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EU Crisis and the Role of the Periphery

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Editors

EU Crisis and the Role of the Periphery

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About the Book

"The South East Europe and Balkan countries need to continue to prioritize strengthening their domestic macroeconomic fundamentals and policies that boost their productivity and resilience to external turmoil," said Satu Kahkonen, manager for macroeconomic and poverty reduction work in Southeast Europe for the World Bank. According to Kahkonen, the countries in the region are facing significant structural challenges in improving productivity and competitiveness including the areas of investment climate, labor market, and the public sector.

Unlike more developed countries, the countries of the Balkans lack fiscal reserves and access to the kind of credit that their western counterparts enjoy. They thus enjoy less of a cushion in the face of external shocks. The global economic crisis has been taking place in regional economy, and as a result, most of the Western Balkan countries have endured a recession. The problem is that conditions prior to the crisis, although clearly improving, were nonetheless difficult. Unemployment rate was very high, while rapid and sustained growth and labor market reforms had long been seen as essential to driving down joblessness. Social safety nets throughout the region are not particularly robust, paradoxically often. They discourage rather than encourage work and are now a target for reform. Of course, undertaking such fundamental systemic transformations becomes far more difficult during a downturn, particularly as the risk of political backlash mounts.

Efforts are needed to further galvanize regional political, diplomatic, and economic security and civil society links among the countries of this region. Of course, a great deal of progress has been made in many of these areas since the end of the wars in the region. But there is still much work to be done. The South-East European Co-operation Process was initiated in July 1996 as a corresponding effort to sustain the Dayton Accords. It is a process initiated by the region's governments. In 2000, member governments adopted the key goals of this process as enhancing political and security cooperation; fostering economic cooperation; and enlarging cooperation by fostering human contact, democracy, and justice and by combating illegal activities. The process is multifaceted and involves annual meetings of the heads of state/governments of the SEE countries, annual meetings of the foreign ministers, sectorial meetings of ministers, meetings of political directors of foreign

ministries, and annual meetings of parliamentary speakers. These kinds of contacts are vital to developing a positive regional identity, forging even closer relations, and lowering barriers to economic exchange. Using this process to develop transborder projects fostering integration would be an obvious next step. Importantly, this process engages countries beyond the Western Balkans including Bulgaria, Greece, Moldova, Romania, Slovenia, and Turkey.

The 5th International Conference EBEEC 2013 held in Istanbul, Turkey, in May 2013 hosted scientists and analysts of the particular region's economies, who discussed many different aspects of the progress of the economies. In this book are published selected articles presented at the conference.

Johannes Leitner, Hannes Meissner, and Ewa Martyna-David provide us with an innovative model of corruption to better understand specific political risks in Ukraine. In this regard, their paper focuses on corruption, favoritism, and institutional ambiguity. In post-Soviet countries—but also worldwide—these three factors regularly pose serious threats to international business. For the purpose of an innovative approach, they emphasize on both the literature on political risks in international business studies and on further reaching theoretical approaches of political science. Secondly, by applying their theoretical model, they analyze the business environment of Ukraine. The analysis is based on qualitative interviews carried out in Ukraine, Austria, and Slovakia. Thirdly, they reveal coping strategies of international enterprises in response to these political risks encountered in the Ukrainian market.

Xanthippi Chapsa, Constantinos Katrakilidis, and Nikolaos Tabakis test the convergence hypothesis for the EU countries with the Netherlands for the period 1950–2010. By using an empirical approach and an econometric model, their results strongly evidence a catch-up process until 1980 toward the Netherlands for all EU countries except the UK. Furthermore, they claim that after 1985, the economies show different courses caused by differences in the growth process.

