of specific terms through bibliometric analysis using the software VOSviewer. For this purpose, the scientific data were attracted from the Scopus.com database, limited to the time frame of 2010–2022. The study results highlight the limited engagement of the scientific community with issues of the post-lignite period. The absence of wider academic attention on the decarbonization process in the framework of the energy transition is an important point of critique and at the same time the main point of the study's contribution to further research.

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Keywords Energy transition · Decarbonisation/decarbonization · Delignitization · Bibliometric analysis

1 Introduction

The sheer magnitude of the catastrophes, caused by severe weather phenomena and their uncharted long-term impacts, has emerged anthropogenic climate change as a global defining challenge (IPCC 2018). Hence, the issue of urgent response to the climate crisis has attracted major attention among policymakers, and researchers (Ripple et al. 2020; IPCC 2021). Admittedly, as the space and energy amount are subject to limitations (Baillie and Zhang 2018), there is a global commitment that responds to the Paris Agreement's 1.5 °C target. Therefore, the reduction of anthropogenic GHG emissions, elimination of the reliance of the energy sector on fossil fuels (coal, oil, and gas) (UNFCCC 2015) as well as ambitious policies and actions of zero-carbon emissions technology by 2050 (European Commission 2019) have emerged into principal priorities. Also, for the first time, the 2021 COP26 Glasgow Climate Pact redefines the global commitment to GHG emissions reduction through the call to phase down the use of all fossil fuels across the energy sector and especially the unabated coal power (United Nations Climate Change Conference UK 2021). In that framework, a global effort of transformation is concentrated on the issue of decarbonization of the energy sector and its implementation through the pathway of delignitization and transition to a post-lignite era by the deployment of renewable energy sources.

Moreover, Newton and Newman (2013) suggest that beginning from a local level, the achievement of a low-carbon green economy demands the implementation of low-carbon technological combinations and interventions in urban and suburban forms of the built environment. In that sense, the transition to a future decarbonized economy could be achieved as an outcome of a multiple research and development strategy, adopting novel combinations of energy technology and fuel sources alternatives (Grahn et al. 2013). In the same spirit, Kittner et al. (2017) support that the route to decarbonization goals in the electricity and transportation sectors could be easily accessible through the adoption by the policymakers of a portfolio of balanced policies designed through synergies among innovation and deployment, as well as the governmental support to emerging energy alternatives schemes, such as solar and wind technologies and energy storage. Hence, controlling CO₂ emissions, from both the energy sector (electricity, heat, transportation, industry, and buildings) and non-energy sector (agriculture, forestry, and land use) (Bruckner et al. 2014), as well as harnessing energy sources have been loomed as determining factors of economic and social development (Newton and Newman 2013).

As there is already a strong research interest in issues of energy transition and decarbonization, this study was triggered by the curiosity to examine the extent to which the term delignitization has attracted current academic attention. Also, no similar bibliometric analysis of the combination of the concepts of the energy

transition, decarbonization, and delignitization has been identified in the bibliography so far. On this basis, the specific study is an attempt to contribute to a further academic understanding of the combination of those three terms, offering novel interpretation through a new research field. Finally, for convenience, in the present paper, the main terms of ‘*energy transition*’, ‘*decarbonization*’, and ‘*delignitization*’ are referred to as key concepts.

Given the aforementioned, the study’s focal point is the systematic comprehension of the evolution of the three key concepts during the period 2010–2022 to (i) present the scientific literature reality, (ii) portray future academic orientation, and (iii) determine possible geographical clusters. Finally, the structure of the present paper is arranged into four sections. Following the introduction, Sect. 2 focuses on the methodological approach and data collection. Next, Sect. 3 provides a systematic review of the analysis and the empirical results. The study is completed with Sect. 4 synthesizing the research conclusions on the existing bibliography with recommendations for future research.

2 Methodology

2.1 Research Methodology and Material Collection

A schematic outline of the adopted methodology is briefly presented in Fig. 1. There are four steps illustrated, with the initial step introducing the formulation of three research questions. The second step refers to the bibliography collection process followed by the third step, the presentation of the bibliometric analysis’s results. Finally, the fourth step focuses on the discussion of stated results and conclusions. On this basis, the paper attempts to comment on three research questions:

- (i) Is there any cluster of keywords, able to categorize the publications related to the research field?
- (ii) Is there any cluster of research hotspots, able to determine the research motif of literature?
- (iii) Is there any cluster of countries, authors, institutions, and sources able to play a leading role?



Fig. 1 Major steps of the methodology

Furthermore, the bibliography collection process used exclusively the literature data source www.scopus.com. Scopus is a popular and affordable (Machado and Davim 2022) extensive multidisciplinary database of peer-reviewed bibliography (Emich et al. 2020) where a researcher can collect material by formulating different search combinations based on criteria, such as keywords, authors, institutions, and publication's period (Wimbadi and Djalante 2020). Initially, it was fundamental to identify the main criteria, by combining the study's three key terms, to enter a specific query string. However, there is a dual use of the word 'decarbonisation' and 'decarbonization'. Hence, based on Scopus online search tips, we used "*energy transition*", and "*decarboni**" to ensure the simultaneous search of the words "decarbonisation" and "decarbonization" and "*deligni**" for both "delignitization" and "delignification" and avoid omission of terms. Therefore, the query string [TITLE-ABS-KEY ("energy transition" AND decarboni* OR deligni*) AND PUBYEAR>2010] was posed.

Data collection was carried out on 6th March 2022 and the initial database search yielded 723 records over the period 2010 to 2022. Continuously, in agreement with the PRISMA 2020 statement protocol of identification, screening, and final records (Page et al. 2021), the first database was refined by including publications only in the English language (n = 26 records out), excluding ERRATUM (n = 1 record out) and omitting undefined authors (n = 1 record out), excluding records with no available text in abstract or full text (n = 29 records out), excluding records not related to analysis's subject areas (n = 3 records out). Hence, the final database includes a volume of 663 records, which is accepted as satisfactory to ensure further bibliometric analysis (Donthu et al. 2021).

Given the variety of patterns of literature, the study focuses on bibliometric methodology. Bibliometric analysis is considered a valuable and widely popular content analysis method, able to successfully manage large volumes of records, offering results on the interpretation and mapping of the accumulative academic knowledge (Donthu et al. 2021). As Primc et al. (2021) assert bibliometric analysis provides a quantitative measurement of research impact by examining the results under micro and macro prism, focusing the interpretation on specific criteria such as researchers, authors, and institutions as well as geographical and country levels respectively. At this juncture, the study used the techniques of performance analysis and science mapping. Analytically, the performance analysis pertains to the annual publications as a productivity index, and the annual citations as an impact and influence index of research constituents, such as authors, countries, and institutions, whereas the intellectual linkages and structural connections among them, are presented through science mapping (Donthu et al. 2021). In that sense, the bibliometric analysis relied on the VOSviewer version 1.6.18 software package, as it allows researchers to construct graphical representations of bibliometric maps based on a similarity matrix (Eck and Waltman 2010).

3 Results

3.1 Literature Portrayal

A total of 663 records of peer-reviewed publications consists of eight types of records: Articles, Reviews, Conference Paper, Book Chapter, Book, Editorial, Short Survey, and Note. The prominent publication category is Article with 505 records and a weight of 76.2%, whereas the rest contain different types including 158 records, representing only 23.8% of the total publications. Moreover, the number of annual and cumulative publications in chronological order between 2010 and 2022 (March) is depicted in Fig. 2. Albeit during the first five years a very limited publication activity has been recorded, and a significant numerical increase in annual publications was captured during the next few years. Moreover, the upward slope of the curve represents the trend of publications related to the research field of ‘energy transition’, ‘decarbonization’, and ‘delignitization’. In that sense, it constitutes a reflection of the intensified priority by the academic community on the existing research field as well as a satisfactory indication of the research trend in the future.

As it is illustrated in Fig. 2, the expansion of publications can be interpreted as a growth path of three phases, with a leapfrog increase during the last three years. The period 2010–2015 is an initial phase, characterized by an introductory academic engagement in the specific research field. During this preliminary stage,

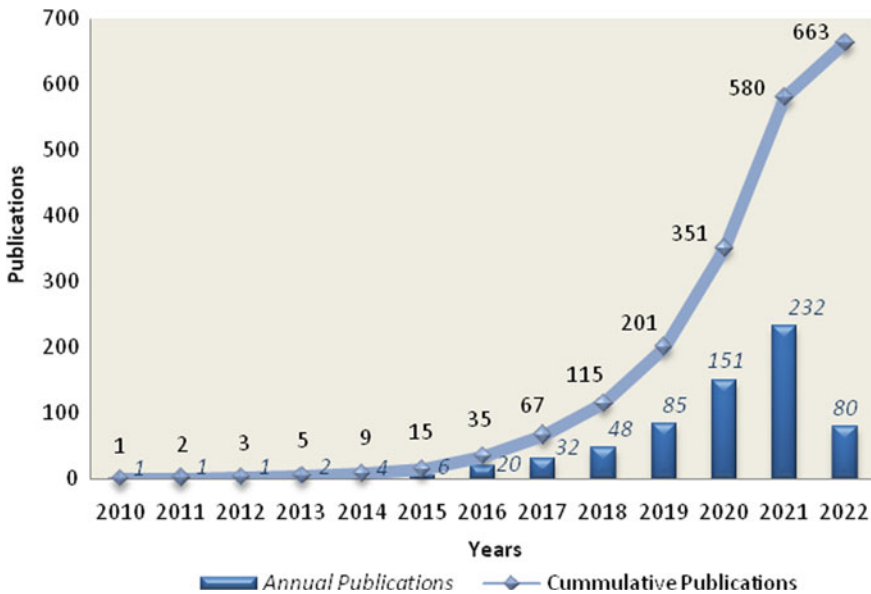


Fig. 2 Annual and cumulative publications during 2010–2022. *Source* Authors’ calculations based on data derived from Scopus on 6th March 2022

there is only an average of 2.5 documents published per year. Afterward, during the next four years 2016–2019, there is a remarkable growth in new publications, with about an average of 46.2 documents per year. Hence, with a steady increase of tendency in new publications, the second phase constitutes a period of change and development of academic attention on energy transition and decarbonization issues. Finally, the third phase (2020—06/03/2022) is characterized by an impressive growth rate in new publications with an average number of 154.3 documents per year. In essence, this vigorous increase in research with an exponential growth rate in new publications emerges as an important indicator for a prognosis of a further growth trend concerning academic engagement with issues of ‘energy transition’, ‘decarbonization’, and ‘delignitization’ in the coming years. Whereas during the first three years, there was only one publication per year, from the year 2016 intensified increase in annual publications is recorded, reaching 580 cumulative publications at the end of 2021. Also, it is important to refer that, until 6th March 2022 there were about 80 new publications already published.

Furthermore, the paper focuses on both the presentation of the authors with the highest number of published documents, as well as the main sources which have contributed to new publications related to the study’s research field. Hence, Fig. 3 highlights that among 160 authors there are 86 Authors (53.8%), and each of them has published only 2 documents, 46 Authors (28.8%) each with 3 documents, 11 Authors (6.9%) each with 4 documents, 8 Authors (5%) each with 5 documents, followed by 3 Authors (1.9%) with 6 documents each. Nevertheless, the authors with the highest contribution in the research field are *Sovacool B.K.*, *Oei P.Y.*, and *Löffler K.* with 8 documents each, followed by *Burandt T.*, *Breyer C.*, and *Aghahosseini A.*, with 7 published documents each. Therefore, based on the documents by authors published during the period 2010–2022, the researchers’ involvement in issues of the energy transition, decarbonization, and delignitization is assumed as limited enough. In that framework, the relatively small publishing activity in this research field implies that academic engagement is in its initial phase. Although there is a manifested activity of publishing and citations, the literature has not yet enough to count more published documents to reach the maturity phase.

In the same line, Fig. 4 presents the number of documents published annually from the ten main journals over the period 2010–2022. It is distinguishable that from the year 2016, there was a constant increase in the contribution from all sources. However, a blast of publications was recorded during the last two years 2020–2021, with journals such as ‘*Energy Research and Social Science*’, ‘*Energies*’, ‘*Sustainable Switzerland*’, ‘*Energy Policy*’, ‘*Renewable and Sustainable Energy Reviews*’, and ‘*Applied Energy*’ considered to have an influential position related to publications, which seems also to be encouraged during the first two months of 2022. Finally, based on co-citation analysis, the network visualization of highly cited sources from 2010 to 2022 is shown in Fig. 5. The main institutes with the highest number of publications are *ETH Zürich* with 19 published documents, *Norges Teknisk-Naturvitenskapelige Universitet* with 18, *The Bartlett Faculty of the Built Environment* with 16, as well as *Technische Universität Berlin*, *University of Sussex* and *University College London* with 14 documents each.

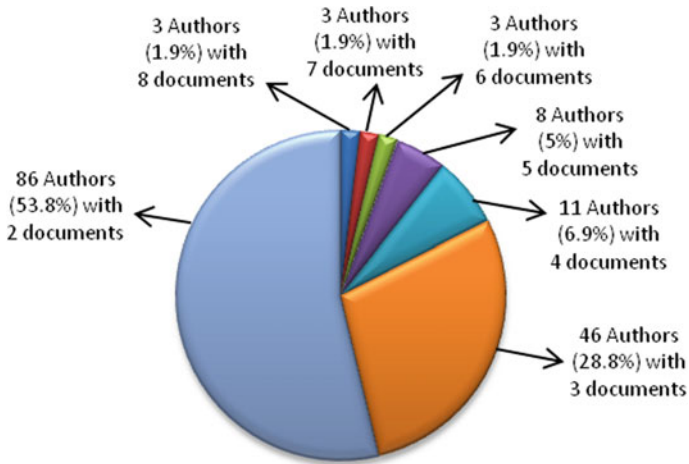


Fig. 3 Published documents per author during 2010–2022. *Source* Authors’ calculations based on data derived from Scopus on 6th March 2022

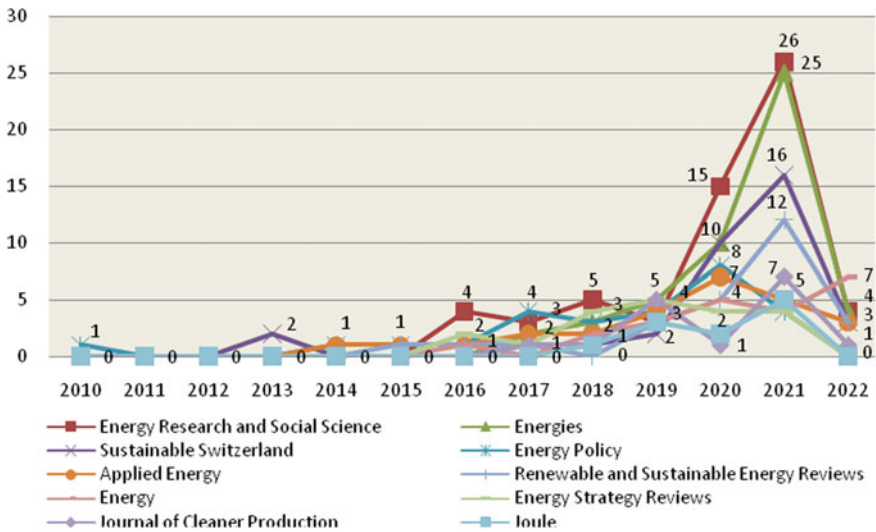


Fig. 4 Annual publications of the main 20 sources during 2010–2022. *Source* Authors’ calculations based on data derived from Scopus on 6th March 2022

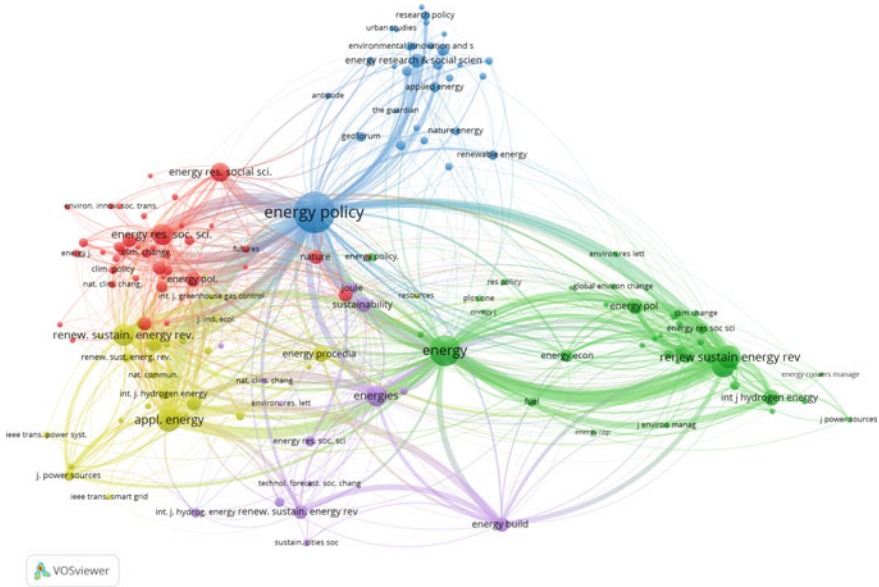


Fig. 5 Network visualization of highly cited sources during 2010–2022. *Source* Authors’ calculations based on data derived from Scopus on 6th March 2022

3.2 Network Visualization of Keywords, Thematic Hotspots, and Countries

As Han et al. (2022) ascertain keywords briefly capture the main characteristics of a research publication, such as subject, methodology, theories, and future perspectives. Especially in highly cited publications, the frequency that specific keywords have occurred implies highlighting those into major topics, interpreting the increased academic attention as well as the evolution trend of the research interest orientation into specific hotspot issues. Moreover, keyword analysis explains the multidisciplinary and interdisciplinary attributes of the main research fields (Primc et al. 2021). In this framework, from the analysis of the co-occurrence network of all keywords from a total of 4252 keywords, only 90 meet the threshold of a minimum number of 15 appearances from 2010 to 2022. Also, the main ten high-frequency keywords are *energy transition* (236 occurrences), *energy transitions* (229), *decarbonization* (166), *energy policy* (116), *climate change* (106), *decarbonisation* (105), *energy efficiency* (85), *alternative energy* (83), *carbon* (72) and *greenhouse gases* (69). Respectively, those main 90 keywords are classified into five network map clusters of the higher level of connectivity, as it is presented in Fig. 6, in a different colour.

Concretely, the first cluster, represented in red colour, delves into studies with main topics of *energy policy*, *climate change*, *alternative energy*, *carbon*, *carbon emission*, *fossil fuels*, and *sustainability*. Also, the second cluster, with green colour, is composed of studies focused on fields of *renewable energies*, *energy efficiency*,

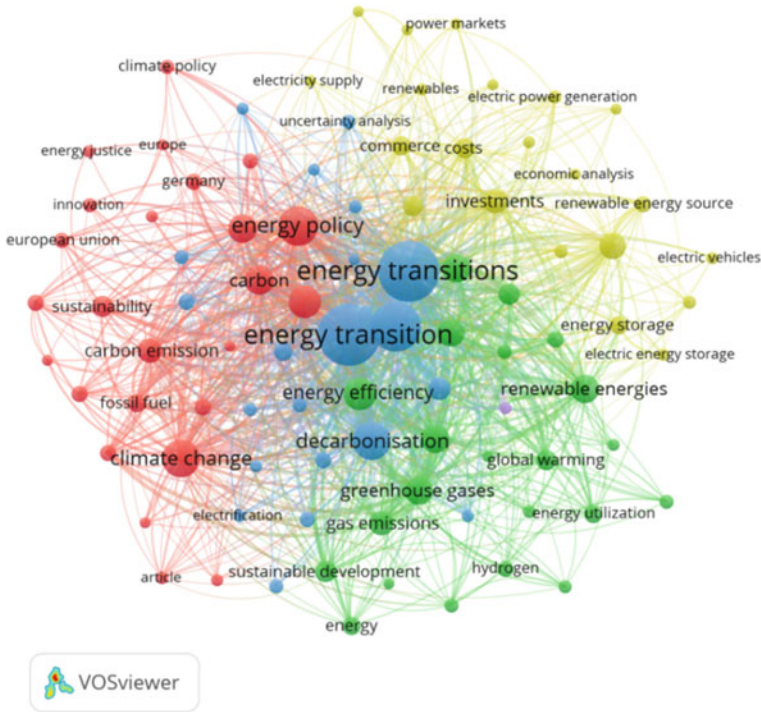


Fig. 6 Network visualization map of high-frequency keywords. *Source* Authors’ calculations based on data derived from Scopus on 6th March 2022

carbon dioxide, greenhouse gases, gas emissions, global warming, energy, and sustainable development. Additionally, in the third cluster, with blue colour, there are research topics focused on *energy transition(s), decarbonisation/decarbonization, energy systems, electricity, power generation, decision-making, and economic and social effects.* Next, the fourth cluster, with yellow colour, combines key themes of *renewable energy resources, investments, electricity generation, electric energy storage, costs, and commerce.* Lastly, the fifth cluster, with purple colour, includes all those studies where *coal* is the focal point.

Furthermore, based on the criterion of the greater number of documents and citations there are three countries distinguished: the *United Kingdom, Germany,* and the *United States.* Hence, from 2010 to 2022 the United Kingdom has 122 documents published, Germany and the United States with 107 and 87 documents respectively, followed by Italy (64), Spain (57), Australia (48), Netherlands (46), Switzerland (45), China (42), and Norway (34). In terms of citations, there are the same three countries that play a prominent role: Germany with 2006 citations, the United Kingdom with 1860, and the United States with 1614, followed by Switzerland (830), Netherlands (721), Italy (631), Spain (540), Canada (493), Australia (467), and Denmark (416). In that sense, we can assume that the United Kingdom, Germany, and the United States

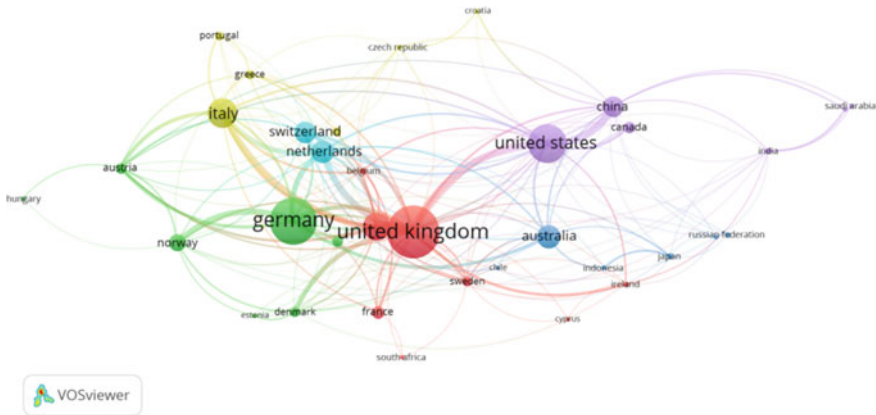


Fig. 7 Co-authorship and countries network visualization. *Source* Authors' calculations based on data derived from Scopus on 6th March 2022

are characterized as leading actors with stronger prominence, and as a consequence with greater academic presence, and mobilization in this research field. Finally, as is shown in Fig. 7, from a total of 35 countries, there are 6 clusters formed.

4 Discussion and Conclusions

Briefly gathering the presented results, we could underline that even though academic attention has been attracted during the last seven years (from 2016) with a blast of publications during the last two years (from 2020), the research field cannot be characterized as a full development topic in terms of new publications. Also, based on high-frequency keywords and citations, we can assume that among the total of 663 publications apart from traditional topics, there are also contemporary and emerging topics with five prominent research hotspots: *energy policy*, *energy efficiency*, *energy transition-decarbonization*, *renewable energy resources*, and *coal*. Moreover, contrary to *energy transition* and *decarbonization*, the keyword of *delignitization* seems to be absent from the list of 90 keywords with a minimum number of 15 appearances from 2010 to 2022. Hence, we could assume that the interactions between the three key concepts of the research field are not completely determined. Therefore, further reviewing of the relationship between those three key concepts could be a proposal for future research. An additional proposal for future research could be a profound examination of the relationships among the five research hotspots. Finally, the fact that the study was based on data derived from specific keywords implies that the extracted published documents were strictly selected, which is one main limitation of this study.

Secondly, the academic attention on the specific research field is globally growing with three main countries playing a leadership role: the United Kingdom, Germany, and the United States. However, the majority of the countries with a significant contribution are geographically spotted mainly in Europe, such as Italy, Spain, Netherlands, Switzerland, Norway, France, Greece, Sweden, and Denmark as well as in other continents, such as Australia, China, Canada, India, and Japan. The intensive research engagement of the European countries in the specific field of energy transition could be interpreted as the aftermath of the European Union's commitment to decarbonization goals. However, fulfilling the environmental dimension during the energy transition and green economy through lignite abandonment implies the deployment of renewable energy sources. Also, the delignitization process and transition to the post-lignite era entails the adoption of novel approaches to innovation and research in order not to jeopardize energy security.

Moreover, we highlight that the coexistence of the Covid-19 pandemic with Russia's invasion of Ukraine is upgrading the issue of the energy crisis into a topic of paramount importance, which implicitly could lead to an unprecedented multi-dimensional global crisis. Hence, due to turmoil in the energy market and possible shortages in energy resources, policymakers are called upon to decide on strategic dilemmas regarding carbon reduction targets. As the data for the present study was derived on 6th March 2022, ten days after Russia's invasion of Ukraine on 24th February 2022, any possible academic interest due to this war was not included. Likewise, the consequences of Russia's war on the issues of energy security, energy transition, and the delignitization process could also be addressed as a proposal for in-depth future academic research. In parallel, the main point of the specific paper's contribution to the academic community is to yield the enrichment of the area of energy transition and decarbonization with the concept of delignitization contributing to the appearance of a new research field. Finally, heading to a post-lignite era, this new approach could be a motivation for intensifying future academic research.

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Employability in the Post-COVID Labor Market in Greece



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Abstract The outburst of COVID-19 pandemic crisis and its catalytic impact on health systems across the globe, has affected all socio-economic activities. The measures implemented for public safety since 2020 had severe consequences on employment, particularly in industries and occupations relying on the physical proximity among employees and customers. At the same time, the need to overcome physical reliance has strongly enhanced digitalization processes and practices at work and affected employment, production and consumption, transports, and communications. As work is shifting from the office or the shop to the expanded digital space, via platforms and cloud computing, the content and organization of work is accordingly changing (crowd sourcing, gig work), as is the status of the employee (sub-contractor, self-employed). With reference to Greece, as indicative case-study of Western Balkans and South East Europe, this paper explores the impact of the pandemic crisis on a digitally lagging labor market. The Greek economy is ranking very low in digital competitiveness (26th in EU28, 2019) and scores below the EU average in the integration of digital technology by business and human capital. In such economies, pandemic-induced digitalization is expected to have a higher impact on employment and employability. Drawing upon primary research data (retrieved via original questionnaire answered by 280 participants), we particularly focused on the highly qualified respondents, to explore whether retaining or losing their job is associated to the sector/industry and nature of their occupation (physical or digital) and their employment status (permanent or flexible). The results illustrate the division between occupations of physical and non-physical reliance, in terms of job losses; as well as, the generalized deterioration of employment conditions, even in digitally operating occupations.

Keywords Digitalization · Employability · Occupational divide

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1 Introduction

Since 2020, the COVID-19 pandemic has evoked an unprecedented labor market shock and unemployment crisis. In EU27, 23% of total employment—nearly 45 million jobs—are in very high risk of disruption; and 22% of the workforce, mostly in medium- to lower-skilled service provision, is exposed to the risk of unemployment. The risk is disproportionate for the most vulnerable workforce groups: older employees, the lower-educated, those working longer hours, women, migrants etc. As existing trends in remote work, e-commerce and automation accelerated, 25% more workers than previously estimated may need to switch occupations (McKinsey Global Institute 2021).

Before the outburst of the pandemic, large work disruptions were already taking place as a consequence of technological change towards digitalization and high-level automation. Work has largely shifted from the office to the expanded digital workplace, via platforms and cloud computing services. The content and organization of work has accordingly changed (crowd sourcing, remote work), as has the role of the employee (routine micro-tasking, gig work) and employment relations (sub-contracting, self-employment).

COVID-19 has accelerated the expansion of digital work and at the same time, has exacerbated pre-existing labor market trends towards flexible employment. The new forms of work are rather breaking up, than accommodating existing standard employment relations; such changes have negative outcomes for workers, i.e. increase in precarious employment etc. (Woodcock and Graham 2020). As digital work is fast spreading into new and diverse occupational areas—i.e., health services, teaching, legal services, various manufacturing and maintenance tasks etc.,—emerging qualitative changes are transforming occupational structures (Huws et al. 2018).

Yet, the novel issue elevated by COVID-19 is the importance of the physical dimension of work. According to McKinsey Global Institute Report (2021), the overall physical proximity adds a different aspect to traditional views of work and forms a new taxonomy of various work arenas. For example, medical caregiving arena includes close interaction of personnel with patients; hospital and medical office administrative staff fall into the computer-based office work arena, where more work can be done remotely; lab technicians and pharmacists work in the indoor production work arena because their jobs require use of specialized equipment on-site but have little exposure to other people (McKinsey Global Institute 2021).

In summary, the emergent new view of work differentiates the traditional definitions of sectors and occupations. The research presented in this paper takes into account the level of both physical and digital intensity of work across sectors and jobs, in order to justify the changes in employment and employability taking place in the post-pandemic labor market. The impact of COVID-19 has been unequal on

different economic sectors and occupations—defined by their capacity to operate remotely ICT-based work and interact online with customers and collaborators. We suggest that employment gains and losses are significantly defined by the degree of digital efficiency and maturity of the overall economic activity.

In the following sections we provide an outline of the post-pandemic changes and challenges in the Greek labor market. First, the research context is described for Greece—with reference to the broader geo-economic region of Western Balkans, South East Europe and the EU—in terms of digitalization and employability before and after the pandemic. The deviation from the average performance of EU member states during COVID-19—in terms of employment, flexible employment and unemployment for the young and particularly, for the highly qualified—frames the main research question and research hypotheses of our study.

Next, we elaborate on the research methodology and tools in order to justify the adoption of certain assumptions and parameters for the fieldwork and primary data analysis. The feedback provided by 286 respondents forms our conclusions and discussion in the final section. Findings established that due to COVID-19 social distance safety measures, job losses are higher in sectors and occupations requiring physical proximity with customers and collaborators, than in those operating digitally. Yet, COVID-induced digitalization has deteriorated employment in digitally operating sectors as well. The depreciation of the most qualified and skilled, particularly in the more productive ages, suggests the digital hysteresis of industry and human capital in the Greek economy.

2 Research Context and Questions

The impact of digitalization on economic growth has been broadly established as positive, according to the bulk of related research. However, variations depend on the level of economic development in a country, or a region. Digital efficiency and integration require significant investments in ICT, but this process was gravely affected by the global economic downturn in 2008. Greece was gravely hit by recession and is still lagging behind, along with the Western Balkan countries. Digital hysteresis is depicted in broadband connectivity, digitalization of industry, regional startups connection and network with major European hubs, digital traineeship to students and young people, cyber-security and so on (European Commission 2018). Greece, as one of the thirteen economies of South East Europe, has adopted the SEE2030 Strategy (SEECF Summit in 2021) to deal with such deficiencies.