Luljeta Sadiku, Nimete Berisha, and Murat Sadiku draw a picture about shadow economies and how they integrate with most countries in the world regardless of their respective level of development. However, in many developing countries, the shadow sector of economy is almost institutionalized. Thus, there is a qualitative difference between the shadow sector in the developed countries and the shadow sector of some of the least developed economies. They also support that measuring the size of the shadow economy is a very difficult and challenging task due to lack of data. While there have been many multinational studies on shadow economy for developed and individual countries, very few researchers have attempted to estimate the size of the shadow economy in the South East European (SEE) Countries. Therefore, their aim is to assess the size of shadow economy in this area, in which most of the countries are in transition, by some new estimates covering the period 2003–2011. The paper also investigates the response of the shadow economy to financial crisis. To estimate the size of the shadow economy, they use the Multiple Indicators Multiple Causes (MIMIC) estimation procedure, which is a special

specification of Structural Equation Modeling (SEM). This is a first attempt on measuring the size of the shadow economy for this set of countries.

Georgios Makris makes an effort to analyze the Optimum Currency Areas theory in its evolution and to underscore its weak points. He also considers the criteria and the main suggested methods of estimating real convergence and finally attempts a meta-analysis of the often contradictory results of empirical researches on real convergence within the context of both the Eurozone and the European Union in view of the abovementioned theoretical controversy. His conclusions lead to skepticism on the evolution of the real convergence process, especially since the recent global economic crisis erupted.

Simeon Karafolas and Alexandros Alexandrakis focus on the annual inflow of legal immigrants in Greece during 2008–2012 on the basis of the demand of Greek employers for seasonal immigrant labor in provenance from non-European Union countries. They support that local needs for work determine the number of immigrants on the local level. Local demand is expressed through prefectures; local needs determine the national demand and therefore the annual inflow. Their paper analyzes the evolution of this demand during the crisis period and tries to investigate whether the economic crisis and particularly unemployment has influenced this evolution. Their analysis is based on a prefectural level because it permits a more qualitative approach of the evolution since they can have more specific results.

Vasilis Angelis, Athanasios Angelis-Dimakis, and Katerina Dimaki use the Cusp Catastrophe Model to discribe the development process taking into account economic, social, and enviromental dimensions. Applying this model to Eastern European countries, they reveal important endogenous and exogenous variables to define the country's basic image that may be a useful managerial tool to improve countries' attractiveness.

Krzysztof Łyskawa and Marietta Janowicz-Lomott take into consideration significant gaps in the identification and financing of catastrophic phenomena. Local government entities do not take action within the risk management process relating to catastrophic risks even in the narrow sense, especially referring only to the effects of nature. It should be noted that the application of the procedures of risk management has been imposed on local government by the Act of August 27, 2009, the Public Finance Act, which introduced the obligation for public sector entities management control as one of its objectives is to provide risk management. The authors' risk management model is based on the concept of "risk owner," which was first defined in ISO 31000. This standard contains numerous links between risk management and the management of the entire organization. This relationship may involve both strategic and operational areas. Detailed activities are based on the separation of areas where risks are identified or created. In the next step, the risk is assessed by a series of questionnaires and interviews with employees in a lower-level unit of local government. The end result is recommendations for further action, which should be consistent between different areas.

Evis Gjebria and Oltjana Zota present PPPs in developing countries by showing the factors determining their participation with a special focus on Western Balkan and emerging countries because these countries need PPP arrangements in

infrastructure. They also focus on the theoretical background that justifies PPPs, empirical studies on main factors impacting PPPs in developing and emerging countries, and main benefits and risks of PPPs. In the second part, they run a comparative analysis of determinants of PPPs in infrastructure in Western Balkan and emerging countries.

Apostolidou, Mattas, and Michailidis refer to the causal relationship that exists between agricultural value added per worker and GDP per capita in the Eurozone. A comparison among Southern and Northern EU countries is applied in order to examine possible differences and similarities as regards the role of agriculture in economic growth. The analysis employs an Autoregressive Distributed Lag (ARDL) approach for cointegration and the Granger causality test in order to examine the role of agriculture in economic growth by short-run and long-run relationships as well as the direction of causality. The bidirectional relationship between agricultural value added and economic growth is of crucial importance since it can facilitate successful economic policies in the EU countries.

Konstantinos Liapis, Dimitrios Kantianis, and Christos Galanos present the methodologies of LCC and WLC together with the NPV measure for the evaluation of real estate investments. These methods are incorporated into a decision-making model using mathematical approaches. The model is applied to a typical commercial property project (office building) in order to explore the significance of impacts from changes in structured variables and the taxation environment under today's debt crisis Greek economic conditions in the evaluation of commercial real estate projects. The application of their methodology to the current Greek economic environment revealed that the tax regime, the financial variables of funding, and the applied monetary and fiscal policies affecting demand and inflation are critical variables of the Net Present Value (NPV) of a commercial property project investment. An integrated WLC mathematical model for the evaluation and valuation of commercial real property projects is introduced. The herein proposed methodology contributes to taxation policy and real estate theory in general and assists industry professionals in effective commercial property management and decision-making.

Tsourgiannis, Kazana, Karasavvoglou, Vettori, Fladung, Sijacic-Nikolic, and Ionita discuss a number of statistical tools and graphs to demonstrate the main market considerations in terms of the regulation processes and public acceptance for woody biomass energy products of transgenic origin. Also, it presents results of a study in Greece initiated in the frame of the EU COST Action FP0905 with the aim to explore consumers' attitudes toward the woody biomass energy products of transgenic origin. Field interviews based on a structured questionnaire were conducted on a random sample of 418 consumers all over the country. Multivariate statistical analysis was performed then on 220 consumers, the ones who stated that they would buy such woody biomass energy products. Principal Components Analysis indicated that the main factors affecting consumers' purchasing behavior toward those products were marketing issues, product quality features, and health safety issues.

Jerzy Handschke and Paweł Rozumek are initially comparing the Eastern European economies' level of penetration with the world and regional references

deriving from S-Curves. The world S-Curve parameters were assessed by W. Zheng, Y. Liu, and Y. Deng, while the regional S-Curve parameters were estimated by the authors on the base of penetration and income levels of analyzed countries. The analysis shows the differences between Eastern Europe and the world and among the analyzed countries. This enables the authors to determine the stage of insurance development in life and nonlife insurance markets, which in most of the cases is a sustained growth stage. BRIP was used by the authors to measure the pace and fluctuations of the analyzed insurance markets' convergence. In the time series model of penetration level, the authors showed the seasonal variation caused by business and insurance cycles. Finally, research proves that countries in Eastern Europe have different paces of insurance convergence. Besides, the analysis shows that the countries can bring into play institutional growth in both life and nonlife insurance markets. Thus, in the time of the global financial crisis, the countries can increase the penetration level without any economic growth.

We would like to express our thanks and appreciation to all the participants of the EBEEC 2013 conference in Istanbul. We would also like to extend our gratitude to the reviewers of the papers and to Fotini Perdiki for the editing of this volume paper. Last but not least, we wish to acknowledge the financial, technical, and administrative support of Istanbul University and Eastern Macedonia and Thrace Institute of Technology.

Kavala/Istanbul   Anastasios Karasavvoglou
June 2014   Ongan Serdar
                                                                              Persefoni Polychronidou

Contents

Part I
Dept Crisis

The Debate About Political Risk: How Corruption, Favoritism and Institutional Ambiguity Shape Business Strategies in Ukraine

Johannes Leitner, Hannes Meissner, and Ewa Martyna-David

Abstract Drawing both on the literature on political risks in international business studies and on further reaching theoretical approaches of political science, this paper provides an innovative model on corruption, favoritism and institutional ambiguity to better understand political risks in Ukraine. This model is then used to analyze the difficult business environment of Ukraine. Referring to this, the paper finally reveals coping strategies of international enterprises.

1   Political Risk in Transition Economies: And Its Consequences for Business

This paper is dedicated to political risks in Ukraine. The country is one of the most important economies for international investors in the Black Sea Region. While most Central Eastern and South Eastern European countries were "discovered" by international business in the 1990s, many international enterprises entered Ukraine only after the millennium. Promising economic growth rates and a market potential of 45 million consumers, albeit shrinking since the 1990s, attracted the attention of international companies. This all held true despite a broad variety of political risks, like systemic corruption, red tape and legal uncertainty.