As a result of COVID-19 crisis, the region of South East Europe suffered GDP decrease by 5.7%; average unemployment rate was 11% in 2020, with youth unemployment reaching 22.5%; in a population of 150 million, 12.5% of people live below mid-high income economy poverty line. At the start of 2022, there were 8.50 million internet users in Greece and the internet penetration rate was 82.2% of the

total population. KEPIOS¹ analysis indicates that internet users increased by 3.5% between 2021 and 2022. These figures reveal that 1.84 million people did not use the internet—i.e., 17.8% of the population remained offline. The 7.40 million social media users in Greece at the start of 2022 were equivalent to 71.5% of the total population, but social media users may not represent unique individuals. According to KEPIOS analysis, social media users remained unchanged between 2021 and 2022. Data from GSMA² Intelligence shows that there were 14.92 million cellular mobile connections in Greece at the start of 2022. However, many people make use of more than one mobile connection (e.g., for personal use and for work). The numbers indicate that mobile connections were equivalent to 144.3% of the total population, as mobile connections increased by +0.4% between 2021 and 2022. (<https://datareportal.com/reports/digital-2022-greece>).

According to the Digital Economy and Society Index (DESI 2020), Greece before the pandemic scored well below the EU average in digital competitiveness (26th in EU28), as well as in the integration of digital technology by business and human capital (Fig. 1). The acceleration of digital transition was expected to boost Greece's GDP by 4% and create more than 50,000 high-value jobs by 2021 (SEV—Hellenic Federation of Enterprises 2021). But the COVID-19 crisis drastically altered this process: in EU27, Greece had the lowest employment rate in 2020Q3 and shared with Italy the lowest score in 2021Q3 as well. In the same period, Greece's unemployment rates are the highest in EU27 and nearly double the EU27 average (Figs. 2 and 3).

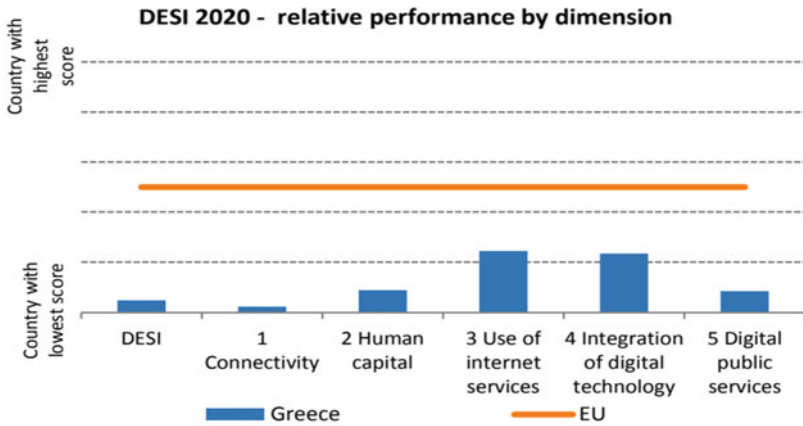
It should be also stressed that the rebound of the European economy was confirmed in 2021Q3 and was clearly visible in the development of employment and the recovery of the labor market, in comparison with the pre-COVID-19 situation. In 2021Q3, 18 out of the 27 EU member states had restored their employment rates at a level higher or equal to that of pre-COVID (in 2019Q4). However, almost half of the EU young employees (aged 15–24 years old) worked on temporary contract in 2021Q3.

In Greece, the unemployment rate (as percentage of the labor force) in 2021Q3 is 9% and the rate of long-term unemployment is 5.6%. It is worth stressing that young people, aged 15–24 years old, account for 31.4% of the unemployed; while those neither in employment nor in education and training account for 16% (Eurostat, LFS—Data for January 2022). When focusing on Greece's highly qualified labor force (aged 20–64), the unemployment rate during the COVID-19 crisis for tertiary education graduates (level 5–8) has been the highest in EU27—reaching 10% in 2021Q4 (with EU27 average at 4.2%) (Eurostat-Values for 2019Q4 and 2021Q4).

We also acknowledge the threatening aspects, exacerbated by the COVID-19 pandemic, of the emerging forms of digital work in the gig economy of flexible and precarious employment. As shown in Fig. 4, an employment loss is recorded from the second quarter of 2020 until the first quarter of 2021 and is mainly due to a strong

¹ Kepios is a strategic marketing consultancy producing some of the world's most widely read reports on digital trends and online behaviors, including the acclaimed Global Digital Reports series (<https://kepios.com/reports>).

² The GSMA is a global organization unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change.



Note: EU aggregate corresponds to EU28, based on 2020 DESI report.

Source: Greece’s ranking in the Digital Economy and Society Index 2020. <https://ec.europa.eu/digital-single-market/en/scoreboard/greece>

Fig. 1 DESI 2020-relative performance by dimension

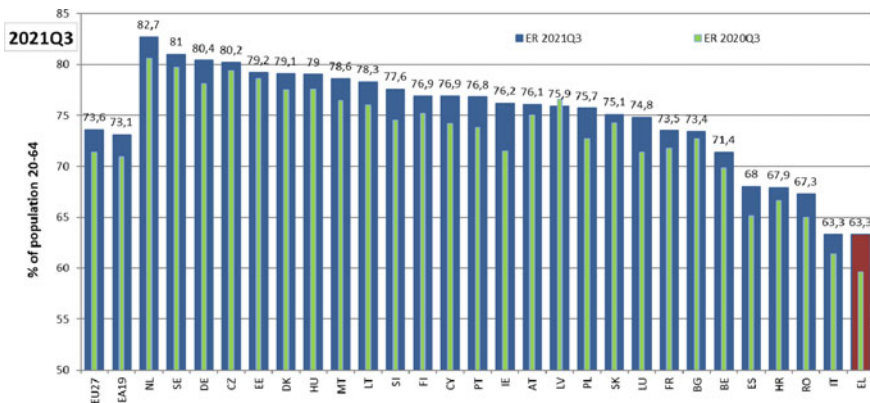


Fig. 2 Employment rate (20–64) EU, euro area and member states, 2021Q3. Source Eurostat, LFS (Quarterly updated charts, March 2022)

decrease in the number of temporary employees. According to Eurofound (2021), on the EU27 scale, the number of temporary contracts fell by 17% between the spring of 2019 and 2020, accounting for well over three-quarters of the decline in aggregate EU employment. The number of permanent employees is also decreasing—1.533 million in the first quarter of 2021 in comparison with the same quarter of the previous year. For the same period, self-employment recorded a decline of 1.655 million people after a year (2019) of relative stability. Promising evidence for the overall employment recovery comes from 2021 Q2 and Q3 data, although the establishment

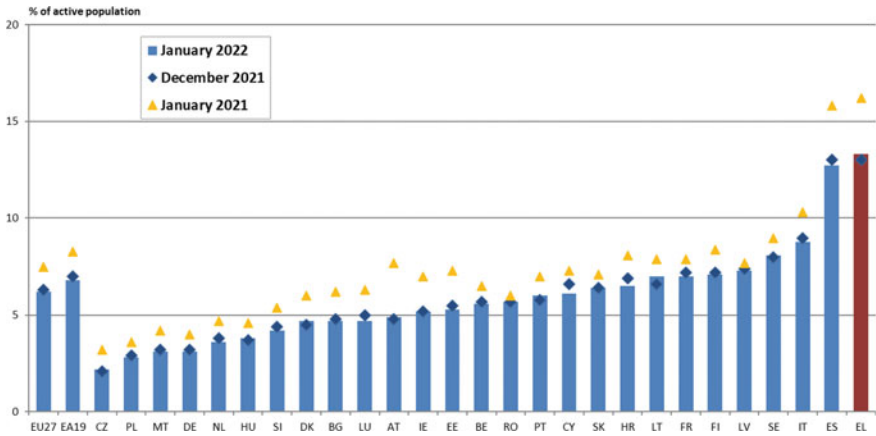


Fig. 3 Unemployment rates—EU, euro area and EU member states. *Source* Eurostat, series on unemployment [une_rt_m]. Data seasonally adjusted

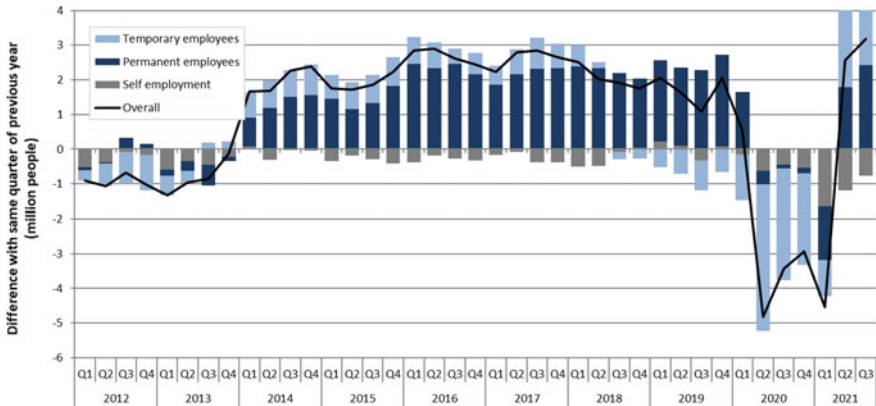


Fig. 4 Permanent, temporary and self-employment—EU. *Source* Eurostat, LFS—Quarterly updated charts, March 2022

of the temporary contracts (that seem to be activated by the pandemic crisis) is a matter of further consideration.

In this context, our study seeks to illuminate key-aspects of the Greek labor market’s disruption since the outburst of COVID-19 pandemic. The impact of COVID-19 has been twofold: first, on the public health level and then, on the level of economic and labor market restructuring by digital reinforcement across sectors and occupations. Our main research question is how the COVID-19 pandemic has affected the Greek labor market. With particular focus on the employability of the young and highly qualified labor surplus, we seek to provide explanation for its inability to recover. Evidence will be sought in: (i) the level of digital efficiency in industries and occupations, and (ii) the changes taking place in employment status and relations.

3 Research Methodology

COVID-19 is expected to bring about structural adjustment and protracted disruption in industries and occupations, in a scale even bigger than the recession of the 2008 global financial crisis. The pandemic had an unequal impact on different economic sectors and occupations, strongly defined by their reliance on physical proximity with customers, or by their efficiency to operate via remote meetings, ICT-based collaboration and online customer interaction. Consequently, individual skills and job factors are most likely to be impacted by the pandemic and accelerated digitalization.

A recent analysis published in McKinsey Report on the future of work after COVID-19 (2021), reveals that workers providing care, sales or other personal services, as well as hospitality and retail managers, health workers and food preparation helpers, have a very high COVID-risk score. Additionally to these high-risk occupations, there are significant subset of occupations facing moderate-to-high risk, as well; most of these rely on the provision of medium to lower-skilled labour services such as: drivers and vehicle operators, cleaners and helpers, protection workers, street service workers, as well as those in construction and agricultural occupations. In contrast, jobs that involve less physical proximity and contact with others and a higher reliance on digital tools and technologies—such as office workers, clerks (not in customer service), scientists, engineers and ICT workers—are less susceptible to the social distancing impact of COVID-19 (Fig. 5).

In this vein, an analysis based on CEDEFOP’s European Skills and Jobs Survey (ESJS) provides a similar occupational classification according to (Table 1). **Our research** takes into account the level of physical and digital intensity of work across sectors and jobs. Occupations are grouped into work arenas according to: (i) the



Note: Occupations were assigned to work arenas using O*NET data. Source: O*NET OnLine, Employment and Training Administration (ETA), US Department of Labor; US Bureau of Labor Statistics; McKinsey Global Institute analysis

Fig. 5 Overall-physical-proximity score (out of 100) by work arena (based on human interaction and work-environment metrics). *Source* www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19

Table 1 COVID-19 risk score by industry, EU-27 and UK

Accommodation and food services	Very high risk
Wholesale and retail trade, sales, shop work	Very high risk
Social and personal services	Very high risk
Education or health services	Some, high, risk
Agriculture, horticulture, forestry or fishing	Some, high, risk
Cultural industries (arts, entertainment)	Some, high, risk
Transportation or storage	Some, high, risk
Financial, insurance or real estate services	Some, low, risk
Supply, management or treatment of water	Some, low, risk
Public administration and support services	Some, low, risk
Construction	Some, low, risk
Manufacturing	Some, low, risk
Supply of gas or electricity, mining	Very low risk
Professional and scientific services	Very low risk
Information and communication technology	Very low risk

Source European Skills and Jobs Survey (ESJS) CEDEFOP

degree to which they involve physical contact and proximity to others; and (ii) the degree to which they involve a high digital skill intensity level.

We conducted a cross-sectional study and developed a fieldwork to acquire information from highly qualified respondents (ISCED levels 5 to 8) about their employment status. According to the e-survey ‘Living, working and COVID-19’ (Eurofound 2020), *young people were most significantly impacted by reductions in employment levels, mirroring the experience of the last recession, which led to serious longer-term challenges for younger people in accessing the labour market.* Greece, according to the annual report of the Hellenic Authority for Higher Education, is in the last positions of the OECD countries both in the employment of higher education graduates aged 25–64 (76%) and young graduates aged 25–34 (73%) (levels 5–8), 12% points away from the OECD average.³

The questionnaire was distributed during the last quarter of 2021. Specifically we recruited participants from September 2021 to December 2021. We addressed a sample of employed and un/under-employed participants. Primary data were collected with the use of structured questionnaire in printed form, and provided 250+ valid responses. The instructions defined ‘underemployment’ as occasional employment and a person who, in spite of being employed, lacks a sufficient volume of work, (without having alternative employment option) and/or is still seeking for a better position.

³ https://www.ethae.gr/images/articles/etisies_ekthesis_HAHE/Eτήσια_Εκθεση_ΕΘΑΕ_2020.pdf, pp. 13–14.

4 Empirical Analysis and Results

To conduct the statistical analysis we used the IBM Statistical Package for the Social Sciences (SPSS) (Version 27.0.1) for Windows. We calculated frequencies and percentages to present the descriptive characteristics of the sample. The employment changes were compared to (a) demographic characteristics (b) workplace of previous/current job, (c) sector of occupation (taking into account the level of physical and digital intensity of work across sectors and jobs as described above) and (d) employment contract, using *t*-tests, chi-square tests, and Fisher's tests, as appropriate. Statistical significance was set at 0.05.

With reference to the research sample a total of 286 participants were eligible. 50.2% ($n = 143$) of the respondents were men and 49.8% ($n = 142$) were women. The vast majority (72.2%, $n = 205$) of the respondents were higher education graduates under 35 years old. More than half of them (50.36, $n = 138$) supported financially their family and almost 4 out of 10 (39.78 $n = 109$) were dependent on their family's financial support. Referring to their employment status 30.1% ($n = 86$) of the respondents were unemployed, 36% ($n = 103$) were underemployed (seeking a better job) and just one third of them (33.9% $n = 97$) were in permanent employment. The sample reported higher rates of unemployment than the Eurostat official data for the target group in the specific period—A fact that can be explained due to the low age average of the research sample (Eurostat metrics for unemployment in Greece, register 10% of unemployment for highly qualified labor force aged 20–64).

Among the employed or recently employed 85.80% ($n = 241$) occupied in physical workplace environment, just 14.20% ($n = 40$) occupied in digital workspace environments (remote work or digital platform work). As the vaccination rate during the last trimester of 2021 was increased, most lockdown measures were abolished and individuals occupied in low digital intensive occupations, returned to the physical workplace environment.

Furthermore, the sample indicates employment in sectors requiring a high level of physical intensity. Specifically, almost one third of the sample (32.2% $n = 92$) of the respondents is/was employed in digitally operating occupations; while 67.8% ($n = 194$) is/was employed in occupations reliant on physical proximity.

Concerning the employment status, 46.5% of the respondents are/were occupied in contract-to-permanent jobs and 45.42% on-standard employment jobs, including temporary contracted employment and part-time jobs. Respecting job position of previous/current job 47.83% of the respondents are/were in positions of general (not skilled—relying) tasks, although highly qualified (Table 2).

4.1 COVID-19 Implications on Employment

For those who were employed during the pandemic, 40.3% maintained their job intact; however, there were substantial percentages who changed their employment

Table 2 Research sample description

Variable	Levels	<i>N</i> = 286	Valid percent
Age	Under 35	205	72.20
	35+	79	27.80
Gender	Male	143	50.20
	Female	142	49.80
Employment status	Unemployed	86	30.10
	Underemployed	103	36.00
	Employed	97	33.90
Workplace of current/last job	Physical workplace	241	85.80
	Digital workplace	40	14.20
Economic status	Depending on family	109	39.78
	Supporting family	138	50.36
	Receiving subsidy	27	9.85
Sector of current/last job	Digital efficient/mature sectors	92	32.20
	Physical proximity reliance sectors	194	67.80
Employment status of current/recent job	Full time contracts	131	46.13
	Part-time/temporary contracts	129	45.42
	Self employed	24	8.45
Position of current/recent job	Entrepreneur	19	6.88
	Manager	28	10.14
	Specialized personnel	74	26.81
	General duties employee	132	47.83
	Freelancer	23	8.33

status: 30.2% remained employed but in different working conditions (remotely, reduced working time and payment) and 26.2% were out of employment (lost their job or cannot find one) due to COVID-19 consequences (Table 3).

The sample engages with the broader empirical literature (Wong et al. 2022; Gezici and Ozay 2020) testing the discrimination theories based on the gap in gender and age as 6 out of 10 who lost their job were women and 80.6% were under 35 years of age. The argumentation about new digital job opportunities does not seem to be confirmed in our research as only 3.2% of the sample found work in digital occupation/platform which follows the country's digital hysteresis.

Table 3 Change of employment status

	Frequency	Percent	Valid percent
Keep job intact	112	39.2	40.30
Employed but in different working condition	84	29.3	30.20
Lost their job or cannot find one	73	25.5	26.20
Found work in digital occupation/job	9	3.1	3.30
Total valid	278	97.2	100.00
Missing	8	2.8	
Total	286	100	

4.2 Employment Change and the Workplace

One of the major issues on the impact of COVID-19 on the labor force is the dramatic increase in remote employment. For exploring the employment changes for those who could or had to work at home, we examined the relationships between workplace and employment status (comparing the categories indicating job changes flexible contract, reduced time/wages and job losses with physical versus digital workplace) using χ^2 and Fisher's exact tests; ($\chi^2 = 3.791$, $p > 0.05$, F -test > 0.05) (Table 4).

Our data showed that the pandemic effects on employment status were not related to respondents' workplace environment. This can be attributed to the fact that our research was conducted during Q4 2021 when most lockdown measures were abolished.

Table 4 Impact of the workplace on employment status

Chi-square tests					
	Value	df	Asymptotic significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson chi-square	3.791 ^a	1	0.052		
Continuity correction ^b	2.946	1	0.086		
Likelihood ratio	3.943	1	0.047		
Fisher's exact test				0.065	0.041

^a 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.22

^b Computed only for a 2×2 table

4.3 *Employment Change and the Sector of Occupation*

As mentioned above, employment changes during the pandemic came in economic sectors with large shares of high physical proximity workers e.g., accommodation and food services, health care and social assistance, retail trade, arts, entertainment and recreation, and educational services.

Descriptive data showed that; 44.9% of those occupied in sectors relying on digital proximity kept their job intact; 28.1% kept their jobs but in different terms; 27% lost their job/did not find a new one. From those occupied in sectors of physical reliance, 38.1% kept their job intact 31.2% kept their jobs but in different terms; 25.9% lost their job and 4.8% found a new job (Table 5).

Table 5 Sector of occupation on employment status

		Keep job intact	Keep job in different working conditions	Lost their job or cannot find one	Found a new job	Total
Digital efficient and mature sectors	Count	40	25	24	0	89
	% Within sector of current/last job	44.9%	28.1%	27.0%	0.0%	100.0%
	% Within how COVID-19 has affected your employment status	35.7%	29.8%	32.9%	0.0%	32.0%
	% of Total	14.4%	9.0%	8.6%	0.0%	32.0%
Physical proximity reliance sectors	Count	72	59	49	9	189
	% Within sector of current/last job	38.1%	31.2%	25.9%	4.8%	100.0%
	% Within how COVID-19 has affected your employment status	64.3%	70.2%	67.1%	100.0%	68.0%
	% of Total	25.9%	21.2%	17.6%	3.2%	68.0%
Total	Count	112	84	73	9	278
	% Within sector of current/last job	40.3%	30.2%	26.3%	3.2%	100.0%
	% Within how COVID-19 has affected your employment status	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	40.3%	30.2%	26.3%	3.2%	100.0%

Even though jobs in work arenas with higher levels of physical proximity are likely to see greater transformation after the pandemic, we noted no significant difference between the changes in employment status (keep job intact, keep job in different conditions or job loss) and the sector of occupation (digital efficient and mature sectors or physical proximity reliance sectors) ($\chi^2 = 0.770, p > 0.05$).

4.4 Employment Change and Employment Contract

In the wake of Greece's pandemic outburst dramatic, unrepresented and previously untested employment changes arose. In Greece, as elsewhere, changes in contractual obligations and employment agreements included clauses such as wages deductions, business interruption clauses and lawful suspension clauses were imposed form as a national state emergency.

Our data showed that there is a statistically significant relation between employment terms and change of employment status (Chi squared 49.86; df. 4; sig. 0.001 * excluded variable: "found a new job"). Specifically, 58.6% of those with permanent/ full-time employment contacts kept their job intact; the percentage for the self-employed is slightly lower (54.5%). From those in temporary employment (in absolute numbers almost equal to permanent contacts) 41.7% lost their job or cannot find one; 33.9% kept their job under different terms; and just 19.7% kept their job intact. A remarkable 41.7% of those who lost their job was engaged in temporary employment contracts. Confirming the findings of a study released by Eurofound and the European Union Joint Research Centre (Eurofound 2021), we argue that employees on temporary contracts were the most affected by job losses and job changes during COVID (Fig. 6).

5 Conclusions and Discussion

COVID 19 crisis has generated many challenges in the labor market. Before the outburst of the pandemic, large work disruptions were already taking place as a consequence of technological change towards digitalization and high-level automation. However the Greek economy was not affected from these changes due to digital hysteresis of the industry and human capital. The businesses lockdown mandated by the state, for the first time in March 2020 and for the second in November 2020 on a nationwide scale, created through an unprecedented economic dualism. Among classic taxonomies for enterprises and organizations (small and medium-sized enterprises, export or non export, innovative or non innovative, between primary, secondary and tertiary sector enterprises etc.) another dimension was added, which divided companies: physical proximity.

In our research on the relationship between changes of employees occupied in work arenas with different levels of digital integration and physical proximity



Fig. 6 Employment status and job gains/losses

reliance, we noted no significant differences. As indicated, COVID-induced digitalization has deteriorated the employment status and conditions equally in digitally operating as well as in physically relying sectors. As just a part of the labor force returned to their physical workplace, the discourse for the future of work is transposed in terms of remote job efficiency and the shift to hybrid working models in the post-COVID era. It includes debates on the evolution of the workplace context (physical, digital, hybrid) and the consequent employment policies and management strategies.

Likewise, as the economy retracted during COVID-19-related shutdowns, someone would expect highly qualified employees not to be affected by unemployment. However, in our sample, more than half of the respondents faced the deterioration in work conditions, lost their jobs or had to seek for a new job. In fact, unemployment for qualified young people is not a pandemic snapshot in Greece. It has become a persistent situation as no structural changes in the country's economy can promise a better future. Several studies predict that around one-tenth of the workforce is in occupations that are likely to grow as a percentage of the workforce. Around one-fifth is in occupations that will likely shrink (estimation which is even lower in recent studies of automation). This means that roughly seven in ten people are currently in jobs where the future is hard to predict. However, findings about skills suggest that occupation redesign coupled with workforce retraining could promote growth in these occupations.

As the number of permanent employees according to the official data is also decreasing; the establishment of the temporary contracts (that seem to have been activated by the pandemic crisis) is a matter of further consideration. Our data showed

a significant relation between employment terms and changes in employment status. Young people are facing a dramatic change in working conditions (for example zero hours contracts, low wages, lack of progression opportunities, dissatisfaction with current employment, or varying hours) and many scholars underline the need for policy measures that could protect and encourage engagement with practices for a more stable labor market and more inclusive societies.

Finally, it is necessary to underline several limitations of our research. First, the focus has been on highly educated employees younger than 35 years of age; thus, older and longtime employed respondents were excluded from our sample. Second, the period our research was carried out right after the abolishment of COVID-19 restrictions. Moreover, a significant dimension of analysis for future research is the level of digital integration of the Greek economy across sectors and occupations as well as the risk of employment precariousness and deterioration that digitalization may cause.

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On the Dynamics of a Heterogeneous Duopoly Game in R&D Efforts



Georges Sarafopoulos and Despoina Terzopoulou

Abstract Nowadays, the market competition among the firms has changed. They have to compete not only the price and amount of their products, but also their R&D (Research and Development) part. This paper is based on the work of Zhou et al. (Hindawei, Complexity, Article ID 9634878, 2020). We investigate the dynamics of a duopoly game with heterogeneous players participating in R&D efforts. Existence and stability of equilibria of this system are studied. Numerical simulations are carried out to show the effect of the speed of adjustment of the bounded rational player on the dynamics of the system. We show that the speed of adjustment of the bounded rational player may change the stability of the Nash equilibrium and cause a structure to behave chaotically. For low values of this parameter there is a stable Nash equilibrium. Increasing these values, the equilibrium becomes unstable, through period-doubling bifurcation.

Keywords Discrete dynamical system · Heterogenous expectations · Stability · Chaotic behavior · R&D

JEL Classification Number C62 · C72 · D43

1 Introduction

Nowadays, with emerging technologies and fast-changing markets, R&D (Research and Development) in business is more important than ever. R&D is an activity that companies undertake in order to develop new products, improve production efficiency, reduce production costs and become more competitive to the market. In fact, in Greece, from 2010 to 2019, business R&D intensity increased from 0.24 to 0.59%

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and R&D tax incentives accounted for 18% of total government support in 2019 (OECD 2021). That's the reason why R&D activity has been attracting more and more the attention of economists.

Some of them, have studied the case of R&D spillover effect emerging among firms (Chatterjee 2019; D'Aspremont and Jacquemin 1988; Ferreira et al. 2012; Griliches 1992; Kultti and Takalo 1998; Luckraz 2011; Zhou et al. 2019; Zhou and Wang 2019). Other researchers have focused on technology spillover (D'Aspremont and Jacquemin 1988; Kamien et al. 1992).

In our study we focus on evolution process among the firm's game using nonlinear dynamics theory. In duopoly game, some authors considered homogenous expectations (Agiza 1999; Agiza et al. 2002; Agliari et al. 2005, 2006; Bischi and Kopel 2001; Kopel 1996; Puu 1998; Sarafopoulos 2015a, b; Zhang et al. 2009) and others heterogenous expectations (Agiza and Elsadany 2003, 2004; Agiza et al. 2002; Den Haan 2001; Hommes 2006; Gao 2009; Sarafopoulos and Papadopoulos 2017, 2019, 2020; Tramontana 2010; Zhang et al. 2007, Wu et al. 2010). This study based on Zhou et al. (2020), presents a Cournot-type duopoly game with different products where each firm behaves with heterogenous expectation strategy. The main purpose is to investigate the influence of continuous change in the bound rational firm's speed of adjustment. The local stability of boundary equilibrium and Nash equilibrium is provided by Jury criterion and numerical simulation to obtain the internal complexity of the model. It is shown that the model not only loses its stability but also gives more complex chaotic and unpredictable trajectories due to change in the bound rational firm's speed of adjustment.

This research is organized as follows. Section 2 includes a two-stage dynamical game model where two firms have different expectations. In Sect. 3, we discuss the stability and the conditions of stability of equilibrium points. Later numerical simulations are concluded in Sect. 4. The complexity of game's discrete dynamical system is revealed via computing Lyapunov numbers, strange attractor and a sensitive dependence on initial conditions using simulations for specific values of the game's parameters. Thus, the impact of adjustment speed is discussed. Finally in Sect. 5, some research conclusions are summarized.

2 The Model

This paper considering R&D activity of firms, analyzes the process of competition between two R&D firms. We assume the two firms supply homogenous products to the market and have heterogenous expectations. Firm 1 chooses the price of its product in rational way while firm 2 chooses it in a naïve way. The meaning of each parameter and variable is shown below:

p_i : price of the firm $i = 1, 2$

q_{3-i} : outputs of the firm $i = 1, 2$ and its rival.

a : maximum scale of the market.

b : differential degree of the products.

x_i : R&D efforts of the firm $i = 1, 2$

c : marginal cost of two firms without presence of R&D efforts.

γ : technical innovation cost.

The inverse demand function is

$$p_i(q_i, q_{3-i}) = a - q_i - bq_{3-i}, i = 1, 2 \tag{1}$$

where $a > 0$ and $b = \begin{cases} 0, & \text{if the products are independent} \\ 0 < b < 1, & \text{if the products can replace each other} \\ 1, & \text{if the products are identical} \end{cases} \tag{2}$

We suppose that technology is totally confidential and not shared between the two firms, so the effective marginal cost of firm i is.

$$C_i(x_i) = c - x_i, i = 1, 2 \tag{3}$$

where $a > c > 0$ and the investments of firm i are

$$I(x_i) = \frac{\gamma x_i^2}{2}, i = 1, 2 \tag{4}$$

Due to the Eqs. (1), (3) and (4) above, the profit functions of firm 1 and 2 are

$$\begin{cases} \pi_1(q_1, q_2, x_1, x_2) = [(a - q_1 - bq_2) - (c - x_1)]q_1 - \frac{\gamma x_1^2}{2} \\ \pi_2(q_1, q_2, x_1, x_2) = [(a - q_2 - bq_1) - (c - x_2)]q_2 - \frac{\gamma x_2^2}{2} \end{cases} \tag{5}$$

and the marginal profits are

$$\begin{cases} \frac{\partial \pi_1}{\partial q_1} = a - 2q_1 - bq_2 - c + x_1 \\ \frac{\partial \pi_2}{\partial q_2} = a - 2q_2 - bq_1 - c + x_2 \end{cases} \tag{6}$$

The Nash equilibrium of this static game is

$$\begin{cases} q_1^* = BR_1(q_2^*) \\ q_2^* = BR_2(q_1^*) \end{cases} \Leftrightarrow \begin{cases} \frac{\partial \pi_1}{\partial q_1} = 0 \Leftrightarrow q_1^* = \frac{(a - c)(2 - b) + 2x_1 - bx_2}{4 - b^2} \\ \frac{\partial \pi_2}{\partial q_2} = 0 \Leftrightarrow q_2^* = \frac{(a - c)(2 - b) + 2x_2 - bx_1}{4 - b^2} \end{cases} \tag{7}$$

and the profits at this NE are:

$$\begin{cases} \pi_1(x_1, x_2) = \frac{[(a - c)(2 - b) + 2x_1 - bx_2]^2}{(4 - b^2)^2} - \frac{\gamma x_1^2}{2} \\ \pi_2(x_1, x_2) = \frac{[(a - c)(2 - b) + 2x_2 - bx_1]^2}{(4 - b^2)^2} - \frac{\gamma x_2^2}{2} \end{cases} \quad (8)$$

As a result, the local marginal profits of R&D efforts x_i are given by,

$$\begin{cases} \frac{\partial \pi_1}{\partial x_1} = \frac{4[(a - c)(2 - b) + 2x_1 - bx_2]}{(4 - b^2)^2} - \gamma x_1 \\ \frac{\partial \pi_2}{\partial x_2} = \frac{4[(a - c)(2 - b) + 2x_2 - bx_1]}{(4 - b^2)^2} - \gamma x_2 \end{cases} \quad (9)$$

The final stage to construct the game’s discrete dynamical system contain the requirement of the players expectations, where the first firm is characterized as bounded rational player, who decides to increase his level of adaption in a mechanism if he has a positive marginal profit. So, firm 1 describes as

$$\frac{x_1(t + 1) - x_1(t)}{x_1(t)} = a_1 \frac{\partial \pi_1}{\partial x_1} \Leftrightarrow x_1(t + 1) - x_1(t) = a_1 x_1(t) \frac{\partial \pi_1}{\partial x_1} \quad (10)$$

On the other hand, firm 2 is decided by a naïve way, selecting this x_2 price that maximizes its profits:

$$x_2(t + 1) = BR_2(x_1^e(t + 1)) \Leftrightarrow x_2(t + 1) = \arg \max_{x_2} \pi_2(x_1^e(t + 1), x_2(t)) \quad (11)$$

where $x_1^e(t + 1)$ is the expected value of the first player and we suppose that $x_1^e(t + 1) = x_1(t)$.

Thus, the dynamical system in $t + 1$ period is described by,

$$\begin{cases} x_1(t + 1) = x_1(t) + a_1 x_1(t) \frac{\partial \pi_1}{\partial x_1} \\ x_2(t + 1) = \frac{4(a - c)(2 - b) - 4bx_1}{\gamma(4 - b^2)^2 - 8} \end{cases} \quad (12)$$

where the adjustment speed of the bounded rational player (firm 1) $\alpha_1 > 0$ and determines the variation ratio of R&D efforts x_1 of firm 1 in the next period.

Due to (9), the dynamic system (12), can be obtained as,

$$\begin{cases} x_1(t + 1) = x_1(t) + a_1 x_1(t) \left\{ \frac{4[(a - c)(2 - b) + 2x_1 - bx_2]}{(4 - b^2)^2} - \gamma x_1 \right\} \\ x_2(t + 1) = \frac{4(a - c)(2 - b) - 4bx_1}{\gamma(4 - b^2)^2 - 8} \end{cases} \quad (13)$$

3 Equilibrium Points and Local Stability

In system (13), we set $x_1(t + 1) = x_1(t)$ and $x_2(t + 1) = x_2(t)$. Therefore, the equilibria of the dynamical system (13) are obtained as nonnegative solutions of the algebraic system

$$\begin{cases} a_1 x_1(t) \left\{ \frac{4[(a-c)(2-b) + 2x_1 - bx_2]}{(4-b^2)^2} - \gamma x_1 \right\} = 0 \\ x_2(t) = \frac{4(a-c)(2-b) - 4bx_1}{\gamma(4-b^2)^2 - 8} \end{cases} \tag{14}$$

If $x_1(t) = 0$, then $x_2(t) = \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8}$ and $E_0 = \left(0, \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8}\right)$ is boundary equilibrium point.

If $\frac{4[(a-c)(2-b) + 2x_1 - bx_2]}{(4-b^2)^2} - \gamma x_1 = 0$, then $x^* = x_1^* = x_2^* = \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8 + 4b}$ and $E_1 = \left(\frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8 + 4b}, \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8 + 4b}\right)$ is a Nash equilibrium point. In order to study the local stability of the above equilibrium points, we consider the Jacobian matrix of the system (13):

$$J = \begin{bmatrix} 1 + \alpha_1 \left(\frac{\partial \pi_1}{\partial x_1} + x_1 \frac{\partial^2 \pi_1}{\partial x_1^2} \right) & a_1 x_1 \frac{\partial^2 \pi_1}{\partial x_1 \partial x_2} \\ -\frac{4b}{\gamma(4-b^2)^2 - 8} & 0 \end{bmatrix} \tag{15}$$

and $J(E^*)$ the Jacobian matrix at an equilibrium E^* . It is known that:

- (a) If all the eigenvalues of $J(E^*)$ lie inside the unit disk in the complex plane, then E^* is (locally) asymptotically stable
- (b) If at least one eigenvalue of $J(E^*)$ is outside the unit disk in the complex plane, the equilibrium E^* is unstable (Elaydi S.,2005).

Proposition 1: The boundary equilibrium point E_0 is an unstable equilibrium point.

Proof The Jacobian matrix at $E_0 = \left(0, \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8}\right)$ is

$$J(E_0) = \begin{bmatrix} 1 + a_1 \left[\frac{4(a-c)(2-b) - 4b \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8}}{(4-b^2)^2} \right] & 0 \\ -\frac{4b}{\gamma(4-b^2)^2 - 8} & 0 \end{bmatrix} \tag{16}$$

The above matrix has two eigenvalues $\lambda_1 = 1 + a_1 \left[\frac{4(a-c)(2-b) - 4b \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8}}{(4-b^2)^2} \right]$ and $\lambda_2 = 0$. With conditions where $a_1 > 0$ and.

$\frac{4(a-c)(2-b) - 4b \frac{4(a-c)(2-b)}{\gamma(4-b^2)^2 - 8}}{(4-b^2)^2} = \frac{4(a-c)(2-b) \left(1 - \frac{b}{\gamma(4-b^2)^2 - 8}\right)}{(4-b^2)^2} > 0$, because of $a > c, 0 \leq b \leq 1$, because of $a > c, 0 \leq b \leq 1$ and $\gamma > \frac{8}{(4-b^2)^2}$, then $|\lambda_1| > 1$. Thus E_0 is an unstable equilibrium point.

Proposition 2: The Nash equilibrium point E_1 of the system is locally asymptotically stable provided that the following hold: $0 < \alpha_1 < \frac{2A}{(A^2+B^2)x^*}$ and $-A < B < A$.

Proof In order to investigate the local stability of Nash equilibrium point E_1 , we calculate the Jacobian matrix at E_1 , where

$$J(E_1) = \begin{bmatrix} 1 + a_1x_1 \frac{\partial^2 \pi_1}{\partial x_1^2} & a_1x_1 \frac{\partial^2 \pi_1}{\partial x_1 \partial x_2} \\ -\frac{4b}{\gamma(4-b^2)^2-8} & 0 \end{bmatrix} = \begin{bmatrix} 1 + a_1x_1 \left(\frac{8}{(4-b^2)^2} - \gamma \right) & a_1x_1 \left(-\frac{4b}{(4-b^2)^2} \right) \\ -\frac{4b}{\gamma(4-b^2)^2-8} & 0 \end{bmatrix} \tag{17}$$

We set $A = \frac{\gamma(4-b^2)^2-8}{(4-b^2)^2} > 0$ because of $\gamma > \frac{8}{(4-b^2)^2}$ and $B = \frac{4b}{(4-b^2)^2} > 0$ because of $0 \leq b \leq 1$ so, $\frac{B}{A} = \frac{4b}{\gamma(4-b^2)^2-8} > 0$ and the $J(E_1)$ is as follows:

$$J(E_1) = \begin{bmatrix} 1 - a_1x^*A & -a_1x^*B \\ -\frac{B}{A} & 0 \end{bmatrix} \tag{18}$$

If the eigenvalues λ_1, λ_2 of the Jacobian matrix $J(E_1)$ are inside the unit disk in the complex plane the Nash equilibrium of the dynamical system is locally asymptotically stable. It is known that $|\lambda_1| < 1, |\lambda_2| < 1$ if and only if

$$\begin{cases} D < 1 \\ 1 + T + D > 0 \text{ (Schur-Cohn Criterion),} \\ 1 - T + D > 0 \end{cases} \tag{19}$$

$$\text{where } D = -\frac{a_1x^*B^2}{A} \text{ and } T = 1 - a_1x^*A \tag{20}$$

the determinant and the trace of the Jacobian matrix $J(E_1)$. Since $a_1x^*B^2 > 0$ and $A > 0$, then $D < 0 \Rightarrow D < 1$ and the 1st condition is confirmed. Therefore,

$$\begin{aligned} 1 + T + D > 0 &\Rightarrow 2 - a_1x^*A - \frac{a_1x^*B^2}{A} > 0 \Rightarrow 2 - a_1x^* \left(\frac{A^2 + B^2}{A} \right) > 0 \Rightarrow \\ \Rightarrow a_1 &< \frac{2A}{(A^2 + B^2)x^*} \end{aligned} \tag{21}$$

In order to be satisfied the 3rd condition

$$1 - T + D = a_1x^*A - \frac{a_1x^*B^2}{A} = a_1x^* \left(\frac{A^2 - B^2}{A} \right) \tag{22}$$

must occur $-A < B < A$. Obviously, the Nash equilibrium point E_1 is stable node, when $0 < a_1 < \frac{2A}{(A^2+B^2)x^*}$ and $-A < B < A$ is satisfied. However, if a_1 goes beyond the stability region, more complex phenomena in terms of evolution of outputs will occur such as bifurcation and chaos.

4 Numerical Simulations

In this section, we analyze the dynamic behavior of the two firms and observe the influence of the adjustment speed of a_1 . We show that the model gives more complex chaotic and unpredictable trajectories as a consequence of change in the parameter a_1 . In order to study the local stability properties of the equilibrium points, fixed values for the parameters are taken, as follows: $a = 61, b = 0.85, c = 51.5, \gamma = 2$. Thus, $A = 13.48, B = 0.316$. Then the Nash equilibrium position is the point $E_1 = (2.588, 2.588)$ and the stability condition becomes $0 < a_1 < 0.579$. The complex (chaotic) dynamics are justified via bifurcation diagrams, by computing numerically Lyapunov numbers and sensitive dependence on initial conditions. The algebraic result is verified by the bifurcation diagrams of the x_1 (Fig. 1) and x_2 (Fig. 2) with respect to the parameter a_1 .

As the Figs. 1 and 2 show, there is a locally asymptotically stable orbit until $a_1 < 0.579$. After this point, the period of bifurcations doubles, then quadruples and finally, for higher values of a_1 the system's behavior becomes chaotic and unpredictable. For $a_1 > 0.579$, outside the stability space, this chaotic trajectory can create strange attractors (Fig. 3).

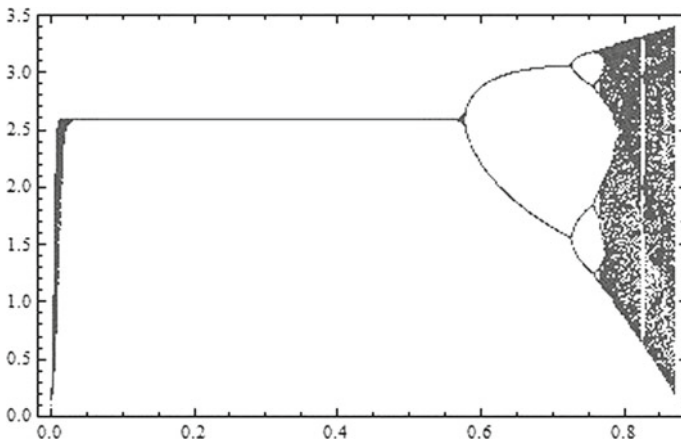


Fig. 1 Bifurcation diagram with respect to the parameter a_1 against the variable x_1 with 150 iterations of the map Eq. (13) for $a = 61, b = 0.85, c = 51.5, \gamma = 2$

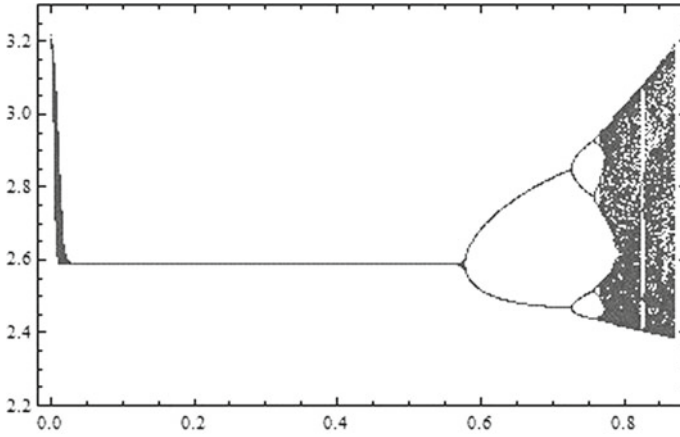
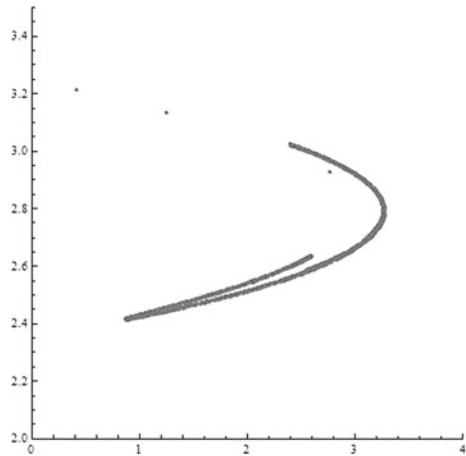


Fig. 2 Bifurcation diagram with respect to the parameter a_1 against the variable x_2 with 150 iterations of the map Eq. (13) for $a = 61$, $b = 0.85$, $c = 51.5$, $\gamma = 2$

Fig. 3 Phase portrait (strange attractor) of the orbit of $(0.1, 0.1)$ with 2000 iterations of the map Eq. (13) for $a = 61$, $b = 0.85$, $c = 51.5$, $\gamma = 2$ and $a_1 = 0.8$



Also, for $a_1 = 0.8$ and the same fixed values for the other parameters a, b, c and γ the Lyapunov numbers become greater than 1 as evidence of the chaotic trajectory (Fig. 4).

This chaotic trajectory makes the system sensitive to the initial conditions. Therefore, a small change on a coordinate may change completely the system’s behavior. As an example, we choose two different initial conditions $(0.1, 0.1)$ (Fig. 5, left) and $(0.101, 0.1)$ (Fig. 5, right) with a small change at the x_1 -coordinate and plotting the time series are indistinguishable, but after a few iterations, the difference between them builds up rapidly.

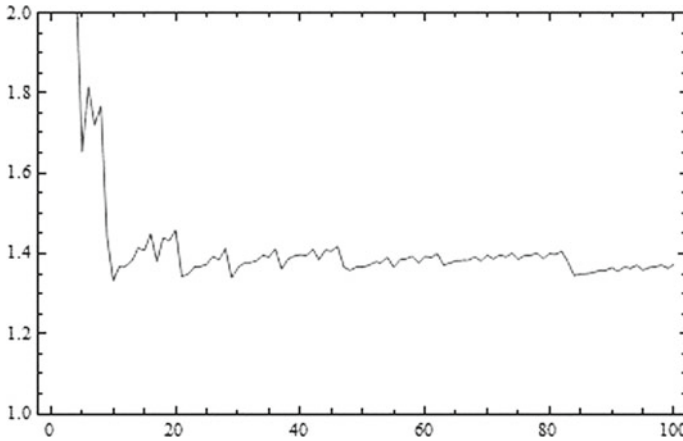


Fig. 4 Lyapunov numbers of the orbit of $(0.1, 0.1)$ with 2000 iterations of the map Eq. (13) for $a = 61, b = 0.85, c = 51.5, \gamma = 2$ and $a_1 = 0.8$

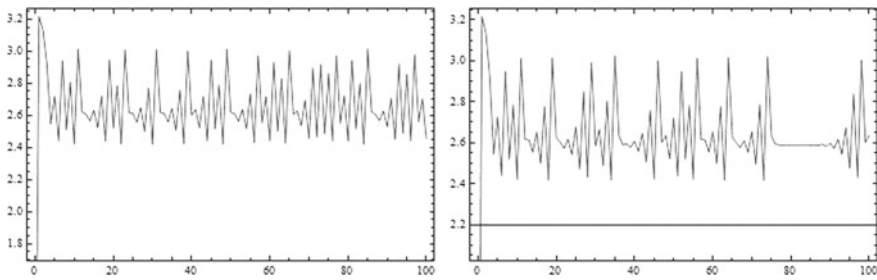


Fig. 5 Sensitive dependence on initial conditions for x_1 - coordinate plotted against the time: of the orbit of $(0.1, 0.1)$ (left) and $(0.101, 0.1)$ (right) of the system Eq. (13) for $a = 61, b = 0.85, c = 51.5, \gamma = 2$ and $a_1 = 0.8$

5 Conclusion

In this study, a dynamic game involving two firms and a decision-making game model is established based on a bounded rationality player and a naïve player. At the same time, we analyze the dynamic behavior of those two players and the equilibrium points. In comparison to Zhou et al. (2020) study, we show that when firms make different decisions, there are only two equilibrium points (one unstable boundary equilibrium and one Nash equilibrium) and the phenomenon of multistability does not occur, making it easier to control the complexity of the system.

The numerical simulations show that when the adjustment speed of bounded rationality player is small, the system is stable. The increase of adjusting speed leads to the complexity of eventual behavior of the dynamical system through period-doubling bifurcation.

As a result, the route of period-doubling is generated in constant choice between firms. This process of evolution presents the properties of “certainty” and “irregular development,” where “certainty” means that the way of bifurcation, that is to say, flip bifurcation, and “irregular development” means that the interior structure of strange attractors. The dynamical system presents a high of certainty and complexity. That means the economic system makes mistakes in predicting, due to the influence of the external condition, and the development of economy cannot be forecasted anymore (Zhou et al. 2020).

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Gamification in Greek Social Enterprises



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Abstract Social enterprises are an important type of business. In recent years, several kinds of social enterprises have emerged in order to facilitate people—mainly with minor opportunities—to penetrate into the market. However, most of these social enterprises face serious internal problems in their operation that undermine their viability. The lack of members' communication as well as of cooperative culture are among them. In Greece, there exists strong opportunistic behavior among members of social enterprises because of these attributes. It appears that the traditional methods of cooperative education are not appropriate. The aim of this paper is to examine whether gamification, as an innovative digital educational tool, can reduce opportunistic behavior that creates obstacles in interpersonal communication. According to the literature review, gamification can enhance the cooperative culture among members. Unfortunately, although this is applied in both developed and developing countries with impressive results on social enterprises, in Greece it is at an early stage. Qualitative research was conducted with cooperative and market experts as well as cooperative members/CEO in early 2022. The first results reveal that such methods are missing from the market and are an important methodological tool especially for categories of people with a wide range of interests and knowledge. Gamification

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can easily and pleasantly transfer knowledge and experiences to people for whom traditional methods of education are not suitable.

Keywords Social enterprises · Communication · Opportunistic behavior · Governance · Gamification

1 Introduction

In recent years, several kinds of social enterprises have emerged in order to facilitate people—mainly with minor opportunities to penetrate into the market. However, they increasingly face complicated internal as well as external problems that need specialized knowledge and experience to overpass them (Van Dijk et al. 2019). Internal problems are related to governance issues like democratic decision making, unequal distribution of roles, opportunistic behavior, poor management of resources, leadership issues etc. External problems are mainly related to market imperfections.

Teaching experience led us to the conclusion that trying to offer economic lessons to the members of social enterprises is not an easy task mostly because of the members' heterogeneity. Moreover, the study of social enterprises as a two-layer entrepreneurial model requires practicing that goes beyond lecturing and textbook analytics. Therefore, another educational approach should be used in order to create the appropriate conditions for cooperative education (Van Dijk et al. 2019).

Gamification, broadly defined, is an educational approach to motivate people to learn by using video game design and game elements in learning environments. The goal is to maximize enjoyment and engagement through capturing the interest of learners and inspiring them to continue learning.¹ In the past many people meant that gaming is just for fun or even worse; that it is useless and distracts from serious things like study and work. Although fun is a very important element, various recent studies have shown that gaming is much more than that. Gaming teaches us how to learn. It stimulates our fluid intelligence, our ability to solve problems and learn new skills, in a much more thorough manner than traditional forms of education. Gaming also trains people to be motivated and focused. Motivation and focus are the most important factors for changing behavior.

Several universities, institutions and companies have developed games on entrepreneurship in the field of collective action to train members by letting them understand differences between cultures and technical practices and how to take advantage of those by letting them play and exchange practice and new ideas. For example, members of agricultural cooperatives are trained how to manage their business and the cooperative business at the same time. Farmers in various cultures have shown to be able to understand and act in two level entrepreneurship: at the level of individual members and at the level of the cooperative firm. By playing through the game, cooperative members experience what it is like to be an entrepreneur.

¹ Retrieved from https://en.wikipedia.org/wiki/Gamification_of_learning.

More specifically, the players and their cooperative business make decisions about the input of the farm, the cash, their investments both in the farm and in the cooperative, processing and selling their crops. While the years pass, the players encounter various events that have an effect on their business and how to solve unexpected problems. After players understand their own business, they learn how to organize themselves as a group and participate in a cooperative enterprise (van Dijk et al. 2019).

The main aims of the present paper are to investigate:

- The social attributes that build up democratic governance and the consequences of opportunistic behavior among members
- The potentials of gamification in reducing opportunistic behavior in social enterprises by increasing the members engagement and involvement in the collective affairs

In order to address the first research question of this study the authors employed a literature review. The analysis of literature is presented in the first part of the “Theoretical framework” section below. The second research aim of this study is answered through an empirical approach consisted of interviews with cooperative experts.

The remainder of this article is structured as follows. We first review the extant literature on the social attributes that build up demographic governance and the role of opportunistic behavior as a serious obstacle for the democratic governance of social enterprises. Moreover, we present the benefits of gamification as a tool of reducing opportunistic behavior for the social enterprises and their members. Subsequently, we present the methodology used as well as the research questions of the qualitative research. In the following part, we present the outcomes of interviews with cooperative members, academics and cooperative experts. Finally, we conclude this article with theoretical and practical implications.

2 Theoretical Framework

Social Enterprises are patron-owned organizations which adopt different government models featuring diverse patronage, residual income and control rights arrangements (Chaddad and Iliopoulos 2013). Due to their collective nature and idiosyncratic organizational structure, customarily encounter a set of collective action issues, commonly known as the horizon, portfolio, free-rider, control, and influence cost problems, which affect how individuals (e.g., members and managers) behave, and hence, how collective organizations perform (Vitaliano 1983; Staatz 1987; Cook 1995; Nilsson 2001; Ortmann and King 2007; Cechin et al. 2013). The majority of new members ignores institutional and behavioral economics and therefore easily worsen these problems.

Undoubtedly, people become members in social enterprises, like agricultural cooperatives, because they seek to benefit in personal level. Usually, the new members

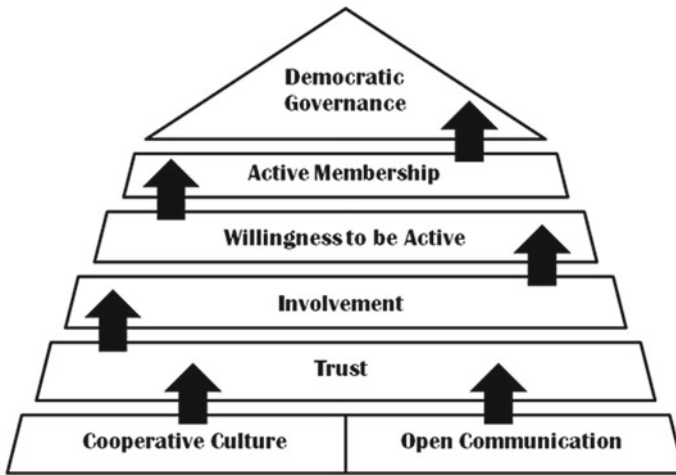


Fig. 1 Social attributes that build up democratic governance. *Source* Retrieved from Verhees et al. (2015)

neither have the cooperative culture nor the appropriate knowledge to understand the principles of cooperation. Consequently, they have difficulties in understanding the concept of democratic governance and often display opportunistic behavior towards both the cooperative itself and the other members. The active participation of members helps to understand how the cooperative operates and is governed.

In order to achieve the democratic governance, other components of the social capital must be pre-existing. The pyramid below shows the stages that lead to an increase in social capital and the democratic governance of social enterprises (Fig. 1).

Further down, we explain the way each attribute affects the upper levels of the pyramid resulting in the democratic governance of the social enterprise.

2.1 Cooperative Culture

The members' cooperative culture is the combination of the values, norms and beliefs that characterize an individual and steer his/her decisions toward believing in the significant value for the cooperative for his/her survival, as well as the survival of the community he/she belongs to (Verhees et al. 2015). When the member understands the significance of the cooperative's prosperity and identifies himself as part of the means to achieve it, he might become more interested in participating in the formulation of the strategies, show more trust in the BoD and finally become more committed to the collective enterprise (Borgen 2001; Österberg and Nilsson 2009).

The member's cooperative culture and consequently his/her commitment to the collective enterprise are often defined by his/her personal characteristics. The discrete characteristics of each cooperative member may affect the final outcome of his/

hers demonstrated level of commitment; as an example, according to Trechter et al. (2002), the level of the member's formal education and the level of commitment increase accordingly. On the other hand, regarding the relationship between the level of formal education and the member's preferences on strategic orientation, Cechin et al. (2013), suggests that as the level of formal education increases the members tend to prefer more customer-oriented strategies. Additionally, several studies (Gray and Kraenzle 1998; Trechter et al. 2002) point out the positive relation between the level of member's commitment and the association and involvement of members in activities related to the cooperative management (e.g. serving in the cooperative BoD's, taking part in various committee works) as well as participating in education and training seminars addressing the matters around the cooperative culture and ideology. As a result, the member's involved in such activities appear to be more active and committed in comparison to others.

2.2 Open Communication

Open communication between management and members helps to develop capacities of both managers and members to listen and respond to genuine concerns (Brown et al. 2013; Baseman 2012). High quality of communication between the cooperative and the member and among the members increases the member's capacity of understanding the basis of cooperative function and furthermore increases their trust to the collective enterprise. In addition, Baseman (2012) grounds the cooperative's failure to adequate communication between the members, the BoD and the local community.

In order to further contain the degree of asymmetric information between the members and the management officials of the cooperative, constant and continuous effort toward the enhancement of communication is needed (Verhees et al. 2015). Barraud-Didier et al. (2012), points out to the significance of establishing a stable basis of information flow, for this may have an impact in reducing the transaction costs of the cooperative. They furthermore state that the social bonds between the members and the cooperative may be strengthened, through the empowerment of the member's feeling of solidarity by being a member of a social group. Cooperative training strengthens the trust bond between the members and the cooperative, and furthermore enhances his/hers willingness to openly communicate with the cooperative.

2.3 Trust

The trust members lay on the cooperative is based on their belief that the cooperative will take action to provide a positive outcome to their wellbeing. Several studies (Barraud-Didier et al. 2012; Kalogeras et al. 2007) point out to the positive relationship between the member's level of trust and the likelihood that this members will

be more willing to actively participate to the common cooperative affairs. Chloupkova et al. (2003) highlight the high degree of association between strong bonds of trust within the cooperative and the building of social capital as an asset for the cooperative.

Trust is built when the members realize the benefits provided by the existence of strong cooperatives in the market. Through cooperative education and training the members are able to identify the functional mechanisms of cooperatives and ultimately actively support the collective enterprise (Manousakis et al. 2021).

2.4 Involvement

Members' involvement with the cooperative is a mixture of motivation, activation and interest which presumes the close relationship between the cooperative and its members. It also reflects the members' willingness to act collectively (Swoboda et al. 2009). Members' involvement with the cooperative is a prerequisite to spend time on the governance of the cooperative and participate actively (Van Dijk and Klep 2008).

The involvement of members in the organizational functions is considered to be of high significance for the vitality of the cooperative in the long term, since involvement assists the transformation of trust in the willingness to be active on behalf of the members (Verhees et al. 2015). Cooperative education assists members to understand the essence of their involvement for the improvement of the democratic governance procedures of the cooperative.

2.5 Willingness to Be Active

The members' willingness to be active in the cooperative is interpreted in the way that members are encouraged to sacrifice their personal time for participating in committees and meetings related to the cooperative governance. In the existing literature (Verhees et al. 2015) efforts are focused on the explanation of the reasons that drive members to alienate themselves with the cooperative affairs (i.e. low expectations for the cooperative viability, intensive competition between members of the same cooperative, weak sense of cooperative ideology), rather to the reasons that motivate them to participate in the common affairs. The members' willingness to be active is mentioned in Barraud-Didier et al. (2012), as a prerequisite in the member's mentality for demonstrating more reciprocal behaviors and achieving efficient cooperation with other members.

2.6 Active Membership

Active membership is interpreted as the voluntary contribution made by members by participating in the cooperative's affairs and their dynamic involvement in decision-making procedures aiming on strengthening both the cooperative as an entity and the members individually. Consequently, the concept of active membership in social enterprises has become of vital importance for ensuring that the members will not lose their control rights, their needs will be taken into account during the formulation of the cooperative's strategies and ultimately, the cooperative will remain in a positive performance course (Barraud-Didier et al. 2012).

In the literature regarding organizational behaviour (Österberg and Nilsson 2009; Bhuyan 2007; Hudson and Herndon 2002), a distinction is made between the diversified nature of the member's association with the cooperative into three distinct roles, those roles are the "governance", the "owner" and the "patron" role. The "governance" role refers to the active participation of the member in meeting, committees and taking action when something appears to be dysfunctional. The other two roles mostly refer to the transactions made between the member and the cooperative. The distinction between the two is made in the sense that the "owner" role refers to the equity contributions made by the member, while the "patron" role is demonstrated when a member actively transacts with the cooperative organization. In the present paper we focus on the importance of active membership in the "governance" role of the members.

Several scientific papers (Park and Siebert 2010; Bhuyan 2007; Fulton and Giannakas 2001), describe the decreasing active membership as an issue of high importance for many social enterprises. Especially to those characterized by large number of memberships, with homogeneous preferences, and operate in a wide spectrum of business activities. Consequently, the large diversification among the members may provide a fertile ground for conflicts and disagreements to arise. The result may be that the social enterprise faces significant cost of resolving conflicts and becomes paralyzed. The rational choice theory mentioned by Olson (1989), focuses on the fact that people are not always willing to collaborate in order to achieve a specific goal that is common for all of them. Instead, they tend to exploit the effort of others by demonstrating "free riding" behaviors, unless there exist personal "selective incentives" which they calculate to exceed the costs of participating in the collective effort.

Taking into consideration the remarks of each social attribute, we conclude that the democratic governance and the viability of cooperatives relies heavily on the before mentioned attributes. However, the social attributes building the democratic governance process are found to be in very low levels in social enterprises nowadays (Van Dijk et al. 2019). The low levels of social attributes strengthen the phenomenon of opportunistic behavior demonstrated by cooperative members and ultimately creates dysfunctions to the democratic governance procedures. Thus, finding ways and means to enhance the level of social attributes becomes a necessity for the success of social enterprises. Such a method, could be the learning through gamification, which

is increasingly employed to groups with heterogeneous characteristics like social enterprises members. Gamification is a promising, innovative method of learning. Further down, the theoretical framework for the potentials of the learning through gamification is presented.