The intention of this paper is threefold: Firstly, it aims at providing an innovative model on specific political risks. In this regard, it focuses on corruption, favoritism and institutional ambiguity. In post-Soviet countries – but also worldwide – these three factors regularly pose serious threats to international business. For the purpose of an innovative approach, the paper draws on both, the literature on political risks

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in international business studies and on further reaching theoretical approaches of political science. Secondly, by applying our theoretical model, this paper analyzes the business environment of Ukraine. The analysis is based on qualitative interviews, carried out in Ukraine, Austria and Slovakia. Thirdly, the paper finally reveals coping strategies of international enterprises in response to these political risks encountered in the Ukrainian market.

Against this backdrop, three research questions are sought to be answered:

(i) What insights can be drawn from international business studies and political science regarding corruption, favoritism and institutional ambiguity as political risk?
(ii) How do these three factors characterize the business environment in Ukraine?
(iii) What strategies do international enterprises choose to cope with it?

The paper is structured as follows: Sect. 2 is designed to recall the current literature on political risks, particularly focusing on corruption. Since international business literature would benefit from additional insights from political science (cf. Wyk 2010), Sect. 3 discusses the concept of neopatrimonialism. Hitherto, international business literature has not frequently adopted neopatrimonialism in its analysis (Laruelle 2012, p. 305), despite some exceptions (cf. Robinson 2013, pp. 137). Nevertheless, we argue that neopatrimonialism allows for a much deeper insight into the specific characteristics of political risks than conventional political risk concepts found in the international business literature. The additional value is to systematically derive risk factors from the political and institutional environment. Consequently, counter strategies from companies can be adjusted much more effectively and therefore being capable of preventing the business from these risk factors 4. The subsequent sections are dedicated to the empirical part of this study. Section 5 provides information on the methodology applied. Section 6 is a country case study on Ukraine, dealing with neopatrimonialism in general and systematic favoritism, political corruption and institutional ambiguity in particular. Section 7 highlights the consequences to international business activities. The paper then unveils the coping strategies of international enterprises in Sect. 8, before concluding with Sect. 9.

2 Political Risk from the Business Perspective

In international business studies, the discussion about political risk has not yielded any unambiguous definition which is generally accepted (Fitzpatrick 1983). Neither does a widely shared concept exist nor has it clearly been operationalized (Agarwal and Feils 2007). Political risk is either referred to as the consequence of government interference with business operations or related to certain events such as expropriation, devaluation, political turmoil, or war (Kobrin 1979; Howell 2001; Monti-Belkaoui and Riha-Belkaoui 1998; Simon 1982; Robock 1971).

Advancing a definition from de la Torre and Neckar (1988), Agarwal and Feils (2007) come up with an approach that suits our needs. According to them, political risk is:

> The probability distribution that an actual or opportunity loss will occur due to the exposure of firms involved in international business activities to a set of contingencies that range from the total seizure of corporate assets without compensation to the unprovoked inter-ference of external agents, with or without governmental sanctions, with the normal operations and performance expected from the firm.

Against this backdrop, a framework for political risk factors is provided. This framework contains both internal and external political risk factors. Internal polit-ical risk factors comprises those dimensions that can be discerned from the study of the "cohesiveness of the social structure, the disparity between people's beliefs and aspirations on the one hand and the quality of leadership on the other, the relative power of the government, the strength and tradition of national institutions, and more general indicators such as official corruption and riots" (Agarwal and Feils 2007). It is argued that the following internal political risk factors have an influence on the internationalization behavior of firms. Political stability, i.e. a stable political environment that provides predictability, has a positive effect on attracting foreign companies (Robock 1971). Level of democracy, i.e. the degree to which elected representatives in the executive and legislative offices act according to the will of the citizens, is suggested to have a positive influence on reducing losses to inter-national businesses (Howell and Chaddick 1994). Finally, red tape in the host country government is considered under the internal political risk factors concept. The degree of red tape describes protocols, procedures and administrative rules that apply to business activities. In its most extreme form red tape may result in corruption and bribery. The latter have been shown empirically to exert negative effects on attracting international business activities (Zhao et al. 2003).