2.7 *Gamification of Learning*

Game-based theory is considering gamified learning method, addressed to individuals that are not complied with classical methodologies of learning, as very effective. According to Larson (2019), the concept of gamification leverages the mechanisms applied in video games, which create stimulus to the psychology of the user, for potentially making real world activities more approachable and engaging. Gaming teaches us how to learn. It stimulates our fluid intelligence, our ability to solve problems and learn new skills, in a much more thorough manner than traditional forms of education. Gaming also trains people to be motivated and focused. Motivation and focus are the most important factors for changing behavior. Literature review suggests that through gamification we can leverage deeper and deeper learning as a form of pleasure in people's everyday lives, without any hint of school or schooling. A game-based method stimulates that people will take risks, explore and try new things (Lee 2015). Especially among young people in schools, the fear of failure can be an issue. By playing games, people will learn that failure is inevitable, but not irrevocable. In games you can always start over again.²

There are three specific characteristics of gamification of learning in social enterprises like agricultural cooperatives of particular importance: (a) Learning principles of gaming, (b) Scale and (d) Data.

2.7.1 **Learning Principles of Gaming**

Research shows us that games can be very effective educational tools. They incorporate several good learning principles, even when they are not specifically geared towards education. Baxter et al. (2017) demonstrated that employees prefer gamified learning over live lectures and other non-gamified methods of online training. The impact games have in the personality of the learner such as emotional, cognitive and social domains provide substantial motivation for him/her toward the learning process (Sailer et al. 2017) In the Investor Owned Firms (IOFs') setting, the application of gamification focuses on motivation recruitment and training of employees (Donovan and Lead 2012; Larson 2019). Additionally, through the gamified learning environment the users are able to familiarize with repetitive tasks, similar to the ones they are called to fulfill in the real world, experience failure and make choices again

² Retrieved from: https://en.wikipedia.org/wiki/Gamification_of_Learning.

and again in a risk-free environment (Dale 2014; Roh et al. 2016). Moreover, a game-based approach gives the opportunity to individualize learning for each cooperative member in a certain way.

2.7.2 Scale

Another important advantage of the game-based approach is that it has great opportunities to scale up, both in terms of quantity and quality. As the game has been developed it can relatively easily be implemented in other cooperatives. In comparison with more traditional learning methods it is easier to achieve, due to the fact that the role of counselors is much more limited in the game-based learning method. Therefore, there is less guidance and instructions necessary to implement this game successfully. In addition, this approach also provides opportunities for continuous quality improvements. The game can be further developed, new knowledge and insights can be processed and can be made easily available to member-users by means of updates. In this way, gamification of learning has high impact potential both in terms of scope and content.

2.7.3 Data

The game generates a variety of relevant data. First of all, data about the behavior and mind-set of players are observed. These data are very interesting for research purposes, both specifically for the further development and improvement of the game as research into more general context. The game also gives the possibility to function as an assessment, which provides a baseline measurement of competencies of the members at the start of their education, during their curriculum and when they finish this.

2.8 Practical Implications of Gamification of Learning

Other than the high degree of utility of gamified learning for research aims, there are several implications of gamification that can assist on the enhancement of the cooperative business affairs and mechanisms. By examining the international literature (Singh 2012; Armstrong et al. 2016; Georgiou and Nikolaou 2020) on the implication of gamified learning in the business environment addressed to employees, two main themes were identified. Firstly, the enhancement of communication within the organization between the management and the employees, and among the employees. Secondly, gamification in learning assists on increasing the engagement of employees to several corporate functions.

2.8.1 Enhanced Communication

Singh (2012), highlights the gamified learn systems in the workplace as positive and innovative for addressing issues faced by organizations and are related to the needs of the employee-learner within the environment of the organization. Hence, by the implementation of gamification methods for addressing the employees' needs the communication between the organization and the employee is strengthened. Gamification aims at influencing learning indirectly by affecting the users' behaviors and attitudes (e.g., engagement) other than learning itself, through the provision of instructional content which navigates and familiarizes the user with the subject of learning (Landers 2014). Aziz et al. (2017) state that gamification in employee learning and training aims on aligning their behavior with organizational strategies, tasks and disciplinary regulations. Thereby, employees are able to better understand the management's decisions and ultimately enhance the value of communication between them and the management.

2.8.2 Increased Engagement

Gamification can be implemented toward the increased stimulation of the users' motivation and furthermore increase his/hers' willingness to actively engage with their tasks within the organization. According to Armstrong et al. (2016), businesses utilize games as a mean of their HRM (Human Resources Management) to familiarize the potential employee with the business environment and the firms' vision and goals. In this sense, the potential employee can project himself working in the specific environment and create a better fit between himself and the organization. Gupta and Gomathi (2017), mention the high impact role of gamification in corporate training, for enhancing the employee's engagement with the organization and motivating them to tend their job responsibilities with a softer heart and greater enthusiasm. Specifically, the utilization of game elements such as avatars, fantasy and narrative may have a substantial impact on the users' engagement, motivation and entertainment (Georgiou and Nikolaou 2020). In the cooperative setting, higher engagement in the organization affairs is highly related with higher levels of member's active participation in the democratic decision-making procedures which are crucial determinants for success or failure of the cooperatives' democratic governance model.

However, as highlighted by Armstrong and Landers (2018), attention should be paid to the design of the gamified learning environment, which should be dynamic. It needs to be constantly monitored, evaluated and readdressed by professional employees in order to be effective and stimulate the employee's engagement. In addition, it should always be accompanied with personal instructors and additional educational content. What is also essential for gamification environment is the adaptation of the level of task and complexity, of the game procedures, to the level of skill and the understanding capacity of the user for sustaining his/hers attention to the training process (Groh 2012).

2.9 Gamification in Cooperative Learning

In the cooperative setting there is a constant necessity of sources of innovative training addressed to the member and assist him/her on understanding the essence of the cooperative enterprise. Hence, the gamification of learning, regarding the cooperative principals, has been proven to be essential for the members' training. The effectiveness of gamification techniques in the training and education of users is highly dictated by the content provided and how this content is adjusted to the characteristics of the users and the industry where the tool is employed (Lombardelli et al. 2020).

Several institutions/companies/universities have developed games on entrepreneurship in the field of agriculture and food to train new farmers by letting them understand differences between cultures and technical practices and how to take advantage of those by letting them play and exchange practice and new ideas. Members of cooperatives are trained how to manage their business and the cooperative business at the same time. Farmers in various cultures have shown to be able to understand and act in two level entrepreneurship: at the level of individual members and at the level of the cooperative firm. By playing through the game, cooperative members experience what it is like to be an entrepreneur. More specifically, the players and their cooperative business make decisions about the input of the farm, the cash, their investments both in the farm and in the cooperative, processing and selling their crops. While the years pass, the players encounter various events that have an effect on their business and how to solve unexpected problems. After players understand their own business, they learn how to organize themselves as a group and cooperate in a cooperative enterprise.

Nowadays, there exist several companies that create such games. Further down, it is presented a successful example from a friendly game named "The Farming Forward game" by KUCHEZA, specialized in educating cooperative member farmers on both production issues and the cooperative way of conducting business.

2.9.1 The Example of Farming Forward Gamified Learning Platform

In order to address the issue related to rural education, KUCHEZA offers to farmers and small business owners in agriculture a "toolkit", as they call it. This "toolkit" contains digital games, videos, and assignments aiming on empowering the educational state of the user toward his/hers profession. The methodology of gamification of learning employed by KUCHEZA is presented in Fig. 2 below. The unique game-based learning environment enables the user to safely experiment with cultivation practices. In the same time the data provided by the game constitute useful insight resulting in training outcomes. Finally, the aims of the gamified learning method of KUCHEZA are to enhance the financial, business and didactical skills needed to raise the productivity and income of small entrepreneurs related to small scale agriculture.³

³ Retrieved from <https://www.kuceza.nl/work>.



Fig. 2 The gamification of learning methodology employed by KUCHEZA. Retrieved from: <https://www.kucheza.nl/>

In a farming simulation game such as Farming Forward the user is able to actively shape the environment of his/her farm through their personal decisions (e.g., decide on the type of the crop, the use or not of pesticides and fertilizers, investing in machinery, investing in the collective business, the effect of the democratic governance, the consequences of opportunistic behavior etc.). The outcome of both the investment and collaborating decisions is easily trackable, hence the user can realize the differentiated results coming from different strategic choices. The learning through simulation games enables farmers to recognize opportunities and make decisions that will let them professionalize their agricultural activities into business ventures. KUCHEZA sums up the key elements of their innovative game-based learning model into three letters “ABC” (Agronomics-Business-Cooperative entrepreneurship). These three key elements constitute the cornerstones for the establishment of the fundamental principles that characterize the member’s cooperative culture (retrieved from <https://www.kucheza.nl/work/>).

3 Methodology

In order to address the first objective of this study, the authors employed an extensive analysis of the international literature on cooperative studies. Both the theoretical and practical studies, composing the cooperative literature inventory, were carefully scanned for the identification of the social attributes characterizing the cooperative

structures and contribute to the sustainable and healthy democratic governance practices of social cooperatives. Furthermore, the extracted data were organized as shown in Fig. 1 (pp. 4) composing a path of attributes resulting in the functional democratic governance model. The social attributes leading to enhanced democratic governance procedures are analyzed in the Theoretical Review of this study. Namely, the social attributes of cooperatives' democratic governance model are: 1. Cooperative Culture and Open Communication, 2. Trust, 3. Involvement, 4. Willingness to be Active, 5. Active Membership and finally, 6. Democratic Governance. In addition, the review of literature was conducted for the exploration of the impact of opportunistic behavior, demonstrated by cooperative members, to the democratic governance procedures.

To answer the second research question, the authors performed qualitative research. Taking into consideration the exploratory nature of the study (Creswell 2003) and the limited number of studies regarding the use of gamification in social enterprises, qualitative research is considered a necessity (Christy and Wood 1999) since it provides insights and understanding of the problem set. In addition, Gilmore and Carson (1996) state that qualitative research methodology is well suited to the characteristics and the nature of services. Qualitative methods are applied in research operations which aim in the description, analysis and comprehension of social processes, situations or relations between social subjects or teams (Konstantinidis et al. 2009).

Semi structured interviews were used with the intention to allow new viewpoints to emerge freely (Aira et al. 2003). The researchers designed an interview schedule on the basis of key themes identified from issues prevalent in the research literature. Semi structural interviews enable reciprocity between the interviewer and participant (Galletta 2012). The interviewers asked the participants 12 questions. Ten of questions were open-ended questions and in two questions the interviewees were asked to put in order of significant five answers proposed by the interviewer.

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For the purpose of the study the authors interviewed, eight (8) experts in issues of social enterprises and six (6) CEO of social enterprises. The interviews were conducted in March, April and May of 2022.

4 Results and Discussion

Almost all the participants, CEOs and experts had more than 10 years' experience. All the participants (both experts and CEO's) recognized that the most important problems in social enterprises were a. the lack of communication between the administration and the members of social enterprises, b. the opportunistic behavior and c. issues of trust among members. Apart from the problems mentioned above, less important problems also emerged: competition, low representation and economic conditions. According to an interviewee (CEO) "the economic conditions need to be improved in order to ensure that agricultural income in the EU decreased only to a limited extent". One of the experts claimed that the only solution to this problem is the reduction of opportunistic behavior among members of social enterprises.

All experts claimed that if the functioning of cooperatives were to be improved, relationships among the members of the cooperatives had to be enhanced and staffing of the organization had to include competent members prone to innovation. CEOs claimed that the function of cooperatives could be improved in the management of cooperatives and of course in member active participation. As one of the CEO of the cooperative emphasized, "there is a lack of competent staff in many cooperatives."

In order to discover the important characteristics of social capital for the viability of Greek cooperatives, the interviewees were asked to rank from the most to the least important the following words: Cooperative Culture, Active Participation, Mutuality, Interpersonal Communication and Trust. The results showed that Mutuality was their first preference, Active Participation the second, Trust the third, Interpersonal Communication the fourth and Cooperative Culture the fifth one.

Education is an essential tool for all the members of social enterprises. As one of the CEO's claimed "clearly education is very important because our members need to be better trained." Landers and Armstrong (2017), conclude that gamification alters the value of perceived training outcomes in terms of reactions, learning, behavioral change, and organizational results. One of the experts emphasized that not only education but also communication among the members themselves and the leaders of social enterprises could be improved.

The results reveal that experts were positive towards gamification. Three (3) of the CEOs were not aware of the term gamification, and five (5) of them were positive in using it in cooperatives. CEOs also agree that gamification is an attractive tool especially for younger members that are familiar with new technologies. However, Groh (2012) mentions the importance of matching the level of task and complexity of the game features with the understanding level of the user in order for the gamification process to be effective. One CEO claimed, "it would be interesting if our entrepreneurs engage and scale up the work environment using digital platform." On the other hand, a view expressed by one of the CEO was that he/she was skeptical about the use of gamification in their case as most of their members were not literate with new technologies. On the contrary Mann (2013) states that gamification constitutes a new point of view to the user by bridging the game tasks with the outcomes desired by the enterprise. One of the CEOs claimed that gamification is important but

training by gaming cannot stand on its own as other forms of education are essential for the case of social enterprises.

All experts argued that gamification could play a crucial role in the education of members of social enterprises, this comes in accordance with the results provided by Armstrong and Landers (2018) that highlighted the positive effect of gamification techniques to learning outcomes. Gamification responds successfully to the market needs: with this type of education, members of social enterprises could easily understand the importance of social enterprises and develop cooperative culture. By using gamification, members of social enterprises can make decisions about the input of the cooperative, the cash and their investments. In recent years such innovative training methods have been developed by applying simulation games. In cooperation with KUCHEZA, a Dutch game developer, such games were tested in practice. (Van Dijk et al. 2019).

During the interviews both with CEOs and experts, the future of education in social enterprises was discussed. One of the CEOs claimed that “Gamification could help social enterprises but it depends on the application process” and a comment by another CEO was that “in Greece it is something quite new but it could help social enterprises. It could provide important opportunities for debate and reflection.” Regarding, the application process Armstrong and Landers (2018) point out the necessity of constantly monitoring and readdressing the procedure for achieving higher levels of effectiveness of gamified learning.

5 Conclusions

Through reviewing the literature, the authors conclude the existence of an extensive opportunistic behavior that jeopardize the market success of contemporary social enterprises. This phenomenon was also highlighted by the empirical evidence provided by the experts' interviews. The opportunistic behavior demonstrated by cooperative members has a significant impact to the functionality of their democratic governance model. The member's opportunistic behavior is linked with the failure on behalf of the members to realize the cooperative business as a business of their own. The prementioned phenomenon suggests the low levels of cooperative ideology characterizing the members of social enterprises. Thus, social cooperatives should provide stimulus to the members for understanding the bond between the cooperative success and the benefits provided to them.

The empirical evidence retrieved from the experts' interviews reveals that innovative techniques in education and training, such as gamification, are essential for social enterprises. Since social enterprises depend heavily on the level of their social capital, they have to make efforts toward its enhancement. The application of gamification methods facilitates the training process especially to younger members that are familiarized with new technologies. However, as suggested by several experts, the gamification techniques could not stand by its own but it has to be complemented by expert guidance provided by specialized personnel.

Evidently, the small size that characterizes the majority of social enterprises creates barriers on investing in innovative techniques such as gamification. Taking into consideration the interviewees' answers on the suitability of gamification methods for addressing the training and education procedures in cooperatives, the necessity of the emergence of a digital platform arises. Since, the majority of social enterprises could not afford the full costs of such a venture, a state-level intervention is required. Considering, the application of KUCHEZA (Farming Forward Game) as a well-established and functioning example, an on-line platform could be emerged. This platform will provide small-scale social enterprises firstly, the required gamification applications and secondly, additional educational interactive content that will assist on addressing the training and education of cooperative members in a more holistic and tempting approach.

Similar to other studies, this study has limitations. The small sample of respondents constitute the first observed limitation of this study. Additionally, the research question regarding the potentials of gamification in learning as an educational mechanism can be investigated into differentiated sectors of social enterprises. The perceptions of experts coming from diverse business backgrounds could provide more solid evidence on both the suitability of such a method as gamification and the ways to employee gamification in diverse social enterprises environments.

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The Effect of the Hotel Attributes on Guest Satisfaction Due to the Covid-19 Pandemic Crisis: The Case of the Greek Tourism and Hospitality Sector



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Abstract The COVID-19 pandemic may be one of the most influential and unprecedented events of the global economy, affecting the performance and stability of the tourism and hospitality industry. Thus, given the significant positive impact of the tourism sector on the global economy, the negative implications on the sector of tourism industry and hospitality by the outbreak of COVID-19 are extremely important. The COVID-19 crisis has led to the emergence of new economic and social policies that has hastened a number of structural changes in the tourism and hospitality industry, which influence the guest satisfaction. In Greece, the tourism sector is one of the key factors of economic growth. In 2019, the tourism industry contributed 20,8% to the country's GDP with more than 34 million international visitors. However, in 2020, the number of visitors decreased roughly over 78%, due to the Covid-19 pandemic. This research attempts to reveal the change in the effect of the hotel attributes on guests' satisfaction due to the COVID19 pandemic crisis. It builds upon the study of (Srivastava and Kumar, *Tourism Management Perspectives* 40, 2021) by extending the sample to include data from the Greek hospitality sector. Tripadvisor was used as a source to collect reviews of 5-star hotels in Athens, Greece. The findings revealed that the main topic of guests' reviews was not the protocol and the social distancing measures in public areas but hotel, rooftop quality, restaurant, location and pool area condition.

Keywords Hospitality industry · Tourism industry · Tourism policy · Covid-19 · Greece

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1 Introduction

Given the significant positive impact of the tourism and hospitality sector on the global economy, the negative implications on the sector of tourism services and hospitality by the outbreak of COVID-19 are extremely important. Based on preliminary predictions, the global economy will face a recession of approximately 5% to 6% on an annual basis. It will mostly affect economies similar to the Greek one, in which the specific sector contributes about 13% of annual GDP (ILO 2020). Furthermore, ILO (2020) indicates that the pandemic of COVID-19 led to the closure of operations of hotels, tour operators, restaurants, airlines, and cruise-liners since min-January 2020, facing a very difficult business environment with major impacts on employment opportunities. The gradual return to the position existed before the outbreak will require a co-ordination of economic policies by national governments and international organizations like the economic measures that have already been decided by the European Commission and the European Central Bank. Within this framework, the adoption of measures to support tourism business and the maintenance of job positions to avoid drastic reduction of incomes will be very important for the revival of the tourism sector.

Risk and uncertainty in international tourism business has significantly increased due to the pandemic of COVID-19 (Sharma et al. 2020). A number of researchers as well as professionals argue that the strategies developed as a response on the enforced lockdown in business activities should be carefully designed and associated with each stage of re-opening of business.

On another strand of the literature that focuses on the impacts of the pandemic, Zenker and Kock (2020) odelli the negative effects of COVID-19 on the tourism industry, focusing on the long-term and indirect effects and change in tourism and hospitality odelling. Moreover, the paper attempts a comparison of the consequences of the current pandemic with previous disasters and crises, aiming to explain how the tourist industry could manage to recover.

The cancellations of the flights by airlines both domestically and internationally have severely influenced the global economy (Hoque et al. 2020) along with the decrease in the demand for hotels and restaurant services. Moreover, short-term letting provided by Airbnb has also faced a decline as a result of COVID-19 (Dolnicar and Zare 2020). This decline will provoke a number of chain reactions to the supply as well as the regulatory framework of the online platforms of short-letting.

According to Sigala (2020), COVID-19 impacts will provoke structural changes to the tourism industry in terms of demand, supply and destination management organization. The number of flights and tourists to Greece and inevitably the contribution of tourism to GDP have been considerably decreased since 2019, verifying the predictions (Medová et al. 2021). Greek government's practices initially targeted the economic support to tourism businesses and employees who were forced to

instantly stop their operations (Fotiadis et al. 2021). However, even when the industry was gradually reopening the governmental support was necessitated, while Tsionas (2021) forecasted that post-COVID-19 gradual adjustment in the tourism and hospitality would take time and needs a careful and detailed strategic plan. On the other hand, tourism professionals upgraded the hygienic standards and protocols applied, increasing the role of technology in their daily business operations (mobile apps, covid-free pass, digital payments, contactless services etc.) (Sigala 2020).

In the last few years, numerous studies have been conducted to examine hotel guests' reviews during the Covid-19 pandemic. However, most of these studies have focused on large countries in Asia (e.g. Hu et al. 2021; Sharma and Kaushik 2021) and America (Peres and Paladini 2022). As culture is a significant factor which affects business decisions (Deirmentzoglou et al. 2020; Deirmentzoglou 2022), this research aims to identify the main topics of discussion that emerged during the Covid-19 pandemic on 5-star hotel reviews in the capital city of Greece, Athens, and how these topics changed over time. By reviewing the user generated content created on the platform of Tripadvisor from January 2019 till May 2022, this paper attempts to detect the hotel characteristics that may cause visitor satisfaction or dissatisfaction. At the same time, the structural topic modelling (STM) allows the comparison between the pre- and post- covid periods and detects the possible changes in the reported characteristics.

2 Literature Review

The tourism sector is one of the main sectors that affects and is affected by the virus transmissions (Yu et al. 2020). Travelers are a main source of the uncontrolled virus spread, and at the same time, hotels face the negative consequences of the travel restrictions and the strict government regulations regarding Covid-19.

The importance of hotel attributes have changed due to the current pandemic crisis. Previous research shows how pandemics change tourists' expectations and decisions regarding travelling (e.g., Wen et al. 2005). During the pandemic of Covid-19 numerous studies have been conducted in order to reveal this change (e.g., Kim & Han 2022; Hu et al. 2021). This type of research is significant as hotel managers can identify the critical services that can offer in order to meet the expectations of their customers (Hu et al. 2021).

Travelers can try hotel services only after they arrive at the hotel; thus, reviews have a critical role in their purchase behavior (Ullah et al. 2019). In the last few years, examining reviews or other kinds of text on digital platforms like tweets (e.g. Kydros et al. 2021; Kydros and Vrana 2021) is a common practice. For instance, Sun et al. (2021) examined the hotel guests' satisfaction before and during the period of the Covid-19 pandemic. Data were collected from reviews of Chinese hotels on Tripadvisor.com. Based on the findings, guests seem to give better reviews during the Covid-19 period and give emphasis on health-related measures and practices. Peres and Paladini (2022) examined the hotel attributes in Brazil based on guests'

reviews from the website booking.com. The findings revealed that during the period of the Covid-19 pandemic, guests gave lower ratings to hotel attributes than in the period before the pandemic. Specifically, attributes regarding cleanliness and check-in process were affected in a negative way by the pandemic. These results are opposed to Sun et al.'s. (2021) study meaning that hoteliers in Brazil failed to adapt to the changing environment and meet the expectations of their guests.

The importance of the hygiene attribute is not something new as studies before the Covid-19 situation have claimed that hygiene measures and practices are critical factors in the hotel industry (Vos et al. 2019). Thus, these factors can play a significant role in travelers' behavior. Yu et al. (2021) examined the hotels' perceived attributes regarding hygiene and their influence on travelers' intentions during the Covid-19 pandemic. Data were collected from travelers who visited a hotel during this period and the results confirmed that hygiene factors had a strong positive effect on guests' behavior.

Current studies investigated the effects of hotel attributes on hotel guests' behavior. Kim and Han (2022) examined travelers' selection criteria regarding hotel attributes before and during the Covid-19 era. The qualitative and quantitative data that were collected confirmed the findings of previous studies. The hotels' reputation, check-in process, value for money, employees' professionalism and cleanliness are some of the main hotel attributes that play a significant role in travelers' purchase selections. Moreover, this study revealed a new attribute that is related to the significance of the physical environment. During the Covid-19 pandemic, these attributes had an even more important role in guests' selection criteria, with safety and hygiene attributes (social distancing, sanitizers, thermal scanners, QR-code based entrance etc.) holding the lead.

Hu et al. (2021) examined tourists' perceptions regarding hotel attributes during the pandemic of Covid-19. In this research, data were collected from more than 98 thousand hotels in China and the findings revealed that travelers have changed their priorities regarding hotel attributes. More specifically, guests during the pandemic started to give more emphasis to attributes that are relevant to hygiene factors while they tend to show understanding when a hotel is lowering the standards in factors that are not significantly related to safety issues. During the pandemic, dominant attributes like "price" and "bed" have ceased to be considered factors of high importance.

Furthermore, recent studies have focused more on the importance of sanitation and cleanliness. For instance, Sharma and Kaushik (2021) examined hotel practices in India. Their findings revealed that the Covid-19 pandemic made hoteliers implement high standards regarding cleanliness and keep them even after the end of the pandemic. Gupta et al. (2022) examined the emotions of 5-star hotels' guests regarding sanitation. The study revealed that guests express negative emotions when the hotels have poor sanitation standards. Finally, current research emphasizes the need for contactless services and new technologies regarding hygiene measures at hotels (Jiang and Wen 2020; Nayak et al. 2021).

Pappas and Glyptou (2021), using Greece as a case study, examine the travel accommodation preferences with respect to COVID-19, highlighting the importance of health and safety as well as the risk aspects. The same results are also

reinforced by the study of Metaxas et al. (2022) who associate travel intentions to Greece with health-protective behavior that is stronger for international than domestic tourists. Finally, Kourgiantakis et al. (2021) focus on the island of Crete and report an increase in domestic tourism activity (at least temporarily) due to the restrictions on international mobility as well as a strong preference patterns towards safety and privacy.

3 Methodology and Data Collection

To identify the changes in hotel attributes as the covid pandemic crisis progressed we collected and analysed Tripadvisor reviews following the method of Srivastava and Kumar (2021). We choose to study 5-star hotels located in Athens, as most of them remained open during the post-Covid period due to their organization while the majority of lower-rated hotels suspended their operations temporarily or permanently (ITEP 2021). This study attempts to provide insights to 5-star hotels managers, owners, and potential investors. The sector has suffered from the financial crisis that broke out in 2009, making potential investors more sceptical than before (Diakomichalis 2012). As a result, the number of the 5-star hotel located in Attica region and Athens remained stable from 2009 to 2012 (28 hotels in Attica and 14 in Athens) (Hellenic Chamber of Hotels 2022). Although, investors' interest returned some years later (the number of the 5-star hotels increased to 43 in Attica and to 23 in Athens in 2020), hotel owners should be prepared to tackle the possible negative effects of the Covid crisis (Hellenic Chamber of Hotels 2022). Consequently, from the 23 hotels that appeared on Tripadvisor we collect and analyze the reviews of the 14 that were open from January 2019 till May 2022. This period includes 13 months before the spread of Covid and 27 months after the outbreak of the Covid-19 pandemic crisis in Greece. It is important to mention that the industry was paused for more than 10 months due to the imposed lockdown, resulting in the period under study before and after Covid being almost equal. To collect data rvest package (Wickham 2022) in R was used. From the total number of the 2.477 reviews that were detected (Table 1) we chose 352 as a sample (first 2 reviews per hotel per quarter from January 2019 to May 2022 if available). All reviews collected were in English as the platform automatically translates them. Reviews with rating of one, two and three stars were perceived as negative and those of four and five stars as positive. The sample included 71 negative and 281 positive reviews.

To analyze data the structural topic modeling (STM) was used. This method uncovers the latent topics in a given text by analyzing the used words. Its topic includes a distribution of words and its text a collection of topics. STM is a formula that can include multiple covariates and factorial or continuous covariates. As it allows the inclusion of covariates it enabled us to detect the changes in hotel attributes as Covid crisis progresses (Srivastava and Kumar 2021). We modeled the prevalence

Table 1 Total number of reviews per hotel

Hotel name	Total reviews	Positive	Negative	From 1/19–5/22
Electra metropolis athens	1557	1416	142	379
Electra Palace Athens	4005	3545	460	311
Coco-Mat Athens BC	228	205	23	228
Grand Hyatt Athens	884	611	275	71
Wyndham Grand Athens	1323	992	231	332
King George, a Luxury Collection Hotel, Athens	1278	1205	74	18
St. George Lycabettus Lifestyle Hotel	3195	2293	902	513
NJV Athens Plaza	1326	1049	327	118
Divani Caravel Hotel	520	432	88	206
Royal Olympic	3396	2682	1254	227
Divani Palace Acropolis	668	521	147	26
Titania Hotel	2194	1192	1002	26
Perianth Hotel	127	113	11	11
Crowne Plaza Athens—City Centre, an IHG Hotel	1056	814	242	11
Total	21,757	17,070	5178	2477

of topics as a function of the year, the review extremity and the interaction of the two ($Prevalence = g(Phase, Positive, Phase*Positive)$). Time was perceived as a continuous variable while positiveness as a binary variable (Positive = 1, Negative = 0).

4 Results and Discussion

As a first step we checked the semantic coherence and the exclusivity scores when the number of topics vary from 10 to 50 and a model of 30 was chosen. The 30 topics that were detected are presented in Table 2. The topic label is an interpretation of the topics that was derived by using Probability, FREX, LIFT and Score metrics. Probability metric reveals the most frequent word in a topic (Roberts et al. 2019). The LIFT metric weighs words by dividing their frequency in the topic by their frequency in other topics and it applies higher weights to those words that appear less frequently in other topics (Roberts et al. 2019). Therefore, the weight is higher when the frequency in other topics is lower (Roberts et al. 2019). The difficulty with this metric is that unusual words are more likely to be highly ranked. On the other hand, FREX measure is defined as the ratio of a word frequency and its exclusivity in a topic (Bischof and Airoidi 2012; Roberts et al. 2019). Score compares the frequency of a word in a topic with the frequency of the word in other topics. Here we used a

combination of the of the Highest Probability and FREX metrics to assign labels to topics. In Table 2 you can see the most relevant terms for each topic using Probability and FREX as well as the given interpretative title. For example, we label Topic 13 Rooftop Quality due to the words rooftop, bar, view. Topic 10 was titled Intention to recommend due to the words recommend, high, spacious, great, room, high, view. The same reasoning, was used for the other 28 topics.

Figure 1 you the topic proportion is presented. From the detected topics (see Table 2) the most important are: 13 Rooftop Quality (Topic 13), Intention to recommend (Topic 10), Proximity to the Historic center (Topic 28), Restaurant (Topic 8), Hotel's location (Topic 3), Pool area condition (Topic 24).

Some examples of the documents (reviews) that are highly associated with the three most common topics (Protocols in Public areas, Intention to recommend, Proximity to the Historic center) can be found in Fig. 2. The quotes mentioned bellow support the interpretative titles that were applied to the detected topics. For example, expressions such as *"I highly recommend the"*, *"the location could not have been better"*, *"excellent hotel"* confirm the title given to Topic 13. For the Topic 10 expressions such as *"skinny balcony with a fairly limited view past an adjacent building"*, *"At 6:30 am each day I would travel to the rooftop and sip coffee in the dark, and view the Acropolis, which was still lit"* and *"but the view from the rooftop was very good"*.

The prevalence of topics as a function of time (year) is plotted with a 95% confidence interval (Fig. 3). The role of Covid-19 burst-out is not clear on the topic "Intention to recommend" (Topic 10). While the topic was important at the beginning of 2019 it prevalence decreased during 2019 and increased again since 2020 that Covid-19 burst out and it peaks in the second quarter of 2021 (coefficient of year = 0.576 $p > 0.05$). It includes the terms recommend, high, choos(e), caravel, beauty(ful). For the topics 13 "Rooftop Quality" and "Proximity to the Historic center" time was not found to be significant although they show a decrease as Covid-19 progresses. The topic "13 Rooftop Quality" (topic 13) includes terms such as protocol, rooftop, Covid, profession, bar (coefficient of year = 0.529 $p > 0.05$). Rooftop Quality was important even before the pandemic of Covid-19, but their importance seems to diminish since the third quarter of 2021. The same is with the topic "Proximity to the Historic center" (Topic 28) whose importance has diminished since the first quarter of 2020 (coefficient of year = 0.9 $p > 0.05$). The topic consists of parthenon, histor(ic), oliv(e), locat(e), distanc(e). The importance of "restaurant's quality" (topic 8) (team, dinner, amaz(ing), sanit(e), profession(alism)) remained almost unchanged through the years (coefficient of year = 0.55 $p > 0.05$). The same is with "Hotel's location" (topic 3) (coefficient of year = 0.99 $p > 0.05$) that consists of the terms near, proxim(ity), meter, alexand(er), omonia. Lastly, the prevalence of the "Pool area condition" (topic 24) decreased and then increased again (coefficient of year = 0.6 $p > 0.05$).

Table 2 Emerged Topics

Frex	Probability
1. Property Impression town, check, beauty, property, polite, pleas, great	1. Property Impression hotel, great, room, stay, locate, Athens, restaurant
2. Food fresh, wasnt, open, buffet, salad, image, enter	2. Food hotel, room, breakfast, view, nice, buffet, acropolis
3. Hotel's Location excellent, near, beauty, meter, square, large, restaurants	3. Hotel's Location hotel, excellent, breakfast, great, restaurants, room, good
4. Service custom, people, representative, table, actual, boutique, greek	4. Service hotel, room, two, day, people, place, want
5. Reasons for traveling city, break, except, center, fair, short, wife	5. Reasons for traveling hotel, room, nice, staff, city, location, Athens
6. Protocols and Social distancing measures mask, wear, week, client, cold, star, menu	6. Protocols and Social distancing measures hotel, breakfast, staff, room, star, food, mask
7. Overall experience Greece, wonder, tour, spend, greet, fire, fan	7. Overall experience hotel, wonder, room, time, Areece, stay, Athens
8. Restaurant amazing, dinner, team, come, definitely, will, profession	8. Restaurant amazing, hotel, staff, view, Athens, friend, service
9. Cancelation process cancel, refund, book, email, month, custom, disappoint	9. Cancelation process book, hotel, cancel, room, disappoint, check, travel
10. Intention to recommend recommend, high, caravel, business, Athens, spacious, wonder	10. Intention to recommend hotel, Athens, recommend, great, room, high, view
11. Noise mirror, music, sleep, hear, outlet, double, air	11. Noise room, night, hotel, book, stay, next, double
12. Honeymoon experience, service, georg, vacation, excel, taken, honeymoon	12. Honeymoon service, hotel, stay, excel, room, experience, staff
13. Rooftop Quality rooftop, excel, electra, Athens, bar, hyatt, Covid	13. Rooftop Quality view, stay, Athens, rooftop, breakfast, hotel, acropolis
14. Relaxing Atmosphere guest, enjoy, vacation, unexpected, plaza, relax, wine	14. Relaxing Atmosphere staff, great, hotel, enjoy, guest, time, good

(continued)

Table 2 (continued)

Frex	Probability
15. Room Amenities bed, quit, pool, terrace, average, sun, machine	15. Room Amenities room, view, hotel, pool, bed, good, service
16. Front Desk desk, front, though, suit, available, globalist, dish	16. Front Desk view, locate, room, desk, front, stay, breakfast
17. Price price, pay, book, euro, manage, reason, chic	17. Price hotel, book, room, price, stay, view, good
18. Lounge check-, lounge, bit, window, coffee, near, personnel	18. Lounge hotel, room, help, staff, breakfast, coffee, check-
19. Shopping shop, nice, value, walk, safe, hyatt, modern	19. Shopping hotel, nice, good, walk, room, location, shop
20. Acropolis–View realli, however, actual, surprise, posit, massage, spa	20. Acropolis – View realli, hotel, staff, recommend, nice, breakfast, room
21. Maintenance morn, garden, smoke, recommend, balcony, weight, center	21. Maintenance hotel, room, view, good, acropolis, recommend, one
22. Location door, georgi, king, parliament, great, facility, bit	22. Location great, hotel, stay, location, breakfast, door, room
23. Staff available, yes, reserve, get, large, change, seem	23. Staff room, hotel, staff, breakfast, Athens, get, available
24. Pool area condition rooftop, pool, love, small, live, good, upstairs	24. Pool area condition great, good, pool, love, hotel, view, location
25. Location Offering hop, museum, stop, wing, easiest, hop-, lot	25. Location Offering acropolis, room, hotel, view, breakfast, restaurant, good
26. Service provision security, elite, card, cab, went, water, honest	26. Service provision hotel, room, get, service, just, nice, water
27. Family-friendly include, morning, families, flight, tire, night, delight	27. Family-friendly room, stay, breakfast, hotel, night, clean, staff
28. Proximity to the Historical center perfect, distance, balconies, just, well, walk, wrong	28. Proximity to the Historical center perfect, hotel, locate, acropolis, staff, great, walk
29. Stay everyone, made, definite, mani, home, far, day	29. Stay stay, hotel, staff, Athens, day, time, made

(continued)

Table 2 (continued)

Frex	Probability
30. Feeling thankful went, beyond, thank, pleasant, kind, bath, incredible	30. Feeling thankful stay, room, staff, thank, went, hotel, pool

On the other hand the prevalence of the topic “Acropolis View (topic 20) decreased from 2019 to 2022 ($p < 0.05$). The topic consists of terms such as view, balcony, deluxe, acropoli(s), recommend. Lastly the prevalence of the topic “Noise” (topic 11) increased from 2019 to 2022 ($p < 0.05$). Some of the terms that are included in the topic are hear, annoy, noise, music, air.

5 Conclusion

In this study, a first attempt was made to examine the issues discussed by the visitors of the 5-star hotels in Athens in the last three years. The aim was to identify the main topics of discussion that emerged during the Covid-19 pandemic and how these topics changed over time. The findings revealed that rooftop quality, intention to recommend the hotel, hotel’s proximity to the historic center, hotel’s restaurant, hotel’s location, and pool area condition were the main topics of discussion. The detected topics, revealed by this study, are in accordance with the previous research (e.g., Kim & Han 2022; Sun et al. 2021). For instance, Sun et al. (2021) claimed that hotel guests gave emphasis on protocols and health-related measures and practices. Protocols and social distancing measures were revealed from data as a factor that influences guests’ satisfaction although it was not included in the most frequent topics. The low frequency of this topic was not expected as the hospitality sector was still striving to recover from the consequences of the pandemic crisis. It has also been observed that topic 6 appeared in guests reviews even before the Covid-19 outbreak. Thus, it has to be considered that protocols in hotels not only refer to Covid-19 but to other hotel policies as well. The low frequency of this topic can be justified by the fact that people may get tired of discussing the pandemic especially when they are on holidays. Probably, this is the reason why topics regarding the hotel’s location, restaurant, and the pool’s area condition showed an increase in guests’ reviews during 2021–2022. However, it has to be mentioned that a larger sample of reviews is needed in order to interpret with more accuracy these variations.

This study shows how pandemics change tourists’ expectations and decisions regarding travelling and has significant implications for the literature on tourism and hospitality as it is the first that analyzes the Greek 5-star hotel reviews during the Covid-19 pandemic with the method of structural topic modelling. Apart from the research interest, this study gives significant guidance to hotel managers, hospitality consultants and policymakers as they can be aware of the points that play a crucial role in customers’ experience regarding their accommodation and detect areas for

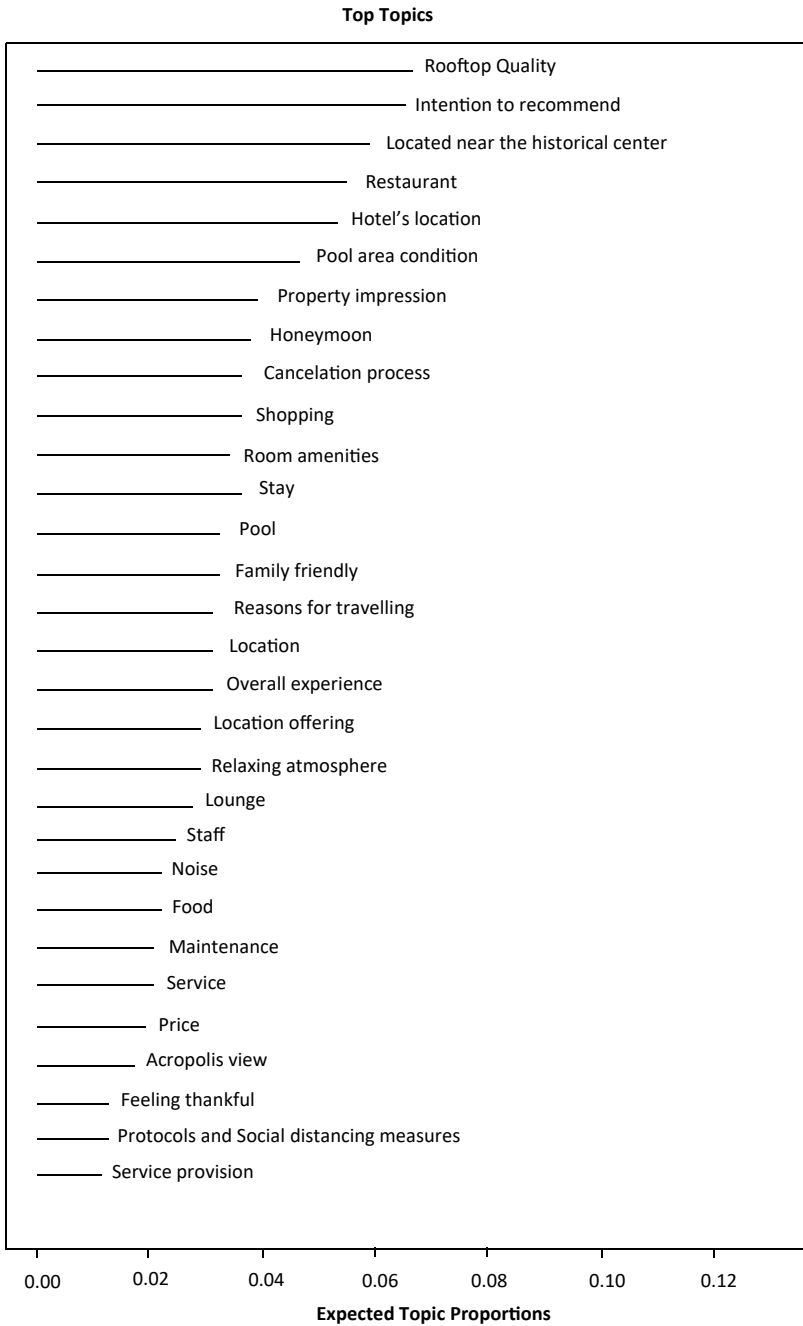


Fig. 1 Topic proportion

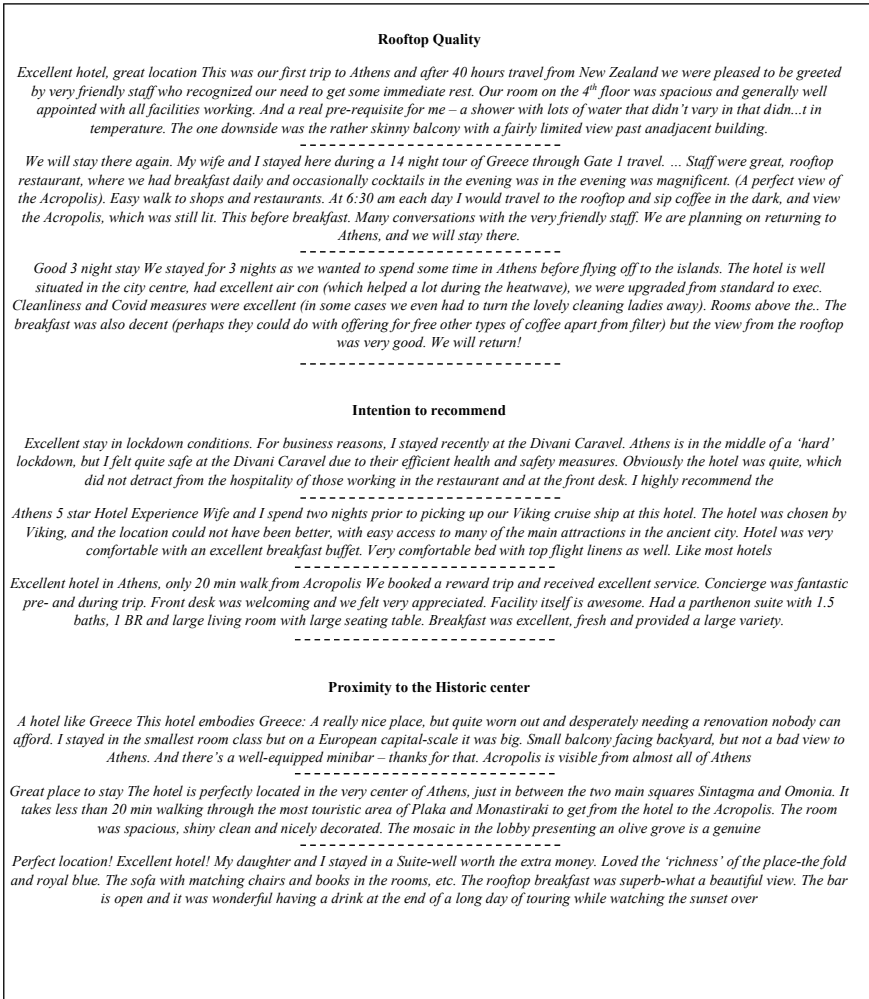


Fig. 2 Examples of reviews per topic

future investment. Finally, this study presents the methodology that will follow the research which will include a larger sample of reviews in volume and time range, as of now only a sample of 352 reviews was examined.

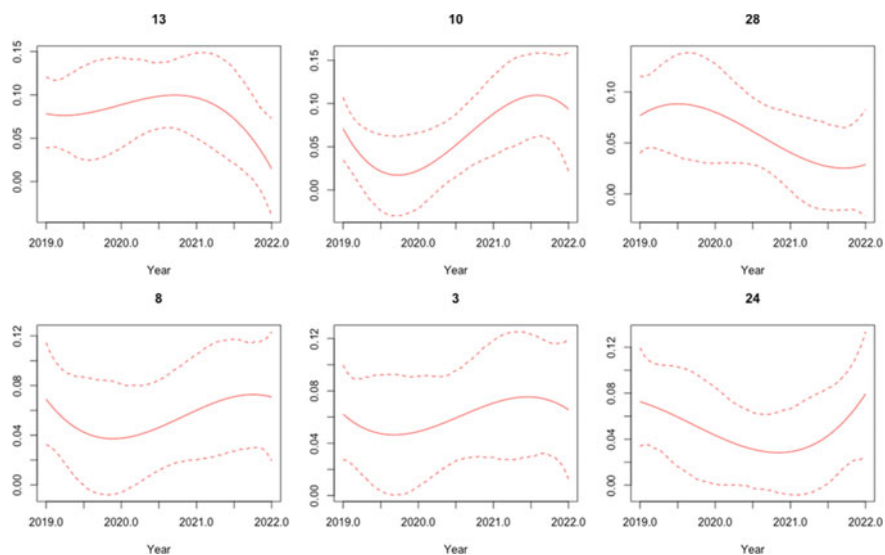


Fig. 3 The prevalence of the most important as a function of time

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Why Did Greeks Prefer not to Do Tourism in the Covid-19 Era?



Lambros Tsourgiannis, Stavros Valsamidis, Giannoula Florou,
and George Drosatos

Abstract The tourism sector, globally, was one of the largest markets of the twenty-first century, until the world faced the COVID-19 pandemic. Regarding the impact of the crisis on the hospitality industry of all countries for the 3rd week of March 2020, compared to the corresponding week in 2019, the number of visitors has decreased significantly by 50% or more. The hardest hit was in countries that were exposed to the crisis acutely with a large number of cases, as well as in countries that have imposed radical measures to curb population movement. The outbreak of COVID-19 due to its expansion worldwide affected negatively all the sectors that are interrelated to tourism. Therefore, it is important to distinguish and quantify perceived attitudes and social behaviours related to tourism during the COVID-19 crisis in order to reduce its adverse effects. In this paper, we aim to discover the potential attitudes of Greek tourists that will not go for holidays due to COVID-19 and to classify them into groups according to their attitude towards these issues. This paper explores the potential attitudes of Greek tourists that will not go for holidays due to COVID-19 and classifies them into groups according to their attitude towards these issues. A primary

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survey has been conducted to a randomly selected sample of Greek tourists. Principal component analysis has been employed to characterize the main factors that influence tourists not to go for holidays. Cluster analysis has been utilized to classify tourists into groups according to their attitude towards those decisions whilst discriminant analysis has been employed to check cluster predictability. Non-parametric tests have been used to examine the impact of their demographic characteristics towards their attitudes. Non-parametric tests including chi-square and Friedman non-parametric test performed to develop the profile of those citizens.

Keywords Marketing · Tourism marketing · Covid-19

1 Introduction

The tourism sector, globally, was one of the largest markets of the twenty-first century, until the world faced the COVID-19 pandemic. Since the beginning of the COVID-19 crisis, the appearance of the outbreak has begun to burn out all forecasts for the tourism sector as it came up as the most discussable issue in news and social networks. According to the WHO, the coronavirus has spread to 227 countries and territories (WHO 2020). COVID-19 caused multiple lockdowns in many countries and travel restrictions. Worldwide, there have been 72,556,942 confirmed cases of COVID-19, including 1,637,155 deaths, as stated by the WHO on December 17, 2020.

For those reasons, the World Travel and Tourism Council (WTTC) has reported that COVID-19 has a chain effect on the worldwide economy, endangering the livelihoods of 300 M employees (10% of the world workforce) working in the tourism sector (WTTC 2019). At the same time, a serious impact on the global economy is expected, a shrinkage of 6% has been predicted for the year 2020 by the Organization for Economic Co-operation and Development (OECD). Almost all countries are virtually trying to control losses in order to minimize the impact on their GDP (World Bank 2020). As foresights show, tourist activities will be reduced by 20–30%, which will cause a depression of the international tourism turnover about three to four and half billion USD. According to WTTC (2020) the number of jobs that are threatened jobs in the tourism and travel industry are up to 50 million, which would have a tremendous impact on employment (a loss of about 12–14%) and the international travel sector (a loss of approximately 25% for the year 2020).

As medical interventions available to treat COVID-19 are limited, most countries around the world have responded with various forms of non-pharmacological interventions, including social distancing, cancelling, or postponing events, prohibitions on assemblages of people over a particular number, lockdown, and closure of non-essential businesses and schools/universities. Restrictions on travels applied at international, national, and local level with a significant impact on national economies, including tourism activities (Gossling et al. 2020). Hence, during the

previous months, global tourism sector has shifted to no tourism (Traveller 2020) from overtourism in previous years (Seraphin et al. 2018).

Therefore, it is important to distinguish and quantify perceived attitudes and social behaviours related to tourism during the COVID-19 crisis in order to reduce its adverse effects. In this paper, we aim to discover the potential attitudes of Greek tourists that will not go for holidays due to COVID-19 and to classify them into groups according to their attitude towards these issues.

2 Literature Review

Tourism industry, as well as the whole economic system and the society suffered from the appearance of pandemics worldwide (Gossling 2002; Huan et al. 2004; Hall 2006; Page and Yeoman 2007; Fauci and Morens 2012; Fotiadis and Huan 2014; Bloom and Cadarette 2019; Scott and Gossling 2015; Seraphin et al. 2019; Hall 2020). However, SARS and COVID-19 are the two main recent epidemics that had a significant impact on the global tourism market and the economy worldwide (Ying et al. 2020).

A completed survey on tourism risk, crisis and disaster management consisting of 142 papers published between 1960 and 2018 describing the approaches and the identified gaps, the methodologies employed and the suggestions for similar future problems (Ritchie and Jiang 2019). Page et al. (2006) presented that tourism industry does not need to panic and appropriate response strategies have to be planned after a health crisis such as the swine flu pandemic. They also examined the impact of media frenzy on tourism as it might damage the image of a destination to visit.

Many factors, such as the continuous mobilization of population worldwide, the urbanization, and the high concentration of population might be the causes of increasing pandemic threats (Pongsiri et al. 2009; Labonte et al. 2011). Additionally, there have been many epidemics due to human interventions in biodiversity and natural ecosystems (Schmidt 2016; Petersen et al. 2016). Therefore, all these factors can have a significant impact on the individual's travel decisions, as well as on the overall travel behavior (Dreyer et al. 2010).

A crucial issue to understanding health security and global change constitutes of the association between pandemics and tourism (Burkle 2006). Disease outbreaks have influenced tourism many times since the beginning of the century. Hence, the variation of the scientific interest in exploring the association between epidemics and tourism depends on that of the general economic and governmental sector. Furthermore, numerous tourism and health researchers have warned that pandemics comprise tremendous threats to tourism and society (Gossling 2002; Hall 2006; Page and Yeoman 2007; Fauci and Morens 2012; Scott and Gossling 2015; Bloom and Cadarette 2019; Hall 2020).

Nowadays, the academic community investigated the effects of COVID-19 based mainly on preliminary data available, either indicated possible research patterns on pandemic or possible relations between outbreak crises and tourism (Gössling et al.

2020; Ying et al. 2020; Wen et al. 2020). Polyzos et al. (2020) investigated the expected effects of the current COVID-19 pandemic on Chinese tourist arrivals in the US and Australia and they argued that it may take 6–12 months for arrivals to come back to pre-crisis and hence there would be significant adverse effects on the whole global economy.

Organisational learning is critical for building disaster-resilient tourism businesses. Limited research has examined the mechanisms of organisational learning in tourism enterprises operating in disaster-prone destinations (Bhaskara and Filimonau 2021). The example of Sweden's COVID-19 response to lure visitors is described by Grech et al. (2020), also showing how countries will express the negative impact on tourism.

3 Methodology

This study is aiming to reject the following research hypotheses:

Ho1: *“Greek tourists that will not go for holidays due to COVID-19 crisis cannot be classified into groups according to their attitude towards these issues”*.

Ho2: *“The demographic and personal characteristics of the Greek tourists are not significantly related to their attitude towards these issues”*.

Hence, the researchers conducted an electronic survey in all over the Greek territory to collect the necessary data. The total productive sample consists of 2364, whilst 1104 (46.7%) of them declared that will not go for holidays this year and 1260 (53.3%).

The representativeness of the sample assessed by checking the proportion of the members of the sample who declared that would go for holidays within COVID-19 crisis with those of the pilot survey adopting the methodology proposed by Siardos (1997). More specifically, the proportion of the of the citizens (p) in the pilot survey who indicated that prefer not to go for holidays within COVID-19 crisis is 45%, whilst the total population of the Greece (N) is 10,816,286 according to Greek Census data (ELSTAT 2020). Therefore, in order to achieve a representative sample, the sample size should be at least 380 consumers (in order have $z = 3$ and $d = 5\%$). The researchers to secure a representative sample send the questionnaire electronically to 3,045 persons. The productive sample reached the 2,364 persons and is reasonable representative according to Siardos (1997) methodology ($z = 1.96$ and $d = 5\%$). Additionally, a power analysis ($\beta = 0.95$) was conducted using the software package G*POWER 3.1.9.2 (Faul et al. 2009), indicating a minimum sample size of 1073 people for a small effect size (Cohen 1988). The effect size was calculated as (mean of experimental group—mean of control group)/standard deviation; a correlation greater than 0.5 is large, between 0.5 and 0.3 is moderate, between 0.3 and 0.1 is small, and anything smaller than 0.1 is trivial (Cohen 1988). Therefore, a sample size of 2,364 people has been considered as fully representative of the whole Greek population.

Prior to the main sampling, a pilot survey addressed to 100 respondents in order to evaluate the adequacy of the questionnaire before the main survey have been undertaken. The pilot survey indicated that the main survey could be conducted with no further modification to the survey tool. In the next stage, for the purposes of the current paper, the researchers selected from the surveyed sample, the people who declared that will not go for holidays within COVID-19 crisis.

The main survey conducted during the period May–July of 2020 whilst the questionnaires were completed electronically by the respondents using the Google forms. For the main survey, the researchers used 87 volunteer enumerators from the thirteen Regions of Greece. Each enumerator sent the questionnaire electronically to about 35 citizens of his/her area (of each generational cohort Z, Y and X as these generations are familiar with Internet surveys) by using their own social media networks. As it was not possible to check which Region derives each completed questionnaire, the representativeness of the sample assessed by using the methodology proposed by Siardos (1997) and in particular, by checking the proportion of the members of the sample who declared that would not go for holidays within COVID-19 crisis with those of the pilot survey.

Moreover, multivariate statistical techniques employed including Principal Component Analysis (PCA), hierarchical and k-means cluster analysis, quadratic statistical analysis (QDA) to the 1104 people responded that will not go for holidays.

The relation between the demographic characteristics of tourists and their attitudes towards their decision to not go for holidays explored though logistic regression analysis. Furthermore, the profile of each group of respondents regarding their demographic characteristics have been developed by using chi-square analysis.

4 Results

4.1 Factors Affecting Attitudes of Tourists that Will not Go for Holidays Due to COVID-19 Crisis

Principal components and factor analyses (through a varimax rotation) were performed to distinguish the key attitude factors, the latent root criterion (eigenvalue = 1), and the proportion of variance were applied to determine the number of factors (Table 1). Many different trial rotations were performed to compare factor interpretability as proposed by Hair et al. (1998).

PCA identified two key factors that affect Greek tourists' decision to not go for holidays this year due to COVID-19 crisis (Table 2).

In the next step, hierarchical and non-hierarchical clustering techniques were utilized to build a typology of the attitudes of tourists regarding their decision not to go for holidays (Hair et al. 1998). Cluster analysis was performed on the 1104 observations, as there were no outliers.

Table 1 Results of PCA regarding the factors that affect Greek tourists' decision not to go for holidays this year due to COVID-19 crisis

Component	Eigenvalue	Variance (%)	Cumulative variance (%)
1	6.979	43.619	43.619
2	2.505	15.656	59.276
3	1.161	7.257	66.533
4	0.887	5.545	72.078
5	0.702	4.389	76.467
6	0.585	3.656	80.123
7	0.558	3.490	83.613
8	0.475	2.966	86.579
9	0.445	2.780	89.359
10	0.364	2.275	91.633
11	0.331	2.068	93.701
12	0.302	1.886	95.588
13	0.275	1.718	97.306
14	0.185	1.157	98.463
15	0.130	0.813	99.276
16	0.116	0.724	100.00

KMO MSA = 0.929, Bartlett test of Sphericity = 11,653.432, $P < 0.001$

It recognized two clusters of tourists that were named according to the factors affecting them in their decision (Table 3). These are: (a) those that are concerning for the economic and health protection measures and, (b) those that are affected by other family reasons. In particular those that are concerning for the economic and health protection measures, comprise 43% of those who prefer not go for holidays. They believe that there is a lack of trust regarding the cleanliness and the adoption of hygiene measures by the restaurants, café, by the people staying in hotels, hostels, etc., by the beach bars and organized beaches, due to COVID-19. They are afraid to become infected by COVID-19 and want to avoid overpopulation and to keep distances among people. They do not like the necessity of adopting hygiene measures more often than home. They have to protect people within the family that belong to vulnerable groups. Furthermore, they have to face income reduction due to COVID-19 crisis; the general economic difficulty, loss of job by a family member due to COVID-19 crisis as well as they have to save money in order to face another possible lockdown due to COVID-19.

On the other hand, those that are affected by other family reasons comprise 57% of the sample. They pay attention to: (a) another health problem, (b) other family obligations, (c) recent illness of themselves or other family member by COVID-19, (d) bad psychology due to the consequences of COVID-19.

The results of the cross-validation classification of the QDA are indicated in Table 4.

Table 2 The main factors that affect Greek tourists' decision not to go for holidays due to COVID-19 crisis derived from PCA

Main factors affecting Greek tourists' decision to not go for holidays this year	Factor loadings
Concern regarding efficient prevention measures towards COVID 19	
Lack of trust regarding the cleanliness and the adoption of hygiene measures by the restaurants, café, etc. due to COVID-19	0.918
Lack of trust regarding the cleanliness and the adoption of hygiene measures by the people staying in hotels, hostels, etc. due to COVID-19	0.914
Lack of trust regarding the cleanliness and the adoption of hygiene measures by hotels, hostels etc. due to COVID-19	0.913
Lack of trust regarding the cleanliness and the adoption of hygiene measures by the beach bars and organized beaches, etc. due to COVID-19	0.898
Fear not to be infected by COVID-19	0.811
Avoidance of overpopulation and keeping the distances among people	0.804
Due to the necessity of adopting hygiene measures more often than home	0.757
Protection of people within the family that belong to vulnerable groups	0.611
Economic reasons	
Income reduction due to COVID-19 crisis	0.864
General economic difficulty	0.805
Loss of job by a family member due to COVID-19 crisis	0.760
Saving money in order to face another possible lockdown due to COVID-19	0.723
Other family reasons	
Another health problem	0.759
Other family obligations	0.616
Recent illness of myself of other family member by COVID-19	0.540
Bad psychology due to the consequences of COVID-19	0.458

Table 3 Classification of Greek people regarding the factors that affect them in their decision to not go for holidays this year due to COVID-19 crisis

Main factors affecting Greek people do not go for holidays	Those that are concerning for the economic and health protection measures	Those that are affected by other family reasons	P-Value
Concern regarding efficient prevention measures towards COVID-19	0.5607	-0.35087	0.001
Economic reasons	0.63062	-0.39472	0.001
Other family reasons	-0.54197	0.33923	0.001
Number of persons (n = 1104)	425	679	

Table 4 Summary of classification with cross-validation

Actual Classification	Those that are concerning for the economic and health protection measures	Those that are affected by other family reasons
Those that are concerning for the economic and health protection measures	416	40
Those that are affected by other family reasons	9	639
Total N	425	679
N correct	416	639
Proportion	97.9%	94.1%
Number of tourists (n = 1104)	N correct = 1055	Proportion Correct = 95.6%

Thus, the three key factors that affect Greek tourists in their decision to not go for holidays due to COVID-19 crisis could correctly predict and distinguish tourists' group membership.

Therefore, the hypothesis *Ho1* "Greek tourists that will not go for holidays due to COVID-19 crisis cannot be classified into groups according to their attitude towards these issues" may be rejected.