External political factors are identified when analyzing position on international issues, regional and international political conflicts and cooperation and the overall environment for foreign business. In particular, two factors are relevant here. First, regional and international political conflict and cooperation, referring to events that impact on the relation between the home and the host countries, e.g. breaking diplomatic ties, but also between the host country and third countries, e.g. building a trading bloc (Nigh 1985; Schöllhammerr and Nigh 1984). Second, another factor becomes important: the attitude of the host country government toward foreign business. Here, it will be described how the host government generally views and acts upon foreign trade and investments. This indicator can be a shortcut for estimating the political risk of a government as a result of nationalistic policies, ideological climate and market interference (De la Torre and Neckar 1988; Toyne and Walters 1993).

Within the framework of political risk, corruption has increasingly gained attention (cf. Mauro 1995; Treisman 2000; Rodriguez et al. 2005; Uhlenbruck et al. 2006; Shahabuddin 2007; Ampratwum 2008; Straub 2008; Sööt 2012;

Rama 2012). Scholars argue that corruption is particularly relevant in transition and developing countries or emerging markets (Hellman et al. 2000).

Corruption, i.e. "the abuse of public power for private benefit" (Uhlenbruck et al. 2006, p. 402, see also Treisman 2000 p. 399) occurs mainly at the interface of the public and the private sector with the representatives of the public sector exploiting their discretionary power over access and distribution of resources to the private sector (Uhlenbruck et al. 2006; Rose-Ackermann 1999). Apart from the numerous publications on different implications and adverse effects of corruption, here the concept itself deserves closer scrutiny.

According to Uhlenbruck et al. (2006), corruption can be differentiated along two dimensions, (i) pervasiveness, and (ii) arbitrariness. Pervasiveness refers to the average probability that a firm will be confronted with corrupt behavior in its daily business with public authorities (Rodriguez et al. 2005). This dimension describes the probability for encountering any corrupt incidences during routine business in a country. If corruption is an integrated part of the public system and a usual part of commercial activities, then corruption shows a high degree of pervasiveness (Uhlenbruck et al. 2006, p. 403). The second dimension, arbitrariness, refers to the degree of ambiguity (Rodriguez et al. 2005, p. 385) or uncertainty within a corrupt system. In the case of arbitrary corruption, overlapping and contradicting jurisdictions could result in ineffective exchange of resources. In other words, due to its unorganized character, arbitrary corruption leads to a situation in which perpetual corrupt demands are exerted by different corrupt actors (Uhlenbruck et al. 2006). Estimating the impact of the degree of arbitrariness on business, Shleifer and Vishny (1993) argue that less arbitrary corruption may require higher resource contributions in the short term but, due to its stability, can be better calculated. Consequently, it is preferred to more arbitrary or disorganized regimes.

Apart from the differentiation between pervasiveness and arbitrariness, Teixeira and Grande (2012) also highlight the distinction between (i) political corruption and (ii) administrative or bureaucratic corruption. Political corruption refers to the abuse of political authority by state officials, to confirm their power status and personal wealth. On the other hand, administrative corruption – also known as bribery – occurs when private sector representatives offer and make payments to public actors to either get preferential treatment by, or to prevent adverse actions from the authorities, and the recipient uses these payments for private or partisan political purposes (Teixeira and Grande 2012, p. 7943).

3   Digging Deeper: Political Science Approaches

Political science also distinguishes between different subcategories of corruption (Byrne 2009). One of them is political corruption. According to Byrne (2009), political corruption refers to "any transaction between private and public sector actors through which collective goods are illegitimately converted into private-regarding payoffs." The special feature is that it not only involves political

decision-makers, but that it also takes place at the highest levels of the political system. In this regard, politicians and state agents use their authority to sustain their power, status and wealth. As a result, "laws and regulations are abused, side-stepped, ignored or even tailored to fit their interests" (Byrne 2009). In the case at issue, corruption is opposed to exploiting occasional opportunities and is therefore systemic. According to Byrne (2009), systemic corruption refers to corruption as an integrated and essential aspect of the economic, social and political system, when it is embedded into a wider situation that helps sustain it (Byrne 2009).

These approaches highlight a highly relevant aspect: Regardless whether we deal with corruption in particular or with any other factor posing a risk to business activities, we have to consider that these factors are part of a wider economic, social and political system. This has two implications: Firstly, we have to take into account that political risk factors are interconnected with each other. Secondly, in order to fully understand their consequences, it is necessary to factor in the country specific socio-economic and political context.