4.2 Profiling Each Group of Tourists According to Their Demographics

A logistic regression analysis conducted to explore the association between each identified group of tourists that will not go for holidays due to COVID-19 and their demographic characteristics. Table 5 indicates there is a significant association between the identified groups of Greek tourists that will not go for holidays due to COVID-19 and the Gender (females), Generation X, Education (those who hold an undergraduate or postgraduate degree) Occupation (private employees, free licensed, Unemployed people and those who prefer housekeeping) and family income (15,001–25,000 Euro and more than 25,000 Euro). No significant association found between planned holidays income and the classified groups. On the other hand, as portrayed in Table 6, in the cases odds ratios that are greater than 1 indicate that the participation of tourists in the group that are affected by other family reasons is more likely at level A, whilst in cases odds ratios are less than 1 indicate the participation of tourists in the group that are affected by other family reasons is less likely at level A. In particular, it is more likely tourists who are male, belonging to generation Z, with primary education, working as civil servants with family income less than 9,000 Euro and spending less than 501 Euro for holidays to be affected by other family reasons in their decision to not go for holidays this year.

Table 5 Logistic regression—coefficients

Term	Coef	SE Coef	Z-Value	P-Value	VIF
Constant	1.966	0.433	4.54	0.000	
GENDER					
Female	-0.396	0.139	-2.84	0.004	1.08
GENERATION					
Generation Y	-0.114	0.223	-0.51	0.610	2.16
Generation X	-0.512	0.240	-2.13	0.033	2.48
EDUCATION					
High School	-0.474	0.311	-1.52	0.128	4.53
University degree	-1.078	0.323	-3.34	0.001	6.10
Postgraduate degree	-1.426	0.382	-3.73	0.000	2.95
OCCUPATION					
Private employee	-0.649	0.264	-2.46	0.014	2.47
Free licensed	-0.927	0.278	-3.33	0.001	2.17
Student	-0.193	0.301	-0.64	0.522	5.30
Retired	0.469	0.611	0.77	0.442	1.19
Unemployed	-0.856	0.316	-2.71	0.007	2.26
Housekeeping	-0.779	0.363	-2.15	0.032	1.67
PLANNED HOLIDAY BUDGET					
501–1,000 Euro	0.110	0.150	0.73	0.465	1.24
1,001–2,000 Euro	-0.124	0.228	-0.54	0.587	1.25
2,001 + Euro	-0.226	0.298	-0.76	0.449	1.30
FAMILY INCOME					
9,001–15,000 Euro	0.104	0.157	0.66	0.508	1.41
15,001–25,000 Euro	0.470	0.208	2.26	0.024	1.52
25,001 + Euro	0.822	0.276	2.98	0.003	1.45

$Y' = 1.966 + 0.0 \text{ Male} - 0.396 \text{ Female} + 0.0 \text{ GENERATION}_Z - 0.114 \text{ GENERATION}_Y - 0.512 \text{ GENERATION}_X + 0.0 \text{ EDUCATION}_{\text{Primary School}} - 0.474 \text{ EDUCATION}_{\text{High School}} - 1.078 \text{ EDUCATION}_{\text{University}} - 1.426 \text{ EDUCATION}_{\text{Postgraduate}} + 0.0 \text{ Civil Servants} - 0.649 \text{ OCCUPATION}_{\text{Private Employee}} - 0.927 \text{ OCCUPATION}_{\text{Free Licensed}} - 0.193 \text{ OCCUPATION}_{\text{Student}} + 0.469 \text{ OCCUPATION}_{\text{Retired}} - 0.856 \text{ OCCUPATION}_{\text{Unemployed}} - 0.779 \text{ OCCUPATION}_{\text{Housekeeping}} + 0.0 \text{ PLANNED HOLIDAY BUDGET}_{< 500 \text{ Euro}} + 0.110 \text{ PLANNED HOLIDAY BUDGET}_{501-1000 \text{ Euro}} - 0.124 \text{ PLANNED HOLIDAY BUDGET}_{1001-2000 \text{ Euro}} - 0.226 \text{ PLANNED HOLIDAY BUDGET}_{> 2000 \text{ Euro}} + 0.0 \text{ FAMILY INCOME}_{< 9001 \text{ Euro}} + 0.104 \text{ FAMILY INCOME}_{9001-15,000 \text{ Euro}} + 0.470 \text{ FAMILY INCOME}_{15001-25,000 \text{ Euro}} + 0.822 \text{ FAMILY INCOME}_{> 25,000 \text{ Euro}}$.

Table 6 Logistic regression—odds ratios

Level A	Level B	Odds Ratio	95% CI
GENDER			
FEMALE	MALE	0.6732	(0.5125; 0.8844)
GENERATION			
GENERATION Y	GENERATION Z	0.8924	(0.5763; 1.3818)
GENERATION X	GENERATION Z	0.5992	(0.3744; 0.9591)
GENERATION X	GENERATION Y	0.6715	(0.4534; 0.9945)
EDUCATION			
HIGH SCHOOL	PRIMARY EDUCATION	0.6227	(0.3382; 1.1466)
UNIVERSITY DEGREE	PRIMARY EDUCATION	0.3402	(0.1806; 0.6409)
POSTGRADUATE DEGREE	PRIMARY EDUCATION	0.2403	(0.1136; 0.5082)
UNIVERSITY DEGREE	HIGH SCHOOL	0.5464	(0.3864; 0.7726)
POSTGRADUATE DEGREE	HIGH SCHOOL	0.3858	(0.2280; 0.6529)
POSTGRADUATE DEGREE	UNIVERSITY DEGREE	0.7062	(0.4314; 1.1559)
OCCUPATION			
PRIVATE EMPLOYEE	CIVIL SERVANT	0.5227	(0.3118; 0.8764)
FREE LICENSED	CIVIL SERVANT	0.3956	(0.2294; 0.6824)
STUDENT	CIVIL SERVANT	0.8246	(0.4567; 1.4888)
RETIRED	CIVIL SERVANT	1.5987	(0.4831; 5.2898)
UNEMPLOYED	CIVIL SERVANT	0.4247	(0.2285; 0.7894)
HOUSEKEEPING	CIVIL SERVANT	0.4588	(0.2254; 0.9340)
FREE LICENSED	PRIVATE EMPLOYEE	0.7569	(0.4758; 1.2039)
STUDENT	PRIVATE EMPLOYEE	1.5775	(0.9739; 2.5553)
RETIRED	PRIVATE EMPLOYEE	3.0584	(0.9586; 9.7584)
UNEMPLOYED	PRIVATE EMPLOYEE	0.8124	(0.4872; 1.3549)
HOUSEKEEPING	PRIVATE EMPLOYEE	0.8777	(0.4611; 1.6706)
STUDENT	FREE LICENSED	2.0843	(1.2096; 3.5915)
RETIRED	FREE LICENSED	4.0408	(1.2611; 12.9474)
UNEMPLOYED	FREE LICENSED	1.0734	(0.6173; 1.8665)
HOUSEKEEPING	FREE LICENSED	1.1596	(0.5987; 2.2462)
RETIRED	STUDENT	1.9387	(0.5860; 6.4137)
UNEMPLOYED	STUDENT	0.5150	(0.3040; 0.8723)
HOUSEKEEPING	STUDENT	0.5564	(0.2707; 1.1434)
UNEMPLOYED	RETIRED	0.2656	(0.0808; 0.8736)
HOUSEKEEPING	RETIRED	0.2870	(0.0841; 0.9792)

(continued)

Table 6 (continued)

Level A	Level B	Odds Ratio	95% CI
HOUSEKEEPING	UNEMPLOYED	1.0803	(0.5368; 2.1742)
PLANNED HOLIDAY BUDGET			
501–1,000 Euro	< 501 Euro	1.1158	(0.8318; 1.4967)
1,001–2,000 Euro	< 501 Euro	0.8833	(0.5647; 1.3819)
2,001 + Euro	< 501 Euro	0.7980	(0.4448; 1.4316)
1,001–2,000 Euro	501–1,000 Euro	0.7917	(0.5090; 1.2314)
2,001 + Euro	501–1,000 Euro	0.7152	(0.4018; 1.2732)
2,001 + Euro	1,001–2,000 Euro	0.9034	(0.4747; 1.7194)
FAMILY INCOME			
9,001–15,000 Euro	< 9,001 Euro	1.1095	(0.8159; 1.5087)
15,001–25,000 Euro	< 9,001 Euro	1.5999	(1.0634; 2.4070)
25,001 + Euro	< 9,001 Euro	2.2761	(1.3250; 3.9097)
15,001–25,000 Euro	15,001–25,000 Euro	1.4420	(0.9859; 2.1091)
25,001 + Euro	15,001–25,000 Euro	2.0514	(1.2175; 3.4566)
25,001 + Euro	25,001 + Euro	1.4226	(0.8271; 2.4470)

Odds Ratio for Level a Relative to Level B

Finally, a chi-square analysis conducted for each group of tourists in order to build their profile regarding their demographic characteristics. As shown in Table 7, the tourists that are concerning for the economic and health protection measures are mainly female of generation Z, holding a university degree, mostly students, who planned to spend up to 500 Euro for holidays and their family income is between 9,001 and 15,000 Euro. Similar is the profile of those who are affected by other family reasons.

Therefore, the hypothesis Ho2 “*The demographic and personal characteristics of the Greek tourists are not significantly related to their attitude towards these issues*” may be rejected.

5 Discussion and Conclusions

This study explored the potential attitudes of Greek tourists that will not go for holidays due to COVID-19 and classified them into groups according to their attitude towards these issues. It identified the factors during COVID-19 that influence Greek tourists to not go for holidays. The results of this work provide important insights about the attitudes of Greek tourists regarding their decision to not go for holidays due to the COVID-19 crisis. Factors including people’s concern regarding efficient prevention measures towards COVID-19, economic and other family reasons, influence the Greek tourists in their decision not to go for holidays due to COVID-19.

Table 7 Profiling each group of tourists according to their demographics

Demographic Characteristics		Those who are concerning for the economic and health protection measures		Those who are affected by other family reasons	
Gender	Male	$x^2 = 49.471$ ($P < 0.001$)	49.1%	$x^2 = 18.146$ ($P < 0.001$)	41.8%
	Female		50.1%		58.2%
Age	Generation Z	$x^2 = 47.976$ ($P < 0.001$)	49.3%	$x^2 = 178.695$ ($P < 0.001$)	57.9%
	Generation Y		24.6%		21.7%
	Generation X		26.1%		20.4%
Education	Primary School	$x^2 = 290.059$ ($P < 0.001$)	5.5%	$x^2 = 450.757$ ($P < 0.001$)	8.4%
	High School		24.9%		27.3%
	University Degree		58.6%		57.4%
	Postgraduate Degree		11.0%		6.9%
Occupation	Civil Servant	$x^2 = 213.186$ ($P < 0.001$)	9.9%	$x^2 = 551.052$ ($P < 0.001$)	12.4%
	Private Employee		18.8%		15.1%
	Free Licensed		15.8%		10.8%
	Student		35.5%		44.5%
	Retired		1.9%		4.0%
	Unemployed		11.8%		8.5%
	Housekeeping		6.3%		4.7%
Family Holiday Budget	< 501 Euro	$x^2 = 184.195$ ($P < 0.001$)	47.3%	$x^2 = 314.655$ ($P < 0.001$)	46.8%
	501–1,000 Euro		34.3%		36.2%
	1,001–2,000 Euro		11.4%		10.6%
	2,001 + Euro		7%		6.4%
Family Income	< 9,000 Euro	$x^2 = 121.758$ ($P < 0.001$)	37.6%	$x^2 = 116.953$ ($P < 0.001$)	31.8%
	9,001–15,000 Euro		38.4%		37.5%
	15,001–25,000 Euro		16.5%		19.8%
	25,001 + Euro		7.5%		10.9%

Consequently, this study is in line with the outcomes of other researchers presented in literature review (Gossling 2002; Hall 2006, 2020; Page et al. 2006; Page and Yeoman 2007; Koe et al. 2008; Scott and Gossling 2015; Noveli et al. 2018; Hanrahan and Melly 2019). Moreover, this study classified those tourists into two groups according to factors that influence their decision to not go for holidays due to COVID-19: (a) those that are concerning for the economic and health protection measures and, (b) those are influenced by other family reasons.

Furthermore, tourists’ age, gender, occupation, educational level, as well as their planned budget of holidays and their family income have a significant impact on their decision to not go for holidays due to COVID-19.

In particular females, Generation X, university or postgraduate education, occupation as private employees and free licensed, unemployment, housekeeping, and those with family income between 15,001 and 25,000 Euro and more than 25,000 Euro are factors that significantly affect their decision to not go for holidays due to COVID-19. Moreover, this study indicated that it is more likely tourists who are male, belonging to Generation Z, with primary education, working as civil servants with family income less than 9,000 Euro and spending less than 501 Euro for holidays to be influenced by other family reasons in their decision to not go for holidays this year.

The above information is important for decision makers in tourism industry sectors and for the policy makers because it can be used for the implementation of appropriate regulation programs and tools. Managers and owners in tourism enterprises should also be informed about the attitudes and factors influencing tourists' decision to not go for holidays due to COVID-19 crisis in order to make the appropriate decisions and conduct accordingly their marketing and business plans.

In addition, the outcomes of this study provide useful recommendations for introducing stimulus and recovery measures to handle the consequences of the COVID-19 pandemic. Tourism sector must be financially supported by governments in order to recover by the COVID-19 pandemic effects.

The main limitation of the present study is that the survey was performed during a period where the COVID-19 outbreak in Greece was at peak. Therefore, it was possible to collect a timely response from respondents, but, at the same time, the respondents may have been affected by strong emotions at the time. Nevertheless, this crisis is still expanding and its effects on tourism require further consideration in future studies. The impact of the COVID-19 pandemic is expected to diminish over time once the pandemic is brought under control. There might even be some positive effect on the tourism sector on certain tourist destinations, such as ecological improvements from the dramatic drop in carbon emissions during the crisis (Qiu et al 2020).

In this regard, the results of this work should lead to further research, both in Greece and in other countries with similar characteristics. Longitudinal studies are also worth conducting.

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Understanding the Travel Risk Profile and Travel Intentions of Generation Z Amidst Covid-19



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Abstract Travel restrictions as a result of COVID-19 have dramatically impacted international travel and tourism. The aim of this study is to explore the travel intentions of Generation Z consumers living in the UK, in light of Covid-19 and to understand their travel risk profile. Data is collected with the use of an online questionnaire distributed to Generation Z consumers living in the UK. We find that Generation Z are not inclined to avoid travel during Covid 19. Their perceptions about the travel risk associated with Covid 19 are relatively neutral and their self-efficacy is very high. They are confident travelling during Covid-19 is not posing a significant risk for their health, but they are concerned about passing the virus to a friend or to family who may be at risk. Our findings contribute to the understanding of the travel risk profile, intentions and concerns of Generation Z travelers during Covid-19.

Keywords Covid-19 · Generation Z · Travel risk · Travel intentions · International travel · Domestic travel

1 Introduction

The Covid-19 pandemic has had a dramatic impact on travel and tourism. According to UNWTO (2021a), despite the slight recovery that the travel and tourism sector demonstrated in June and July 2021 in comparison to earlier in 2021, “international

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tourist arrivals (overnight visitors) in the first seven months of 2021 were 40% below the levels of 2020, and still 80% down when compared to the same period of pre-pandemic year 2019". As a result of the pandemic, international markets have experienced a dramatic downturn, and the travel and tourism sector is one of the sectors of the global economy impacted the most (Abbas et al. 2021; da Silva Lopes et al. 2021; UNWTO 2021a). Since the outbreak of the pandemic in 2020, governments across the globe have implemented travel restrictions of one form or another—ranging from completely or partially closed borders to requiring tourists to present some kind of Covid-19 test upon their arrival to the host country, to quarantine upon arrival at the host country. As a result of the new Omicron variant, travel restrictions that had been eased in previous months are now reinstated (Durbin 2021) and, as of November 2021, "still 98% of all destinations have some kind of travel restrictions in place" (UNWTO 2021b). These travel restrictions are limiting people's ability to travel and are putting on hold what seemed to be a (slow) restart of domestic and mainly international tourism.

Along with travel restrictions, additional measures have been put in place by countries, such as social distancing, closure of or restrictions to the operation of restaurants and bars, bans of public events, all of which are having an impact on the tourist experience. These travel and other restrictions impacting the tourism experience, along with concerns about contracting and transmitting the virus, are eroding travellers' confidence and impacting their intention to book holidays and travel (Abbas et al. 2021; Gossling et al. 2020; PWC 2020). As a result, airlines, travel agents, tour operators, hotels, and the entire tourism industry are experiencing a significant drop in business resulting in significant financial difficulty.

The demographic characteristics of travellers are impacting their travel behaviour and creating distinctive profiles of consumer behaviour across generations (Baltescu 2019). This has a direct or indirect impact on the travel and tourism industry which should take into account these demographic differences between generations in order to be able to understand the unique consumer behaviour of each generation and to meet the demand for travel and tourism (Robinson and Schanzel 2019). Younger travellers have their own unique risk profile. Research is suggesting that young travellers are characterised by a higher likelihood to take health risks due to low-risk perceptions regarding travel-related illness and infections (Ma et al. 2020; Aro et al. 2009). However, at the same time, younger generations have been found to be characterised by "an underlying desire for security" (Wood 2013, p. 1) and to show considerable concern for physical risk during travel (Dolnicar 2005). Research conducted by DCI (2020) is suggesting that compared to other generations, Generation Z expresses an increased concern about their health during travel amidst Covid-19 (DCI 2020).

The aim of this research is to explore the impact of Covid-19 on the travel intentions of Generation Z consumers. More specifically, we want to explore the travel risk perceptions of Generation Z in light of Covid-19, and to understand how concerns about Covid-19 are impacting their planning and purchasing of holidays. Generation Z are individuals born between 1995 and 2009 and, according to Euromonitor (2018), Generation Z accounted for 1.8 billion people or 24% of the global population in 2017. This generation of young consumers is anticipated to become, and remain,

the largest consumer group across all generations until 2030 (Euromonitor 2020). This makes it imperative for businesses operating in the travel and tourism sector to understand the travel intentions of this consumer group amidst Covid-19. Our study focuses on Generation Z consumers living in the UK at the time of the research. We find that Generation Z are not inclined to avoid travel during Covid 19. Their perceptions about the travel risk associated with Covid 19 are relatively neutral and their self-efficacy is very high. They are confident travelling during Covid-19 is not posing a significant risk for their health, but they are concerned about passing the virus to a friend or to their family who may be at risk. Our research contributes to the research about travel intentions and travel risk perceptions in light of Covid-19. As young Generation Z travellers are going to be the largest customer group in the years that follow, it is very important for the travel and tourism sector as well as for governments and organisations wishing to support a dynamic restart of the travel and tourism sector to gain insights into the needs, wants and concerns that shape the travel intentions of this group of consumers.

2 Literature Review

2.1 *Travel and Risk*

It is widely discussed and acknowledged in the travel and tourism literature that travel risk perceptions are a primary consideration in travel and vacation planning and decisions (Quintal et al. 2010; Cahyanto et al. 2016; Williams and Balaz 2015; Carballo et al. 2017; Huang et al. 2021). Williams and Balaz (2015) underline the centrality of risk in travel and vacation planning, arguing that “risk and uncertainty are inherent to, and provide lenses for deepening understanding of, tourism” (p. 271). Different types of risk have been associated with travel and tourism, such as for example, physical risk (Schiffman and Kanuk 2010; Roehl and Fesenmaier 1992; Maser and Weiermair 1998), financial risk (Schiffman and Kanuk 2010; Sonmez and Graefe 1998); psychological risk (Schiffman and Kanuk 2010; Sonmez and Graefe 1998); risk of natural disasters (Maser and Weiermair 1998); hygiene and health related risk (Cahyanto et al. 2016; Maser and Weiermair 1998; Lepp and Gibson 2003; Carballo et al. 2017) among others.

Travel risk considerations become more prominent following recent, negative events) and evidence is suggesting that recent crises and disasters are increasing travellers’ concerns about health and safety during travel (Bergstrom and McCaul 2004; Cahyanto et al. 2016). Travel risk can be classified on the basis of the level of control over a negative event and the speed of onset of the negative event (Glaesser 2006). Also, according to Glaesser (2006), travel risk considerations enter travel and tourism planning and decisions in the form of two key factors: (i) the likelihood of a negative incident taking place and (ii) the damage resulting from the negative incident. The consequences of a choice or a behaviour have been found to impact travel

and tourism planning and decision making, with individuals using-costs benefit analysis in order to conduct travel risk assessment and make travel decisions (Williams and Balaz 2015; Cahyanto et al. 2016; Chien et al. 2017). Risk and safety are gaining importance in the travel and tourism booking process and tourists are more concerned about safety and security during travel.

The tourism industry is particularly susceptible to crises, disasters and exogenous threats which may increase the level of perceived travel risk, largely due to the nature of tourism and the tourism product. Tourism involves a level of information uncertainty, it is experiential in nature, it typically involves movement of tourists from one place to another and it involves social interaction (Arbulu et al. 2021; Cahyanto et al. 2016; Williams and Balaz 2015; Sirakaya and Woodside 2005). As a result, travel and vacation planning and decision making largely depends on perceptions of safety and security (Carballo et al. 2017).

2.2 *Travel and Covid-19*

The experiential nature of tourism and the movement and social interaction elements make tourism particularly susceptible to health crises such as pandemics and epidemics (Arbulu et al. 2021; Seabra et al. 2021; Cahyanto et al. 2016). Also, the industry has been dramatically impacted by measures taken to contain the virus and to limit its spread, such as travel restrictions (including closing of borders), advice to limit non-essential travel, quarantine measures, vaccination requirements, social distancing (including the closing or restrictions on bars, restaurants, and public events), etc. (Beck and Hensher 2020; Linka et al. 2020; Adekunle et al. 2020; Gossling et al. 2020; Movsisyan et al. 2021), all impacting people's ability to travel as well as the tourist and holiday experience.

Tourism has been impacted by health crises in the past, for example during the outbreak of SARS, H1N1, MERS, or Ebola. Research conducted on the impact of these health crises on travel and tourism suggested that the impact was more prominent for domestic travel and tourism of the affected countries and that global travel and tourism continued to grow despite these health crises (Gossling et al. 2020; Arbulu et al. 2021; Duro et al. 2021). As Gossling et al. (2020, p. 3) suggest, prior to Covid-19, "tourism as a system has been resilient to external shocks". However, Covid-19 has had an unprecedented impact on the travel and tourism industry. The impact of Covid-19 on the travel and tourism industry appears to be more devastating than World War II (da Silva Lopes et al. 2021) and the 2018 financial crisis (Duro et al. 2021). The unprecedented impact of Covid-19 on travel and tourism makes it imperative to understand the impact that the pandemic has on tourists travel intentions and planning and how these are impacted by travel risk perceptions.

There have been some studies exploring the travel intentions of tourists and travel risk perceptions since the outbreak of the pandemic. Huang et al. (2021) investigated the impact of Covid-19 on Chinese national's tourism preferences and found that Covid-19 has negatively impacted preference to travel to countries with a high

number of infections, and to geographically, administratively and culturally distant destinations. Also, the study found that Chinese tourists had less interest in all travel modes and forms in general and that tourists preferred shorter trips and shorter distances after Covid-19. Da Silva Lopes et al. (2021) used surveys conducted in the metropolitan area of Porto in Portugal to investigate tourists' risk perception before and during Covid-19. The authors found that the impact of Covid-19 was significant on how tourists perceive the risks of using public spaces and in the way they arrange tourist visits. Zhan et al. (2021) measured risk perceptions of Chinese travellers to Wuhan after the outbreak of the virus across different demographic dimensions and experiences and found that significant differences in risk perceptions were found in relation to attitudes such as "involvement in disease prevention control, losses suffered during the pandemic, and previous experiences of visiting Wuhan" (p. 1). Neuburger and Effer (2021) studied the impact of travel risk perception during Covid-19 on travel behaviour in the DACH region (Germany, Austria, Switzerland), aiming to understand changes in travel risk perceptions and behaviours toward changing, cancelling and avoiding travel. The study found that the outbreak of Covid-19 had a significant impact on travel risk perceptions and that avoiding or cancelling travel during the pandemic is highly associated with travel risk perception. Bae and Chang (2021) investigated the effect of risk perception on the travellers' intentions toward 'untact' tourism in South Korea during the Covid-19 pandemic. The study found a positive attitude toward 'untact' tourism stemming from travellers' concerns about theirs and their families' health and lives. None of these studies focuses on Generation Z consumers or UK residents.

A study which investigates the behaviour of Generation Z travellers during Covid-19 is Percic and Spasic (2021). More specifically, the study conducted an online survey among Generation Y and Generation Z consumers in order to explore travellers' preferences and opinions about organised travel during Covid-19. The authors found that respondents were less inclined to opt for organised travel arrangements post-Covid-19 and had an increased preference for self-directed travel. Also, the authors found that Generation Z travellers were even less interested in organised travel compared to Generation Y travellers. A second study investigating the impact of Covid-19 on the travel behaviour of Generation Z is Roncak et al. (2021). This research investigated the intention to travel during and after the pandemic outbreak, the safety concerns and changes in travel behaviour of Generation Z in the Czech Republic. The researchers found that respondents were not inclined to change their travel habits because of Covid-19 and that they would continue to travel internationally. They also found that the respondents prepared individual travel and accommodation rather than group travel, as a precautionary measure to reduce the risk of being exposed to Covid-19. These two studies did not look at travel risk perceptions of Generation Z travellers. Our research will complement existing research and will add to our understanding of travel intentions of tourists and travel risk perceptions since the outbreak of the pandemic.

2.3 *Generation Z, Risk Behaviour and Travel*

Generation Z, also referred to as the iGen and Gen Z, are individuals born between 1995 and 2010. According to research conducted by Bloomberg (Wood 2018), they were expected to “account for 2.47 billion people of the 7.7 billion inhabitants of planet Earth” by 2019, representing 32% of the world’s population. Members of Generation Z are a very dynamic consumer group that is expected to become and remain the largest consumer group across all generation groups until 2030 (Euromonitor 2018). They are often referred to as true natives, as they are a generation born in a technologically advanced era and exposed to the internet, mobile devices and social media from a very young age (Baltescu 2019). As consumers, members of Generation Z are characterised by “(1) a focus on innovation, (2) an insistence on convenience, (3) an underlying desire for security, and (4) a tendency toward escapism” (Wood 2013, p. 1). Moreover, their consumption patterns become part of their identity and an experiential process for them, and they are more concerned about ethics, the environment and sustainability compared to previous generations (Turner 2015; Francis and Hoefel 2018; Baltescu 2019).

Generation Z consider travel as an important part of their lives and they make savings in order to travel (Seabra et al. 2021; Roncak et al. 2021). They are more open to travel, and travel and tourism are motivated by a desire for conviviality, socialisation and empowerment, a need for new and unique experiences and a sense of connectedness and desire to explore the world (Haddouche and Salomone 2018; Yeoman and McMahon-Beattie 2019; Niemczyk et al. 2019, Seabra et al. 2021). Generation Z is characterised by a desire for security (Wood 2013), a profound sense of anxiety and distrust (Robinson and Schanzel, 2019), and considers health and safety to be very important (Seemiller and Grace 2018). According to Duman et al. (2020, p. 217) Generation Z travellers “are not particularly looking for risk and adventure in their vacation choices and Covid-19 has increased their anxiety about travel (Roncak et al. 2021; DCI 2020).” According to DCI (2020), Generation Z are more concerned about travel during Covid-19 than Generation X and Boomers and getting sick during travel is a stronger hindrance for Generation Z than it is for Generation X and Boomers. At the same time, Generation Z has developed a sense of safety (Seabra et al. 2021, p. 467), their upbringing in an era of major crises, environmental, economic, political, security, has helped them develop coping mechanisms (Robinson and Schanzel, 2019, p. 129), they perceive themselves as above average when considering their health (Seemiller and Grace 2018) and they are more likely to engage in riskier travel than older generations (DCI 2020).

3 Data Collection

Data for the study were collected with the use of an online survey questionnaire distributed through JISC online surveys. The questionnaire included eight (8) demographic/profile questions designed to capture the profile of the participants and then used 5-point Likert scales (1 = extremely unlikely/strongly disagree to 5 = extremely likely/strongly agree) to capture participants' opinions on travel risk and their holiday preferences. The survey was based on Cahyanto et al. (2016) who used the Health Belief Model (HBM) to capture the dynamics of travel avoidance following Ebola in the U.S. More specifically, this study developed a framework on the basis of six factors, namely perceived travel risk, perceived susceptibility, perceived severity, self-efficacy, subjective knowledge and socio-demographics, to explain travel avoidance in the U.S. due to the Ebola epidemic. Also, our questionnaire captured participants' intention to travel to the following international destinations: Asia (except China); Canada; China; Europe; UAE, USA, Other. The list of international destinations was adapted from Seeman et al. (2019).

Our study population consisted of Generation Z consumers over the age of 18 residing anywhere in the UK at the time of the study. Generation Z tourists are considered a very dynamic consumer group and a very important consumer group for the future of the tourism and travel industry (Yeoman and McMahan-Beattie 2019). Statista (2015) estimated the size of the Generation Z population in the UK 14.5 million in 2015, so a minimum of 384 completed questionnaires would be representative of the population. Although the dynamic of Generation Z as a consumer group is recognized in the literature, there is limited academic literature examining their travel intentions and even fewer studies investigating the impact of Covid-19 on Generation Z travel and tourism habits. The online survey was disseminated via social media platforms and in particular Facebook and Instagram, and the data was collected in the summer of 2020. A total of 402 completed surveys were used for analysis.

4 Findings

4.1 Participant Profile

Females constituted the majority of the participants of this study, with 69.4% of 402 participants being female and the remaining 30.6% being male. Although female participants were more than double the male participants in this study, we still think that the number of male participants was representative. The study participants were primarily between the age of 21 and 23 (45%), followed by the age of 24 and 25 (36.3%), then 18 and 20 (14.9%), and 'other' (3.7%). More than two thirds of the study participants indicated that they had received higher education or vocational equivalent (71.4%), while 23.4% had A-Level education or equivalent vocational

experience. Caucasian participants represented 87.6% of the sample, followed by Asian or Asian British (6.5%), ‘mixed ethnic group’ (2.7%), and Black, African, Caribbean or Black British (2.2%), and 1% of the participants who reported that they were from another ethnic background. This is suggesting that all other ethnic origins, except White, were under-represented in our sample, and as a result our findings should be interpreted with caution. Most of the study participants were employed (59.7%), followed by students (33.6%), while only 6.7% of the sample indicated that they were unemployed at the time of data collection. At the time of data collection, the majority of the participants resided in England (85.6%), followed by Scotland (8%), Wales (2.5%) and only 1.2% of the study participants resided in Northern Ireland. Also, 11 participants did not indicate their country of residence in the UK. When asked how many times they had travelled internationally in 2019 the majority of the participants (48.3%) reported more than 3 times, followed by 45.5% who reported that they had travelled internationally 1–2 times in 2019, while only 6.2% reported that they did not make any international travel in 2019. This finding confirms the view that Generation Z perceives international travel as an important part of their lives (Seabra et al. 2021; Roncak et al. 2021). Finally, the majority of the respondents (33.8%) reported that their average vacation cost was between £400 and £599, followed by £800+ (28.6%), £600 and £799 (19.7%), £200 and £399 (16.2%) and finally, only 1.7% reported that their average vacation cost was between £0 and £199. Table 1 summarises the profile of the respondents.