Political and systemic corruption have been operationalized as an integral part of a concept called "neopatrimonialism" (cf. O'Neil 2007, p. 10; Bratton and van de Walle 1997, pp. 63–68; Soest et al. 2011, p. 7). As Laruelle (2012, p. 305) highlights, "corruption refers to specific practices that may occur in non-neopatrimonial states, it can be widely non-politicized and decentralized, (. . .) but neopatrimonialism supposes centralized and hierarchical corruption that operates in a pyramidal fashion and serves a political legitimacy strategy." At the same time, corruption is not the only feature of neo-patrimonial states that might pose a risk to international businesses.

Neopatrimonialism is a universal, commonly applied concept in political science. It first emerged in development studies in the early 1970s to explain obstacles to modernization in sub-Saharan Africa. Since then, the concept has increasingly been applied to other world areas as well. (Erdmann and Engel 2006, p. 5; Erdmann 2012b, p. 44) The concept describes "the coexistence and interaction of formal and informal institutions, or widespread informal behavior within a formal polity such as a modern state" (Erdmann 2012a, p. 47). It is a system in which two logics and institutional patterns exist next to each other: the patrimonial system of personal rule, clientelism and patronage and the legal-rational system of modern statehood. As Erdmann (2012a) further emphasizes, the two spheres are conflating. "The patrimonial system (of personal rule) penetrates the legal-rational system, twists its logic, functions and output (. . .), as formal and informal institutions and behavior are intimately linked to each other in various ways and to varying degrees and this mixture becomes institutionalized" (Erdmann 2012a, p. 47f.).

Neopatrimonial systems are characterized by clientelism (Soest et al. 2011, p. 8; Bratton and Van de Walle 1997, p. 65; Franke et al. 2009, p. 79). Clientelism means that a president or strongman relies on awarding personal favors, like the distribution of public sector jobs and public resources through licenses, contracts and projects. The client, in turn, gives allegiance to this person. "Clientelism means the exchange or brokerage of specific series and resources for political support in the form of votes" (Erdmann and Engel 2006, p. 20). Clientelism is therefore a form

of dependency based on the unequal distribution of resources which are used for mutual benefit (cf. Erdmann 2012a, p. 49; Ziemer 1998, p. 304).

This goes along with the systematic concentration of political power in the hand of one or a small number of individuals (Soest et al. 2011, p. 8). They act as patrons. The privatization and distribution of public goods to their clients is an essential factor for the stabilization of their power. However, this does not preclude that patron-client networks partly change over time (Erdmann and Engel 2006, p. 20). With the president on the top, neopatrimonial networks often have a pyramid structure. This is due to the practice that high-ranked members of the state apparatus privatize public positions they have access to. Then, they pass them to friends and family members. With the subordinates at each level gathering their own clientele at the ranks below them, extensive networks emerge (cf. Meissner 2010, p. 32). This does, however, not necessarily mean that such systems are always totally centralized. It might also be that different elite networks compete for power, thereby having captured different state institutions.

4 Corruption, Favoritism and Institutional Ambiguity as Political Risks: An Analytical Model

There are three political risk factors that can be derived from neopatrimonialism. They are in particular "political corruption", "systematic favoritism" and "institutional ambiguity".

1. Political corruption means that the president and the persons close to him use their authority to sustain their status and wealth. In this context, the pyramid structure of informal networks proves advantageous. Corruption money is generated at each level, with parts of it being redirected to the top. This is how corruption money stabilizes these networks (cf. Meissner 2013, p. 72). In this context, international business is confronted with systemic corruption. It occurs in the form of entrance fees, kickbacks and payments necessary to overcome the insecurity inherent to neopatrimonial systems. As corruption is an integrated part of the public system, it generally shows a high degree of pervasiveness (cf. Uhlenbruck et al. 2006). However, this does not ultimately mean that political corruption cannot take any arbitrary forms. In cases of competing elite networks, having captured different state institutions, corruption tends to be more arbitrary.