4.2 International Travel Intention

We were interested in capturing the international travel intentions of the participants and we asked them how likely they were to travel internationally within the next 6 months and the next 12 months. The responses suggested that the study participants were less likely to travel internationally within the next 6 months compared to the next 12 months (mean responses 3.19 and 4.19 respectively). Also, we asked participants where they were more likely to travel for their next international trip. The responses suggested that Europe was the most likely next international destination, selected by 91.6% of the participants. China was the least likely next international destination, selected only by 8.4% of the participants. Table 2 summarises the participants’ travel destination preferences.

4.3 Reliability of Test Results and Travel Risk Profile

In order to study the overall travel risk profile, the variables of the questionnaire were grouped in scales. More specifically, six scales were created from specific items of the questionnaire, and we used the responses to develop a score for each of the six scales. The scales, descriptive statistics, reliability estimates using Cronbach’s α

Table 1 Profile of the respondents

Demographic characteristics	Variable	Frequency	Percentage (%)
Gender	Male	123	30.6
	Female	279	69.4
Age	18–20	60	14.9
	21–23	181	45
	24–25	146	36.3
	Other	15	3.7
Education	No qualifications	2	0.5
	Other qualifications: level unknown (including foreign qualifications)	2	0.5
	Qualifications at level 1 and below	2	0.5
	GCSE/O level grade A*-C	15	3.7
	A-levels, vocational level 3 and equivalents	94	23.4
	Higher education and professional/vocational equivalents	287	71.4
Race and ethnicity	Asian/Asian British	26	6.5
	Black/African/Caribbean/Black British	9	2.2
	Mixed/multiple ethnic groups	11	2.7
	White	352	87.6
	Other ethnic group	4	1
Employment	Student	135	33.6
	Employed	240	59.7
	Unemployed	27	6.7
Country	England	344	85.6
	Northern Ireland	5	1.2
	Scotland	32	8
	Wales	10	2.5
	Missing values	11	2.7
International travel in 2019	None	25	6.2
	1–2 international trips	183	45.5
	3+ international trips	194	48.3
Average vacation cost	£0–£199	7	1.7
	£200–£399	65	16.2
	£400–£599	136	33.8
	£600–£799	79	19.7

(continued)

Table 1 (continued)

Demographic characteristics	Variable	Frequency	Percentage (%)
	£800+	115	28.6

Table 2 International travel destination preferences

Travel to		Highly unlikely	Unlikely	Don't know	Likely	Highly likely	Missing values
Asia	Frequency	137	82	30	90	57	6
	Percent	34.1	20.4	7.5	22.4	14.2	1.5
Canada	Frequency	100	97	65	88	43	9
	Percent	24.9	24.1	16.2	21.9	10.7	2.5
China	Frequency	228	95	32	17	17	13
	Percent	56.7	23.6	8	4.2	4.2	3.2
Europe	Frequency	5	4	18	129	240	6
	Percent	1.2	1	4.5	32.1	59.7	1.5
UAE	Frequency	130	110	56	56	38	12
	Percent	32.3	27.4	13.9	13.9	9.5	3
USA	Frequency	137	89	49	67	54	6
	Percent	34.1	22.1	12.2	16.7	13.4	1.5
Other countries	Frequency	66	34	131	90	65	16
	Percent	16.4	8.5	32.6	22.4	16.2	4

and the F-statistic and p-value of ANOVA are indicated on Table 3. The reliability estimate using Cronbach's α is in all cases very satisfactory except the Perceived travel risk scale. All means between items are statistically different, as suggested by the F-statistic and p-value of each of the nine scales.

The study participants demonstrated a relative neutrality toward travel risk associated with Covid-19, as indicated by the overall mean score of 3.3436 of the Perceived Travel Risk scale. Interestingly, the respondents considered domestic travel almost as risky as international travel. Participants were rather neutral about the riskiness of air travel, even though they reported a relatively higher concern about travelling by air compared to other items of the scale, as indicated by the mean scores of the items *I am concerned about Coronavirus during travel by air right now* and *It is dangerous to travel internationally by air right now because of Coronavirus* (3.44 and 3.54 respectively).

Perceptions about the Perceived Susceptibility to Covid-19 were almost neutral, as indicated by the overall mean score of 3.0680 of this scale. The participants were less concerned about contracting the virus if they travelled within the next few weeks compared to if they travelled in general (mean scores of 2.90 and 3.47 respectively). Also, the participants were less concerned about contracting the virus if they travelled

Table 3 Scale statistics

	Scale	Number of items	Cronbach's α	Min	Max	Mean	Standard deviation	F-statistic	p-value
1	Perceived travel risk	10	0.581	10	46	33.436	5.167	50.280	0.00
2	Perceived susceptibility	5	0.807	5	25	15.340	3.832	59.106	0.00
3	Perceived severity	5	0.800	5	24	13.455	3.841	642.960	0.00
4	Self-efficacy	5	0.815	5	25	21.333	2.785	5.701	0.00
5	Pay for vacation safety	4	0.913	4	20	13.676	4.042	70.791	0.00
6	International travel in the next 6 and 12 months	2	0.814	2	10	7.375	2.430	326.95	0.00

in the UK compared to travelling internationally (mean responses of 2.74 and 3.23 respectively).

Our findings show that perceived severity of Covid-19 was relatively low, as indicated by the overall mean score of 2.6910 of this scale. More specifically, the participants were relatively neutral about how dangerous the virus is (mean response of 3.45), and they were even less worried about dying from the virus. The main concern for our participants was passing the virus to a member of their family or a friend who might die (mean response of 3.99).

The self-efficacy of the participants was very high, as suggested by the high overall mean score of 4.2666 of this scale. Our participants were very confident that they understood the health and prevention instructions that they knew how to avoid contracting the virus, and that they could identify the symptom and how to behave in case they were exposed to the virus.

In addition, the respondents were relatively neutral about paying more for safety during travel. The participants were less inclined to pay more for safety during travel in the UK (mean response of 3.04) and a little more inclined to pay more for safety during international travel (mean response of 3.58), during flying (mean response of 3.51) and at their hotel (mean response of 3.54). Finally, as indicated earlier, the participants reported that they were highly likely to travel internationally in the next 6 and 12 months. This was mainly driven by their intention to travel internationally in the next 12 months, while the participants were relatively neutral toward travelling in the next 6 months.

4.4 Independent Samples *t*-Test and ANOVA

We used independent samples *t*-test to compare the results on the five scales capturing the participants' travel risk profile across the two categories of the gender variable. The significance of the *t*-statistic on Table 4 being lower than 0.05 (*p*-value) provides evidence of a statistically significant difference between the two samples of gender, indicating larger differences in Perceived Travel Risk, Perceived Susceptibility, Perceived Severity and Pay more for Vacation Safety, between female and male participants.

Table 4
Independent-samples *t*-test

Scale	<i>t</i> -test	<i>p</i> -value
Perceived travel risk	−3.048	0.003
Perceived susceptibility	−3.092	0.002
Perceived severity	−3.433	0.001
Self-efficacy	0.157	0.875
Pay more for vacation safety	−2.101	0.037

Table 5 ANOVA

Scales	Variables	F	p-value
Perceived travel risk	International travel in 2019	5.952	0.003
Perceived susceptibility	International travel in 2019	3.767	0.024
Perceived severity	International travel in 2019	5.535	0.004
Self-efficacy	Average vacation cost	2.978	0.019
Pay more for vacation safety	International travel in 2019	6.455	0.002

In order to compare the five scales of the participants travel risk profile and variables with more than two categories, we apply the ANOVA procedure. Table 5 indicates which variables contribute the most to our cluster solution. Variables with large F values provide the greatest separation between clusters. In cases where the p-value is lower than 0.05, there is evidence that at least two means are different between them.

Specifically, regarding Perceived Travel Risk the respondents who have travelled 1–2 times in 2019 have higher scores than those who have travelled more than 3 times in 2019. The same difference appears in Perceived Susceptibility, Perceived Severity and intention to Pay more for Vacation Safety.

5 Discussion

Covid-19 has been characterised as an illness with a high potential risk and at the time of the study, the WHO (2022a) was reporting more than 35,000 daily deaths from the virus globally. Despite this, the research respondents were relatively neutral about Covid-19 being a frightening disease. This could be attributed to the fact that the virus is usually more severe for people over the age of 60 and for those with underlying medical conditions (WHO 2022b; CDC 2020). Our participants, being young and usually without conditions such as diabetes or cardiovascular disease, were less frightened about Covid-19. Also, the study participants considered the perceived severity of Covid-19 to be low. This is in line with Roncak et al. (2021), who are also reporting that their generation Z research participants were also neutral about the perceived severity of Covid-19. Earlier findings suggest that this generation perceive themselves as above average when considering their health (Seemiller and Grace 2018). What was a significant concern for our respondents was contracting the disease and passing it to a member of their family or a friend who might die. These findings are in line with Cahyanto et al. (2016) who also found that their study participants were neutral about the perceived severity of Ebola, but they were concerned about passing it to family and friends who might die of the disease.

Our findings show that the self-efficacy of the respondents was very high and they were very confident that they understood the health and prevention instructions, that they knew how to avoid contracting the virus, and that they could identify the symptom and how to behave in case they were exposed to the virus. Growing up in an era of major crises, environmental, economic, political, and security, has helped Generation Z develop coping mechanisms (Robinson and Schanzel 2019, p. 129) and to be more pragmatic (Francis and Hoefel 2018). Also, earlier research is suggesting that Generation Z considers health and safety to be very important (Seemiller and Grace 2018). As true digital natives and very comfortable with collecting information from many sources (Francis and Hoefel 2018; Merriman 2015), it is very likely that Generation Z are highly informed about Covid-19 and also feel very comfortable to be able to find more information, should this be needed, and this may be what's driving their self-efficacy.

The respondents were relatively neutral about the perceived travel risk associated with Covid-19 and they were almost neutral about their perceived susceptibility to Covid-19. Both these results could be related to the respondents' perceptions about how dangerous Covid-19 is and the severity of the virus, as well as their self-efficacy. The participants were relatively neutral about Covid-19 making travel riskier and about being exposed to and contracting the virus if they travel. As a result, respondents were not inclined to refrain from travel and they reported that they were highly likely to travel internationally in the months following the study. Our findings are similar to those of Doncak et al. who also found that their Generation Z study participants were not inclined to change their travel behaviour because of Covid-19. In contrast with our findings, Neuburger and Effer (2021) found that their study participants' travel risk perception increased post-Covid-19. This could be attributed to two reasons: (i) the different demographic characteristics of our study and the profile of Generation Z travellers, and (ii) the timing of the Neuburger and Effer study, which was conducted in March 2020, immediately after WHO had declared Covid-19 a pandemic when the number of confirmed cases had started to increase and there was a lot of uncertainty about the virus.

We found that participants were very reluctant to travel to China for their next international trip and only a very small percentage of our study participants reported that they were likely or highly likely to travel to China for their next international trip. This is in line with Lu and Atadil (2021) who also found that US travellers were reluctant to travel to China after the outbreak of Covid-19 due to it being the first epicentre of the disease. China's hospitality sector was strongly impacted by the outbreak of the pandemic with hotel occupancy experiencing a dramatic drop in the early months of 2020, according to Hao et al. (2020). The country's image as a travel destination has been negatively impacted with fear of infection hampering tourists' intentions to travel to the country (Li et al. 2021). As earlier research on the impact of health crises on travel and tourism suggested, the impact of these health crises was more significant for the affected countries (Gossling et al. 2020; Arbulu et al. 2021; Duro et al. 2021) and the perceived travel risk of traveling to China, the first epicentre of the disease seems to be higher among travellers.

Participants reported some, but not a strong inclination to bear a cost in order to increase their safety during international travel, air flight and at their hotel accommodation as a reaction to Covid-19. Of course this is a plausible finding, in light of our findings about participants' perceived travel risk, perceived susceptibility, perceived severity and self-efficacy. This finding is suggesting that the price elasticity of the cost of these services for Generation Z travellers is low. However, given that we did not ask more specifically about bearing an extra cost to increase safety during travel amidst Covid-19, we believe that this issue might warrant more investigation.

Finally, we found that female participants reported higher concern about the travel risks associated with Covid-19, their susceptibility to the virus and the severity of the virus. Also, female participants were more likely to indicate an inclination to pay more for vacation safety, compared to male participants. Similar findings have been suggested by earlier studies. For example, Pericic and Spasic (2021) found that female travellers were more likely to organise travel on their own rather than group travel and to book private accommodation as additional measures to limit the risk of being exposed to and contracting Covid-19, compared to male travellers. Turnsec et al. (2020) also found that female study participants risk perception during travel was higher compared to male study participants. Cahyanto et al. (2016) also found that female participants were more likely to avoid travel due to Ebola. As Cahyanto et al. (2016, p. 200) are suggesting, this may be due to an increased 'ethic of care' associated with women and an increased perception of risk associated with infectious diseases.

Given the lack of studies conducted on COVID-19, the research increased critical understanding surrounding the problem highlighting possible solutions and recommendations. The findings suggest that Generation Z are more concerned with travelling internationally than domestically.

6 Conclusions and Recommendations

Our findings offer a clear insight into the perceptions and intentions of U.K. based Generation Z consumers about travel amidst the Covid-19 pandemic. Generation Z is a widely discussed population, but research on its travel intention and travel risk perceptions is limited, especially in relation to Covid-19. This generation of young travellers is anticipated to become, and remain, the largest consumer group across all generations, and it is expected to play a key role in the recovery of the travel and tourism industry. Given the scarcity of studies conducted on the travel behaviour of Generation Z travellers during COVID-19, our research increased critical understanding surrounding the subject. The findings suggest that perceptions of Generation Z relative to the risks associated with travel during Covid-19 and relative to their susceptibility to Covid-19 are relatively neutral. They do not consider Covid-19 as a severe disease and they feel very confident about understanding the virus being exposed to it and about handling the situation if they are exposed. Also, Generation Z will continue travelling. Although they suggest that they are less likely

to select certain destinations for their next international travel, they are not inclined to avoid international travel because of Covid-19.

Our study focused on the travel risk profile of Generation Z consumers in relation to Covid-19 and how this is impacting their travel intentions. We did not investigate at all other ‘inconveniences’ introduced to the travel experience as a result of Covid-19, such as for example, longer cues at airports, ports, museums and attractions, delays due to the introduction of additional checks and controls, the introduction of Covid-certificates for travel, and so on. Since Generation Z seem to be less concerned about the risk associated with travel during Covid-19, it would be interesting to investigate whether these other ‘nuances’ have an impact on their travel risk behaviour.

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Forecasting Consumer Service Prices During the Coronavirus Pandemic Using Neural Networks: The Case of Transportation, Accommodation and Food Service Sections Across E.U



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Abstract This study examines how the coronavirus pandemic may affect the price of consumer services in the Transportation, Accommodation and Food Service sections in the European Union over the next period utilizing Machine Learning. For the purpose of the study, the authors use monthly reports of coronavirus cases and deaths along with a nominal sample size of 44.000 units, mainly national institutes, from the Joint Harmonized EU Programme of Business and Consumer Surveys by Directorate-General for Economic and Financial Affairs of European Commission. The dataset contains balanced answers from surveys asking for positive and negative replies measuring managers' assessment of their company's turnover from past experience and future estimations. The authors present evidence that it is possible to forecast future expectations on service price evolution during the pandemic utilizing Neural Network models. These models can predict a balanced percentage which can further be used for a systematic decision-making process. This percentage depends on the number of cases and deaths in each country but not in the same analogy to others. Each country performs differently in every sub-category of economic activity presented. To the best of our knowledge, this is a first attempt to investigate and predict the impact of coronavirus on consumer service price. These predictions concern the evolution of economic indicators using Neural Networks. In case of emergency situations, such as during pandemic, it is difficult to have enough data to make reliable predictions using other statistical models, therefore utilizing machine learning methods seems appropriate.

Keywords Machine learning · Neural networks · Coronavirus · Price evolution

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1 Introduction

Since early days, the world has experienced pandemics, disasters and epidemics (Esterwood and Saeed 2020), which affected the economy and social life in many ways (Smith et al. 2009). Today, humanity suffers from a viral infection pandemic arising from a novel Coronavirus (COVID-19) (Liu et al. 2020). The increasing death rate, the lockdowns and the fear of widespread infection has had a huge impact on the economy (Goolsbee and Syverson 2020) and has caused many social changes to happen already. Public social life has changed dramatically in many countries (Jacob et al. 2020), triggering a substantial decrease in personal spending expenditure (Coibion et al. 2020).

During the last two decades, many serious disease outbreaks with flu-like symptoms occurred, proving a continuous need to develop strategies for monitoring and curbing. Such disease outbreaks are the Severe Acute Respiratory Syndrome (SARS-Coronavirus) in 2003, the Swine influenza pandemic (H1N1) in 2009, the Avian influenza (H7N9) in 2013 (Springborn et al. 2015) and the Ebola virus (World Bank 2016). A common citizen's reaction during these outbreaks has been that, no matter how official governments react, people have chosen to stay home to minimize the risk of infection (Fan 2003). This attitude has proven to have direct impacts to many domains of economic activity like services, construction, industry, exports and tourism-related services. Investment funds have also been impacted because market demand has decreased, fears have risen and threats have grown.

Swine influenza pandemic (H1N1) in 2009 culminated in multiple economic effects that involved a decline in tourism, transportation and retail use. It has had a detrimental effect on industry and education due to the increased absence and rising prices for specific medical services (Verikios et al. 2011). Avian influenza's (H7N9) economic influence was much less serious than SARS. It resulted primarily in the closing of live poultry markets and in collapsing meat and poultry market prices, which resulted in the Chinese poultry industry losses of over 40 billion RMB. Furthermore, H7N9 had no global financial effect (Qiu et al. 2018). A brief definition of a report established by the world Bank (2016) reported that, in line with commodity price shocks, Ebola's economic and fiscal effects persisted longer than the spread of the virus itself due to harsh shocks in development, demand, and expenditure throughout the world. The mortality rate attributed to the contaminated disease pandemic was 60%.

Today the corona virus pandemic has affected all sections of economic activity and supply chain (Rowan and Laffey 2020). Several organizations have been impacted resulting in economic instability and vulnerability with major consequences. Covid-19 has raised problems concerning corporate social responsibility for companies and organizations while most of them attempt to benefit from this crisis (Hongwei 2020).

Current research tries to focus on how the pandemic has been having an impact on the economy taking into consideration every possible factor. The most important factor is people's fear of getting infected, which leads to social isolation and under spending. It is challenging to quantify how consumer behavior evolves during

the pandemic and how businesses expect to correspond to it. Such a prediction is a complex and difficult one, since it refers to human feelings. The study presented in this article is very important and timely, as it proposes an alternative way to correlate pandemic and economic effects, using Artificial Intelligence. The study utilizes Neural Network models using data gathered during the last year to forecast the price of consumer services in the near future in Transportation, Accommodation and Food Service sections across the E.U. It is based on a nominal sample size of 44.000 units, mainly national institutes, from the Joint Harmonized EU Programme of Business and Consumer Surveys by Directorate-General for Economic and Financial Affairs of European Commission. The dataset contains balanced answers from surveys asking for positive and negative replies measuring managers' assessment of their company's turnover from past experience and future estimations. As a result, we provide satisfying forecasts of the expectations of price evolution in the near future. This will certainly help businesses, consumers and policy makers to make appropriate decisions in the very short timeframe imposed by the pandemic.

2 Related Literature and Challenges

During the corona virus pandemic every country and every research institution has been focusing on studies concerning COVID-19's outbreak and how it has been affecting the economy. Most studies predict high demand in certain industries, such as healthcare and groceries, while low demand is expected in others, such as goods, services and other Industries with low economic activity (Hasan El-Mousawi and Hasan Kanso 2020). Given that prices depend on demand, it is reasonable to expect an analogous evolution of prices during the coronavirus pandemic. Many researchers believe that "World trade is predicted to plunge by 11 percent this year before growing by 8.4% in 2021..." (Euronews 2020).

Researchers, in their efforts to understand the pandemic and forecast its consequences, have used theories and algorithms from many fields of science. An example of such algorithms is Neural Network models. These models are considered as computer-based programs that learn patterns and high dimensional relationships from experimental data, make forecasts and help with the decision-making process (Cheung et al. 2006). They usually perform well in discriminant analysis and practical problems (Yoon and Swales 1990) as well as in specialized non-linear problems like those encountered in Finance (Donaldson et al. 1993). Additionally, they are insensitive to minor noise in the input data. Potentially they can provide significant benefits to Private and Public Authorities and increase productivity (Borthick and West 1987).

Neural networks are able to identify patterns among high dimensional data, leading to robust models that can provide reliable predictions. These characteristics make them useful in healthcare (e.g. forecasting the coronavirus outbreak) (Mesko 2020), in finance (Wong and Selvi 1998), in management (Sharma and Chopra 2013), in decision-making (Dunke and Nickel 2020) as well as in other fields of science.

Bertalan Mesko (2020), argues that many countries utilize Machine Learning to figure out what comes next. Especially when a country has many cases and deaths due to COVID-19, decision makers should make fast decisions. Several researchers have proposed the use of Neural Networks in industry, economy, or management from multiple viewpoints (Tkám̄b and Verner 2016). Neural networks have a significant range of advantages over conventional models, mainly when datasets have nonlinear and complicated structure (Hill and Remus 1994; Chiang et al. 2006).

According to Poesche (2019), the growing economic, legal and practical importance of semantic pluralism in business drives further considerations regarding the early steps of cognition. An extensive investigation in neural application studies has proven that there is much research focused on the effectiveness of financial and non-financial performance measures. Recently, neural tools have been increasingly applied in financial statistical analysis as well (McNELIS 2005). The principal benefit of them is that they can calculate every arbitrarily close nonlinear function and provide an improved fit compared to parametric linear models especially in financial statistics.

Decision-making is a step-by-step process to make choices. Archer (1980), Blai (1986) Mintzberg et al. (1976) suggest that major decisions can usually be divided into smaller decisions. Top-level managers usually take programmed decisions, whereas lower-level managers non-programmed ones. But all decisions are influenced by experience gained over a much longer period. That's why Neural Networks need to be trained to help managers to take some important decisions; e.g. to decide the appropriate human resources for the organization or enterprise they lead or for a particular job function. (Schocken and Ariav 1991). Most problems are considered as classification ones and Neural Networks can be used in several ways to provide solutions, some of which are:

- predict future values considering patterns that are observed within the historical training data
- categorize unknown information into predefined groups with supported features within the data sets
- cluster the training data into natural groups by similarities in characteristics within training data (Smith and Gupta 2002)
- establish quality control systems
- provide directions to managers on which performance boosters and strategies can be utilized to increase performance by combining neural network models with genetic algorithm training. (Montagno et al. 2002)

It is proven that after training, a neural network model provides estimations with high level accuracy (Mazhar and Kaebernick 2007). Taking into consideration the above-mentioned characteristics and potential abilities of Neural Networks, authors believe that they are appropriate for making satisfactory predictions in the case of future expectations of managers regarding their firms' performance during the pandemic.

3 Research Methodology

3.1 Sample

This study aims to understand how coronavirus affects economic activity of firms and identify correlations between the extent of pandemic, the performance of businesses and the future expectations of managers. In order to solve this problem a tailor-made dataset was created by combining open datasets. The first dataset contains coronavirus cases and deaths (WHO 2020), while the other contains data from the Joint Harmonized EU Programme of Business and Consumer Surveys by Directorate-General for Economic and Financial Affairs of European Commission. The above mentioned programme includes data from EU Member States including the UK; which is covered by the transition period following its withdrawal from E.U. on 31 January 2020; and contains survey results in the manufacturing industry, retail trade, services, construction, consumers and financial services.

The datasets from the Joint Harmonized EU Programme of Business and Consumer Surveys present data based on judgments and anticipations from the firm's managers in diverse sections of economic activity (European Commission 2020). The managers that take part on the surveys, answer to questions like "How do you expect the demand for your company's services to change" with a simple answer like "improve", "remain unchanged" or "decrease" based on their experience and their feelings. In order to answer this simple question managers have learned to correspond to assumptions from experience. In this sense, the summary of each individual answer to a survey's question is considered as the outcome of the calculations achieved via complex cognitive processes.

The dataset contains balanced answers from surveys asking for positive and negative replies of a nominal sample size of 44.000 units, mainly national institutes, in monthly basis. The surveys present managers' assessment of their company's turnover taking into consideration their experience from the past and their estimation for the future. The questionnaire consists of the following questions:

- How has your business situation developed over the past 3 months?
- How has demand (turnover) for your company's services changed over the past 3 months?
- How do you expect the demand (turnover) for your company's services to change over the next 3 months?
- How has your firm's total employment changed over the past 3 months?
- How do you expect your firm's total employment to change over the next 3 months?
- How do you expect the prices you charge to change over the next 3 months?

The questionnaires are collected the first two–three weeks of each month, then are expressed as a balanced percentage and finally are weighted by a coefficient that represents an aspect from each firm's size. The balanced percentage is the difference between positive and negative answering options (Nardo 2003):

$$EBAL_t = EUP_t - EDO_t$$

where EUP_t is the percentage of answers “Improved” and EDO_t the percentage of answers “Decreased” during month t .

Monthly summaries from each Member State mixed with coronavirus cases and deaths can further be used as primary data to identify patterns, implement indications and forecast how corona virus pandemic will affect economic activity, based on how managers feel. The summary of individual judgements is very helpful in the case of coronavirus pandemic as its effect on the economy is multidimensional. Lockdowns, closure of businesses, unemployment, fear, uncertainty etc. affect the economy in many ways, making the estimation of an equation that will consider all indicators difficult. In this sense, in order to implement such forecasts, it would be ideal to have a dataset with every potential indicator and then run a neural network algorithm. Due to the lack of such a dataset, authors used the balanced summaries of the above-mentioned survey, assuming that each individual answers incorporates all potential indicators.

3.2 The Neural Network Model

Neural Network models are able to learn how to predict and classify outcomes (Maulenkamp and Grima 1999) through examples they have seen and can discover patterns and relations (Dayhoff 1990) calculating the appraised values (output). Generally, the perception of a Neural Network model is that given n variables (input) the model calculates one output value multiplying input values with their weights (Kirkos et al. 2007) which represent the strength of a particular node. In this simple case, this sum is fed to the activation function which finally produces the output. The main purpose of the activation function is to convert an input signal and to decide whether a neuron should be activated or not given the weighted sum.

Combination function:

$$\Sigma = \sum_{i=0}^n w_i x_i$$

This is the mathematical version of the above combination function, where each x is connected to a neuron via a weight vector W consists of w_1, w_2, \dots, w_n , meaning that for each input x we also have an associated weight w . Finally, the output node takes the weighted sum, applies an activation function f and outputs a value. The most simple activation function is the “step function”, used by the Perceptron algorithm. In this activation function, there is a very simple threshold, which demands that if the weighted sum is greater than zero the output is one, otherwise, the output is zero. However, while being a simple function, the step function is not differentiable, which

can lead to problems when applying gradient descent in training the networks. This is why the sigmoid function is more preferable in neural networks' models:

Transfer function:

$$Sigmoid(x) = \frac{1}{1 + e^{-x}}$$

The sigmoid function is a better choice for learning than the simple step function since it is continuous and differentiable everywhere. It is also symmetric around the y-axis and asymptotically approaches its saturation values. The most basic advantage is that the smoothness of the sigmoid function makes it easier to devise learning algorithms.

While a Neural Network Model calculates outputs, the algorithm learns through this process changing weights to fit better to the desired outcome. This procedure represents the learning process of the model (Mavaahebi et al. 2013). If we know that the output should have the value t (target) but the algorithm calculates as output the value o (output) we can compare both values and then decide if the weights should somehow change. If $t = o$ the weight seems fine and no change should be made. If $t \neq o$ then the algorithm calculates new weights:

$$\Delta_i = \eta \delta x_i$$

where η represents the learning rate and $\delta = t - o$

$$w_i(n + 1) = w_i(n) + \Delta_i$$

where $w_i(n + 1)$ represents the i st weight value after correction at step $n + 1$, $w_i(n)$ represents the i st weight before correction at step n .

The learning rate η controls the amount of each step that the neural network makes towards the required solution. It is critical that the learning rate is set correctly; otherwise, it may never converge to a solution. A larger value of η will cause the network to take a step in the right direction. However, this step could be too large, and this could cause the neural network to overstep a local or global optimum. On the other hand, a smaller step may delay a lot the finding of the optimum point or it may never find it. There are different methods to choose the most suitable learning rate in each case. An approach is to try a few different values and see which one gives you the best loss without sacrificing the speed of training. For example, a solution could be to start with a higher learning rate and then reducing it exponentially. In this way, the maximum learning rate is required, where above it the model is unable to converge. Even this value will not be sufficient to train for numerous epochs because the network will eventually need more precise weight updates. Another more sophisticated method is also the cyclical learning rate (Smith et al. 2017).

3.2.1 Neural Networks Models

The simplest model of feed forward neural networks is the Perceptron in which a pattern applies to a single neuron and has the same learning algorithm across all neurons (Freund et al. 1998). Feedforward Neural Networks are the simplest models that borrowed their name from the single-direction information flow inside the network. The Perceptron, is often used to classify linearly separable patterns as the single neuron is able to classify two classes. The Delta-Rule model is a generalization of Perceptron and is able to learn fast especially if the learning rate is high. This can sometimes lead to a higher error rate. In general, low learning rate leads to error minimization.

Back Propagation is the most common steepest decent type learning algorithm, where weights are respectively updated according to specific deterministic equations, but the identification of a global minima is not guaranteed as it is easy to become trapped at a local, due to slow convergence rate (Mutasem et al. 2009). However, in the backpropagation model specific learning algorithms, like the conjugate gradient, can be utilized to achieve slower convergence and therefore have better chances to find the true global minima (Johannson et al. 1992). In general, irrespective of the learning algorithm used, there is no guarantee that the model will discover the optimal solution. The backpropagation model is ideal for datasets that consist of large nonlinear and noncontinuous data (White 1989).

Regarding the popular Hopfield model, studies provide that it is reliable for many types of networks mainly used to solve optimization problems. The main disadvantages of this model are its weakness to find global optimization and the fact that the energy function poses many unnecessary local solutions (Takahashi 1998). On the other hand, Kohonen model differs much from others and is much suitable for classification problems. It is trained to produce two-dimensional maps and convert nonlinear statistical relationships into geometric. It is easy to understand and able to provide satisfactory evaluations of its performance (Dragomir et al. 2014). Finally, Generalized Regression Neural Nets (GRNN) models have many advantages compared to other models. These models are appropriate to make real-time decisions while they can learn fast (Specht 1991).

4 Research Model

The characteristics of Neural Networks make them appropriate for the case of forecasting pandemic effects to economy. Taking into consideration the advantages and disadvantages of each model, the authors decided to test the dataset on Palisade Neural Tools Add-in for Microsoft Excel version 7.6.1 Build 18 (Student version) because this tool can check the dataset using the “Best Net Search” Algorithm (Palisade 2015). This procedure will test the dataset’s performance on Generalized Regression Neural Nets (GRNN) and Multilayer Feed-forward Network (Conjugate Gradient Descent—Back Propagation) with 2–6 Nodes. One of these models seem

to be appropriate for the above-mentioned nonlinear and non-continuous dataset and the Bet Net Search procedure will identify the one.