2. Systematic favoritism means that the president and high-ranked officials rely on the awarding of personal favors. This (inter alia) takes place in the form of the distribution of public resources through licenses, contracts and projects. Systematic favoritism is not necessarily a consequence of clientelism in the proper meaning of the term, since public resources are not only distributed in exchange for political support, but also for direct material benefits, in other words bribes. This means that actors that are actually no clients of the rulers – like

international businesses – can "buy into" networks. However, favoritism generally poses a major threat to international businesses as certain markets are freely accessible only at first sight. In fact, the ruling elite are deeply involved in business activities, often controlling significant shares of the national economy. Own businesses are favored while companies not being part of the rulers' network – or lacking any (sustainable) access to – are disfavored.

3. Institutional ambiguity means that procedures, regulations and laws are unclear or even contradictious. This goes hand in hand with legal uncertainty, the arbitrary use of power by civil servants, as well as a lack of security and predictability. In the present case, this is a result of clientelism, favoritism and political corruption, since "laws and regulations are abused, side-stepped, ignored or even tailored to fit their interests" (Byrne 2009). As Erdmann (2012a, p. 48) points out, "in neopatrimonial states, formal state institutions cannot fulfil their purpose, but fulfil other purposes and perform other functions (. . .) in which particularistic interests determine politics and policies."

5 Methodology

Exploring the mechanisms of political risk factors, particularly with regards to corrupt practices and illicit structures, is certainly a highly problematic issue when it comes to scientific methodology and objectivity. Hitherto, neither do exist unambiguous quantitative and objective measures of corruption. Notwithstanding the contribution delivered through the Corruption Perception Index of Transparency International, or the World Bank, they are subject to critique (cf. Andersson and Heywood 2009). Nor does our research question support a quantitative approach. Consequently we opted for a qualitative design that allows us to (i) catch the topic of corruption, patronage, favoritism and neopatrimonialism and (ii) unveil business strategies in response to these circumstances.

First, in the beginning of this paper we carried out an intensive literature review with the aim to capture the most relevant concepts determining political risk and its diverse facets. Here, we combined findings from the international business literature with political scientific approaches, which resulted in our theoretical model to describe political risks in Ukraine. Based on this, we designed a questionnaire and a category system. The questionnaire was our guideline for conducting the narrative interviews with business representatives from companies that directed their Black Sea Region business activities from their Austrian headquarters.

In February and March 2013 we carried out a field research in Ukraine where we collected 35 interviews. All interviews were conducted face to face. Three interviews took place outside of Ukraine, two of them in Vienna (Austria) and one in Bratislava (Slovakia). The interviewees were representatives of Austrian businesses from various sectors such as transport, chemistry, construction, technology, infrastructure, telecommunication, finance and banking. In addition, we also

interviewed representatives of Ukrainian NGOs, journalists and scientists. The average interview duration was 65 min.

Fourteen interviews were conducted in German, 14 in English and 7 in Russian. Due to the sensitive topic we did not in all cases get the permission to record the interview. Therefore, 24 interviews were written down by one interviewee, while the other was conducting the conversation. The remaining 11 interviews were recorded and transcribed afterwards.

The category system guided us through the analysis of the interview material. In this respect we followed Mayring's (2000) content analysis while applying the deductive approach, which means that we derived the categories from the literature and not –as would be the case of the inductive method- from the material itself. The reason for us to opt for the deductive approach was that there already exists a bulk of literature providing rich variables and concepts which we wanted to use as our point of departure.

6   Elite Networks, Favoritism, Corruption and Institutional Ambiguity in Ukraine

Drawing on the innovative theoretical model introduced in Sect. 4 the following section analyzes the specific Ukrainian neopatrimonial system. Accordingly, the particularities of elite networks, corruption, favoritism and institutional ambiguity are outlined subsequently.

Elite Networks

In Ukraine, the break-up of the Soviet Union did not go along with any real democratic elite change. Like in most other post-Soviet states, democratic counter elites were just too weak to dismantle the old cadres at the time of national independence (Meissner 2013, p. 68). As a result thereof, the country is under the control of elites, which have emerged out of Soviet networks. When democratic transition started, members of the old elites converted to capitalists, seizing control power over the national economies, enriching themselves through self-controlled privatization processes, favoring their own networks (Meissner 2013, p. 68ff.).