The authors chose randomly to test a sample data from the area of services and more specifically sections H (Transportation and Storage) and I (Accommodation and food services activities) which consist of the following branches according to the Classification of economic activities in the E.U. (European Parliament 2006): Section H: Land transport and transport via pipelines, Water transport, Air transport, Warehousing and support activities for transportation and Postal and courier activities and Section I: Accommodation and Food and beverage service activities.

Each row represents one Member State's coronavirus status in one month from January 2020 to November 2020 and the balanced percentage of managers' expectations for demand, employment and prices over the next three months. Due to the fact that EU has a common market with similar behavior among Member States, it is possible to use data from different countries into the same table. This dataset is fed into a Neural Algorithm which learns how managers react to coronavirus and, therefore, make forecasts for future expectations of prices. In an effort to present Coronavirus cases and deaths for each country in a comparable way, the authors chose to calculate cases and deaths per one million people for each month. EU Member States have different populations, which means that the algorithm should consider it when it measures coronavirus cases and deaths.

The final table contains 1.626 rows with data. The columns of the table have the following categories: Country (Independent Category), Classification (Independent Category), Cases/1mil Pop (Independent Numeric), Deaths/1mil PoP (Independent Numeric), Service Sub-sector (Independent Category), Confidence Indicator (Independent Numeric), Business situation development over the past 3 months (Independent Numeric), Evolution of the demand over the past 3 months (Independent Numeric), Evolution of the employment over the past 3 months (Independent Numeric), Expectation of the demand over the next 3 months (Independent Numeric), Expectation of employment over the next 3 months (Independent Numeric) and Expectation of the Prices over the next 3 months (Depended Numeric).

Where:

Country	The name of the EU Member State including UK (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom)
Classification	Classification on Economic size by OECD (Large, Medium, Small)
Cases/1mil Pop	The monthly summary of the number of new coronavirus cases in one M.S./Population
Deaths/1mil PoP	The monthly summary of the number of deaths due to coronavirus in one M.S./Population

(continued)

(continued)

Service sub-sector	The category of subsector (Land transport and transport via pipelines, Water transport, Air transport, Warehousing and support activities for transportation, Postal and courier activities and Section, Accommodation, Food and beverage service activities)
Confidence indicator	The arithmetic average of the balances (in percentage points) of the answers to the questions on business climate and on recent and expected evolution of demand
Business situation development over the past 3 months	The balanced summary on recent business situation over the past 3 months
Evolution of the demand over the past 3 months	The balanced summary on recent demand over the past 3 months
Evolution of the employment over the past 3 months	The balanced summary on recent employment over the past 3 months
Expectation of the demand over the next 3 months	The balanced summary of managers' expectation for demand over the next 3 months
Expectation of employment over the next 3 months	The balanced summary of managers' expectation for employment over the next 3 months
Expectation of the Prices over the next 3 months	The balanced summary of managers' expectation for Prices over the next 3 months

5 Results

5.1 Model Performance

The obtained dataset was tested on Palisade Neural Tools and run the “Best Net Search” Algorithm. This algorithm compares the performance of each model mentioned on Table 1 (Palisade 2015) by calculating their Root Mean Squared Errors (RMSE). RMSE is an evaluation metric ranging between 0 and infinity, which represents the square root of the difference between the predicted and actual values. Regarding the performance of a model, a lower RMSE is better than a higher one (Hyndman and Koehler 2006). The algorithm compares the dataset and calculates its RMSE during the training procedure and during the testing procedure (James et al. 2013).

In Table 1, RMSE estimations for each model during the Testing procedure are compared. The General Regression Neural Network has the best performance (RMSE = 9.18). The RMSE is even lower during the testing procedure (RMSE = 3.291) (Table 2). In Figs. 1 and 2, the Histograms of Residuals in the training set and in the testing set are presented. A histogram of the Residual is the representation of the distribution (Pearson 1895) of the differences of predicted and actual values (Dodge 2008). Figures 6 and 7 depict Predicted versus Actual values diagrams, while Figs. 8

Table 1 Results of RMS error after best net search algorithm

Model tested (Compared from the Test set predictions)	RMS error
General Regression Neural Network	9.18
Multilayer Feedforward Network with 2 Nodes	24.78
Multilayer Feedforward Network with 3 Nodes	19.65
Multilayer Feedforward Network with 4 Nodes	19.98
Multilayer Feedforward Network with 5 Nodes	20.58
Multilayer Feedforward Network with 6 Nodes	21.32

Table 2 Bad predictions and RMS error in general regression neural network

Bad Predictions Training Set	25,564%
Root Mean Square Error Training Set	3,158
Bad Predictions Testing Set	27,425%
Root Mean Square Error Testing Set	9,18

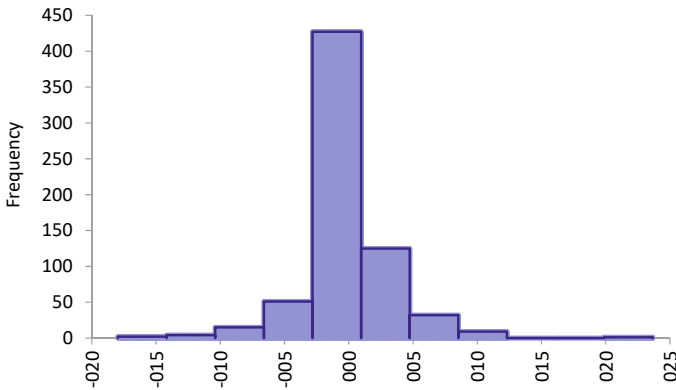


Fig. 1 Histogram of residuals (training set)

and 9 depict Residual versus Actual values diagrams. From these diagrams, one may conclude that most predicted values are close to actual because the majority of residuals value close to 0 (Figs. 4, 5) and that there is only few widely dispersed values where Predicted and Actual values have a significant deviation (Figs. 3, 4, 5 and 6).

5.2 Qualitative Evaluation of Results

From the above-mentioned observations on the results in the sample data, we concluded that with an acceptable error rate (Alexander et al. 2015) it is possible

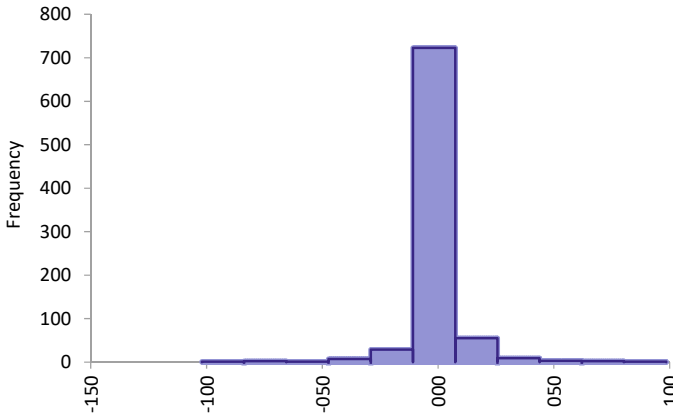


Fig. 2 Histogram of residuals (testing set)

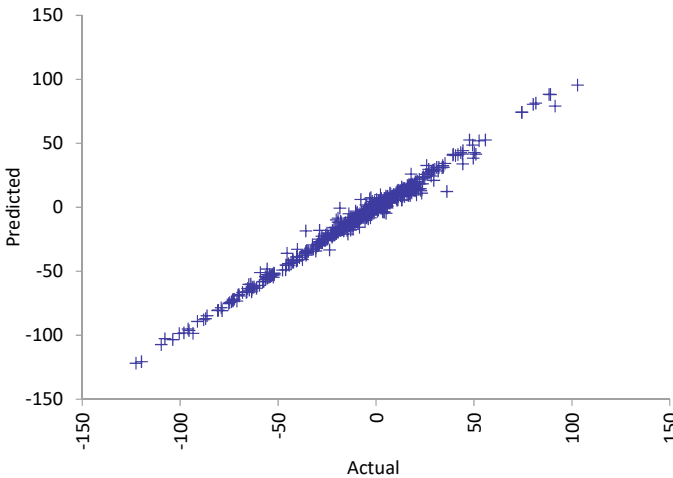


Fig. 3 Predicted versus actual (training set)

to forecast future expectations and guess in which sector managers expect prices to increase or decrease the most during the pandemic. These forecasts were achieved with Neural Network models, which managed to predict balanced percentages of the expectations of the evolution of prices. Predictions do not represent specific prices, but they are indications of trends, which refer to the manager’s intuitive feelings about the evolution of prices. Will prices increase, decrease or remain the same? If they change, is the change marginal, moderate or high? This categorization can help consumers and managers to make decisions.

Authors present their predictions for Price Expectations for November 2020 in comparison with real estimations (Joint Harmonized EU Programme of Business

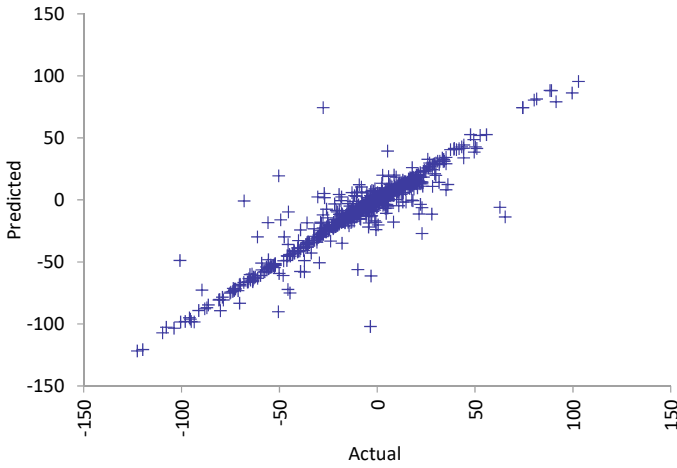


Fig. 4 Predicted versus actual (testing set)

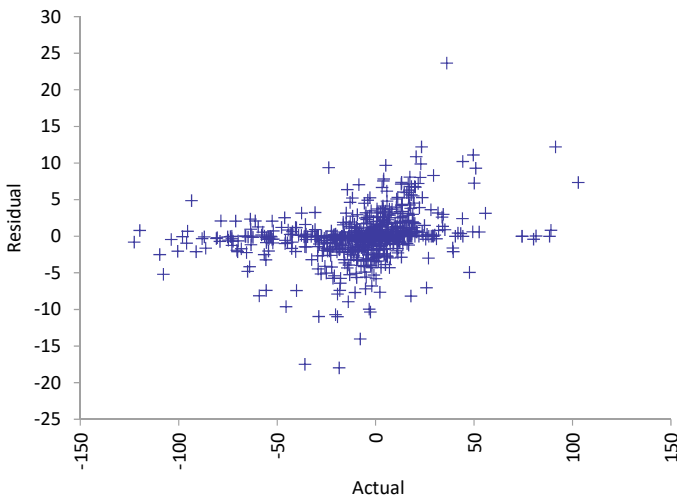


Fig. 5 Residual versus actual (training set)

and Consumer Surveys) (Table 3). They chose to run the model for November 2020 because for this month the data containing real estimations is available. This gives readers the opportunity to compare predicted with real values. The prediction takes into consideration the coronavirus status of each country in November 2020 (WHO 2020) and forecasts managers' expectation for Prices over the next 3 months (December 2020, January and February 2021). These expectations are presented as balanced summaries, for example, in case of Greece, the prediction is:

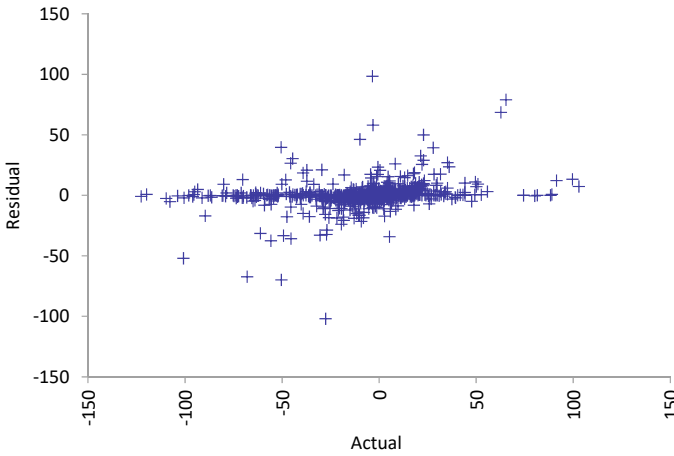


Fig. 6 Residual versus actual (testing set)

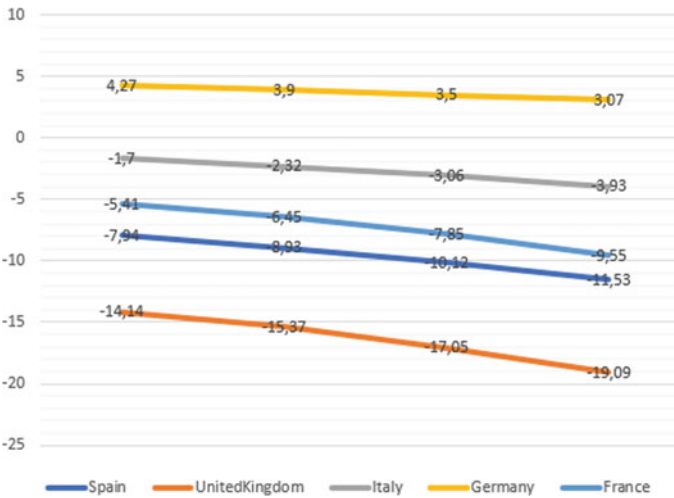


Fig. 7 Graphical illustration of Table 4 scenarios for large economies (OECD classification)

$$p^E_{EL49} = -20,64, p^E_{EL50} = -22,5, p^E_{EL52} = -27, \\ p^E_{EL53} = 15,8, p^E_{EL55} = -11,2, p^E_{EL56} = 1,2$$

where, p = the balanced summary of expectations for prices, E = Estimation, and EL49-56 = Greece, subsectors 49–56.

The balanced summary $p^E_{EL49} = -20,64$ predicts that, given the dataset used to train the neural model (it contains the predictions from January to November 2020), the estimation for December 2020–February 2021 is: $p^E_{EL49} = -20,64$. This means

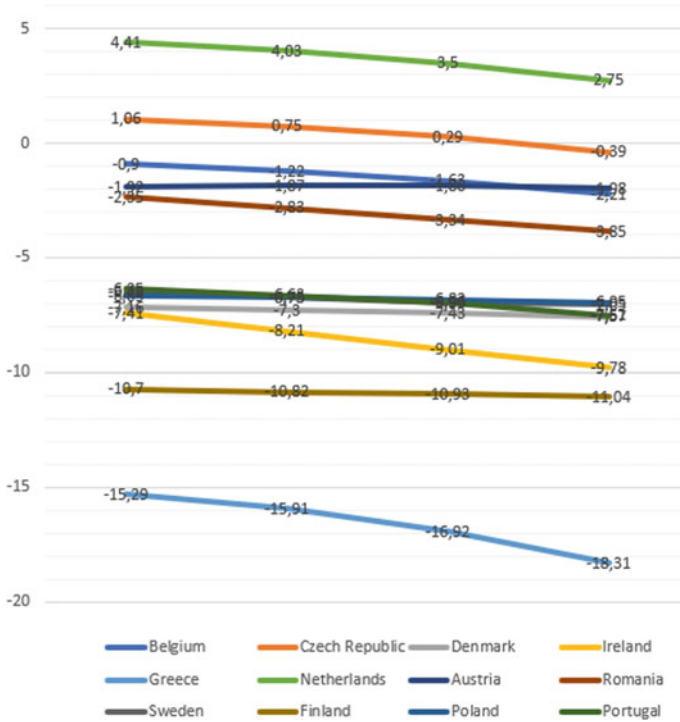


Fig. 8 Graphical illustration of Table 4 scenarios for medium economies (OECD classification)

that the percentage of managers in sub-sector “Land transport and transport via pipelines” in Greece, who believe that in the next three months prices will decrease is 20,64% higher than those who believe it will increase. When the estimated value is close to zero (either positive or negative) the prices are not expected to change. On the other hand, if the model predicts that a vast majority of managers expect prices to increase (high positive value) or decrease (high negative value) it is likely that they will actually accordingly increase or decrease. The higher the absolute value of the balanced summary prediction, the more certain for the prices to increase or decrease it.

Where:

MS	The name of the EU Member State including UK
Cases/1M	The summary of cases in November 2020 divided by countries population. The result is multiplied by one million
Deaths/1M	The summary of deaths in November 2020 divided by countries population. The result is multiplied by one million

(continued)

(continued)

49–56 E	<p>The model’s estimations on the balanced summary of managers’ expectation for Prices over the next 3 months (December 2020–February 2021) in sub-sectors:</p> <ol style="list-style-type: none"> 1. 49-Land transport and transport via pipelines 2. 50-Water transport 3. 51-Air transport 4. 52-Warehousing and support activities for transportation 5. 53-Postal and courier activities 6. 55-Accommodation 7. 56-Food and beverage service activities
49–56 R	<p>The balanced summary of managers’ expectation for Prices over the next 3 months (December 2020 – February 2021) (Joint Harmonized EU Programme) in sub-sectors:</p> <ol style="list-style-type: none"> 1. 49-Land transport and transport via pipelines 2. 50-Water transport 3. 51-Air transport 4. 52-Warehousing and support activities for transportation 5. 53- Postal and courier activities 6. 55-Accommodation 7. 56-Food and beverage service activities

In the case of e.g. Greece, the model predicts that prices in “Land transport and transport via pipelines”, in “Water transport” and “Accommodation” are expected to decrease over the next three months, in “Accommodation” are expected to decrease less and in “Warehousing and support activities for transportation” as well as in “Food and beverage service activities” are expected to decrease marginally.

In addition, the model can be used to classify each member state’s performance against the consequences of the pandemic. The authors tested the model using hypothetical scenarios for November 2020 under sub-sector 49 “Land transport and transport via pipelines” with the given number of cases and deaths for every country. The authors tested four scenarios (Scenario A: 2.000 cases/mil and 15 deaths/mil, Scenario B: 4.000 cases/mil and 30 deaths/mil, Scenario C: 6.000 cases/mil and 45 deaths/mil, Scenario A: 8.000 cases/mil and 60 deaths/mil) and compared the results with real numbers. The result of this exercise is presented on the table that follows (Table 4). Calculations prove that each country is expected to have diverse performance even if the spread of the coronavirus is analogous.

Figures 7, 8 and 9 present that countries whose economy is similarly classified by OECD (e.g. Small, Medium or Large economies) do not have a similar performance. For example, some countries have a positive balanced summary of managers’ expectation for Prices over the next 3 months when others have a negative one. The absolute values of each balanced summaries have great variations as well, meaning that the pandemic does not affect economies in the same way, even if it’s spreading is proportional. In contrast, each graph tends to be linear while most of them have a negative gradient. This means that there is an inversely proportional relationship between the number of covid cases and deaths and the balanced summary of managers’ expectation for Prices (when covid cases and deaths increase, prices decrease or increase

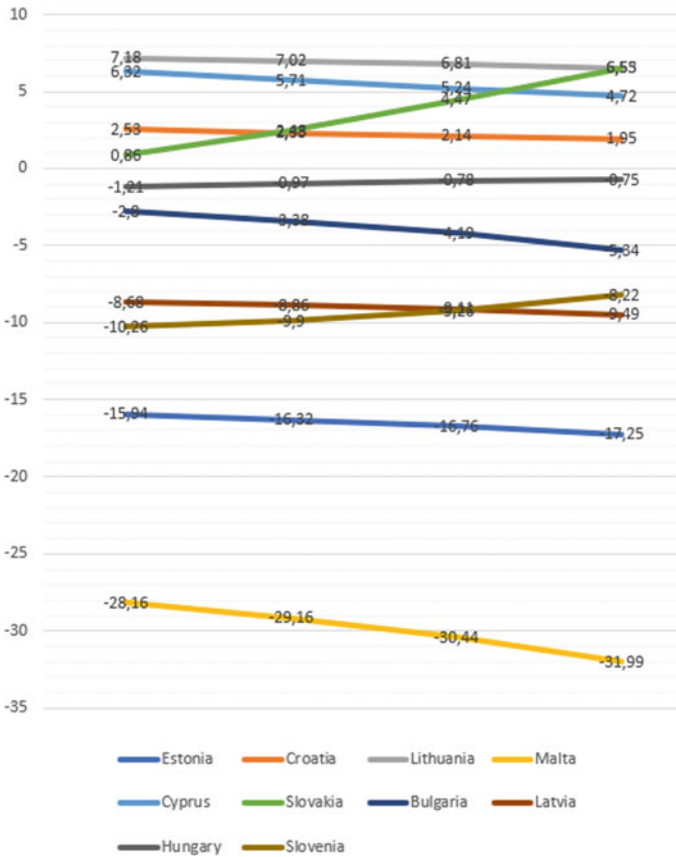


Fig. 9 Graphical illustration of Table 4 scenarios for small economies (OECD classification)

less). The surprising outcome is that Slovakia and Slovenia react differently (when covid cases and deaths increase, prices increase or decrease less as well).

The discussion of scenarios proves that it is difficult to indicate a common rule applicable to each member state, because there are many aspects of economic activity and many indicators that may affect it's performance during the pandemic. The identification of these aspects; no matter how important it may be; is not within the scope of this study. The findings are very helpful for decision-makers in many ways as it is shown that each country's economic performance depends somehow on coronavirus cases and deaths. For a firm that wants, for example, to outsource "Accommodation", it is preferable for its manager to decide not to sign a contract during this month but wait for the prices to fall over the next three months as expected.

Table 3 Prediction Sample of trained dataset and real estimations for November 2020

	Cases/ Imil	Deaths/ Imil	49 E	49 R	50 E	50 R	51 E	51 R	52 E	52 R	53 E	53 R	55 E	55 R	56 E	56 R
Austria	19,624	203	-13.4	-13.5					-9.5	-8.6	24.5	33.2	-31.2	-36.5	2.8	3.2
Belgium	11,682	438	2.91	-1.9					3.8	4.5			-15.2	-17.2	1.7	2.6
Bulgaria	13,160	368	0.5	3.3	11.8	19.7	-35.2	-44	3.9	4	-13.5	-13.9	-10.9	-11.8	-1.2	-0.5
Croatia	19,503	288	-1.64	-1.7					4.1	3.9			-4.7	-5.4	0.9	0.7
Cyprus	5107	19	5.51	7.5	-8.2	-7.6			-7.4	-7.7			-22.8	-30.8	-2.4	-3
Czech Republic	18,307	473	8.85	9.2			0.8	1.2	2.4	3.3	1.5	4.7	-18.5	-39.7	-2.5	-3.1
Denmark	5892	19	-7.34	-12.1	-23.5	-24.1	-48.5	-60.2	-7.1	-6.8	-1.9	-1.8	-35.1	-39.7	-8.2	-15.2
Estonia	5489	29	-16.59	-22.5					-7.9	-9.2			-42.5	-35.6	-1.7	-3.8
Finland	1574	6	-10.7	-13.8									-33.21	-39.5	-15.5	-17.6
France	13,581	241	-14.68	-16.6					10.2	10.7	-3.4	-4	-50.4	-49.2	-10.2	-11.7
Germany	6387	69	3.31	1					-1.2	-1.3			-18.5	-19	18.4	18.8
Greece	6431	163	-20.64	-24.2	22.5	39.2			-27.5	-35.4	15.8	16.1	-11.2	-11.6	1.2	0
Hungary	14,679	318	-7	-7.3					15.8	14.7			-23.2	-24.2	4.8	3.8
Ireland	2265	29	-7.6	-25.6	-40.5	-45.1			40.5	50.4	65.2	72.3	-5.5	-8.4	-6.8	-7.6
Italy	15,506	274	-1.31	0.1	-37.5	-41.3	-50.1	-56.8	0.2	0.4	-1.2	-1.5	-17.5	-18	2	1.4
Latvia	5989	68	-9.14	-15.4	-1.9	-2.5	-3.1	-2.6	-4.6	-4.4	-9.8	-10.2	-13.2	-13.6	-13.9	-13.9
Lithuania	17,449	128	5.78	6	15.2	17.6	1.1	2.7	-0.8	-1	5.2	7.7	-2.5	-4	2.8	3.7
Malta	8425	168	-36.46	-41.3			-12.4	-10.3	8.5	9.9			-42.1	-61.1	11	10.7
Netherlands	2265	29	4.33	-25.6	-5.5	-7.4	-22.8	-34.8	1.5	0.2	16.8	15.4	-23.5	-24.7	-8.5	-4.2
Poland	17,022	309	-10.99	-11.9	-15.8	-16.1	-48.2	-52.2	-4.7	-5.3	2.1	1.6	-18.2	-17.8	4.1	3.7

(continued)

Table 3 (continued)

	Cases/ Imil	Deaths/ Imil	49 R	50 E	50 R	51 E	51 R	52 E	52 R	53 E	53 R	55 E	55 R	56 E	56 R
Portugal	15,449	192	-11.6	-1.7	-2.5	-3.2	-4.3	-1.8	-1.9	22	27	-14.5	-15.9	-11.2	-12
Romania	12,265	225	-1.6	-1.5	-3.2	-14.5	-54.8	-15.4	-16.3	-1.9	-2	-3.5	-2.9	0.7	0.1
Slovakia	9276	111	17.8			-1.9	-2.5	-2.8	-3.2	13.5	14.5	-25.2	-36.9	59.2	54.1
Slovenia	20,622	338	-4.8					1.5	-2.6	15.8	19.6	1.2	7.7	1.8	-2.9
Spain	9892	197	-29	0.5	0	-22.1	-34.5	1.7	2	5.2	6.1	-26.3	-26.6	-5.5	-4.3
Sweden	12,726	112	-6.1	-9.8	-10.6	-18.5	-20.1	13.5	14.4	7.4	5.3	-53.2	-55.8	-11.2	-12.7
United Kingdom	9245	177	-27.6	3.4	4.6			-22.5	-23.7	11.5	12.9	-11.8	-33.2	-16.5	-16.4

Table 4 Scenario testing for November 2020 & sub-sector 49 Land transport and transport via pipelines

Country and classification of economy by OECD (L: Large, M: Medium, S: Small)	Real scenario									
	Scenario A (2 k, 15)		Scenario B (4 k, 30)		Scenario C (6 k, 45)		Scenario D (8 k, 60)			
	Real case	Real deaths	Real price Est	Net. predicition	Net. predicition	Net. predicition	Net. predicition	Net. predicition	Net. predicition	Net. predicition
Spain	L	9892	197	-29	-15.77	-7.94	-8.93	-10.12	-11.53	
United Kingdom	L	9245	177	-27.6	-21.73	-14.14	-15.37	-17.05	-19.09	
Italy	L	15,506	274	0.1	-1.31	-1.7	-2.32	-3.06	-3.93	
Germany	L	6387	69	1	3.31	4.27	3.9	3.5	3.07	
France	L	13,581	241	-16.6	-14.68	-5.41	-6.45	-7.85	-9.55	
Belgium	M	11,682	438	-1.9	2.91	-0.9	-1.22	-1.63	-2.21	
Czech Republic	M	18,307	473	9.2	8.85	1.06	0.75	0.29	-0.39	
Denmark	M	5892	19	-12.1	-7.34	-7.16	-7.3	-7.43	-7.57	
Ireland	M	2265	29	-25.6	-7.6	-7.41	-8.21	-9.01	-9.78	
Greece	M	6431	163	-24.2	-20.64	-15.29	-15.91	-16.92	-18.31	
Netherlands	M	2265	29	-25.6	4.33	4.41	4.03	3.5	2.75	
Austria	M	19,624	203	-13.5	-13.4	-1.92	-1.87	-1.86	-1.98	
Romania	M	12,265	225	-1.6	-4.03	-2.35	-2.83	-3.34	-3.85	
Sweden	M	12,726	112	-6.1	-6.5	-6.48	-6.75	-6.96	-7.05	
Finland	M	1574	6	-13.8	-10.7	-10.7	-10.82	-10.93	-11.04	
Poland	M	17,022	309	-11.9	-10.99	-6.65	-6.73	-6.82	-6.95	
Portugal	M	15,449	192	-11.6	-10.26	6.35	-6.63	-6.99	-7.51	
Estonia	S	5489	29	-22.5	-16.59	-15.94	-16.32	-16.76	-17.25	
Croatia	S	19,503	288	-1.7	-1.64	2.53	2.33	2.14	1.95	

(continued)

Table 4 (continued)

Country and classification of economy by OECD (L: Large, M: Medium, S: Small)	Real scenario					Scenario A (2 k, 15)	Scenario B (4 k, 30)	Scenario C (6 k, 45)	Scenario D (8 k, 60)
	Real case	Real deaths	Real price Est	Net. predicition					
				Real price Est	Net. predicition				
Lithuania	S	17,449	128	6	5.78	7.18	7.02	6.81	6.53
Malta	S	8425	168	-41.3	-36.46	-28.16	-29.16	-30.44	-31.99
Cyprus	S	5107	19	7.5	5.51	6.32	5.71	5.24	4.72
Slovakia	S	9276	111	17.8	9.32	0.86	2.48	4.47	6.55
Bulgaria	S	13,160	368	3.3	0.5	-2.8	-3.38	-4.19	-5.34
Latvia	S	5989	68	-15.4	-9.14	-8.68	-8.86	-9.11	-9.49
Hungary	S	14,679	318	-7.3	-7	-1.21	-0.97	-0.78	-0.75
Slovenia	S	20,622	338	-4.8	-4.62	-10.26	-9.9	-9.26	-8.22

6 Conclusion

This study investigated how COVID-19 health crisis has affected consumer service prices. Many indicators, such as the duration of lockdowns, unemployment rate, disappointment, fear, uncertainty etc., may negatively affect a specific economic domain. It is difficult to map how exactly these indicators operate, because most of them concern human behavior. The authors examined how the pandemic affects managers' expectations on service prices in transportation, accommodation and food service sections in the E.U., as the pandemic has a great impact at them. They proved that every country performs different but its performance is usually analogous to the coronavirus spread. They used indications and future expectations from surveys and open data and managed to forecast in which sector prices are expected to increase or decrease.

Authors faced many limitations for this study because of lack of data of real prices for each country in a specific area of service. They tried to solve this problem using data from the Joint Harmonized EU Programme of Business and Consumer Surveys by the Directorate-General for Economic and Financial Affairs of European Commission which proved to be acceptable. The problem is that these data present indications and feelings and not real prices. Authors believe that testing the same algorithm on a dataset which will include real prices would be a good idea, for future work, if such data is available in the future. This study could probably have less error rate and could potentially calculate exactly how much prices will increase or decrease during a pandemic.

Neural Network models proved to be appropriate for the above-mentioned predictions, after testing a real case scenario with satisfactory results. This approach used a large variety of data examples in order to identify relationships and errors and provide possible outcomes. This approach is very helpful, even if it is difficult to implement in real cases. Outcomes can potentially help consumers, managers as well as governments to make right decisions considering the evolution of prices. In general, these forecasts can become very helpful for the benefit of the individuals as well as of the whole economy.

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