As a result thereof, politics and business are tightly interlinked in Ukraine. Oligarchs support the respective ruling president financially and he satisfies the political and economic wishes of his sponsors in return (Interview 1). The president and the government also have the means to influence these groups of people (Interview 2). Structurally, a lasting relationship between political key decision makers and the representatives of big business in this country can be detected (Matuszak 2012, p. 5). The system has come into being in the mid-1990s under

President L. Kuchma. Despite some changes, we can still see much continuity. The representatives of big business managed to maintain their decisive voice in the key areas of politics and economics of this country.

Depending on the respective assessment, between 3 and 12 oligarchic groups currently exist in Ukraine. The distinctions are difficult to be made. According to one leading Ukrainian journalist there are currently 5–6 oligarchic clans in Ukraine gathered around: R. Ahmetov, V. Pinchuk, I. Kolomoyskyi, D. Firtash and "the Family" (Interview 3). The most powerful networks have been established by R. Akhmetov and D. Firtash and A. Yanukovych, the eldest son of the current President (Interview 2).

Under the current president, the role of oligarchs has not changed dramatically. The configuration, however, has shifted. Many oligarchs, who openly supported either the former President V. Yutshchenko (such as I. Kolomoyskyi) or Prime Minister Y. Timoshenko (such as S. Taruta, V. Haiduk, K. Zhevago) have largely lost their influence and their access to the distribution system (Schneider-Deters 2012, p. 290). A new group "the Family" has entered the game in the early 2012. The newest group is gathered around A. Yanukovych (Matuszak 2012, p. 39)

Over time the role of the president in the system has changed. Under President Kuchma, the relationship between the head of state and oligarchs could be described as arbiter-client (Interview 4). Nowadays, the president has become one of the oligarchs. According to James Sherr from Chatham House, V. Yanukovych " he does not just preside over an oligarchic dictatorship. He leads it" (Sherr 2010, p. 4).

V. Yanukovych is attempting to gain more independence from the supporting groups and began to build his own vertical of power (Interview 1; Interview 24). Until the last government reshuffle he was balancing between two oligarchic groups – the Firtash group (so-called RosUkrEnergo group) and the Ahmetov group. The new appointments in the state apparatus show that the balance has been destroyed in favour of "the Family" (Schneider-Deters 2013, p. 4).

Corruption

Ukraine is perceived as a corrupt country (cf. CPI 2012). All types of corruptive practices are indeed present there (Yemelianova 2010, p. 2). Corruption is of systemic nature. This phenomenon is particularly visible in the police apparatus, tax administration and customs (Kupatadze 2011, p. 3). The companies encounter it in the sphere of licensing, inspection, taxation and customs (business-anti-corruption 2013). As Ukraine's bureaucratic system sets huge barriers private business frequently chooses illegal practices to efficiently speed up processes of gaining licenses, permits, favorable court decisions or treatment by authorities (Zimmerer 2012, p. 3). The current authorities have the capacity to pursue anti-corruption policies but are unwilling to introduce them (Kupatadze 2011, p. 3). A former economic advisor to the governments of Ukraine, Anders Aslund, noticed that

president Yanukovych "is not prone to pursue any anti-corruption program" (Aslund 2011).

Due to the sensitive character of corruption practices it is difficult to identify the structure of corruption system and the final beneficiary of it. According of some interviewees the phenomenon is centrally conducted and the strings lie in the hands of President V. Yanukovych (Interview 5; Interview 6). The general perception is that the corruption has a pyramid form and that corruption money is collected at each level of the pyramid. According to one interviewee, Yanukovych has even come into power in order to monopolize the corruption vertical (Interview 24). According to another interviewee, a certain portion of money is redirected upwards, to the department leaders, who are close allies of Yanukovych and are the final beneficiaries (Interview 7).

Favoritism and Institutional Ambiguity

The main claimants of the systemic favoritism are currently the members of the Family group and people close to them (Interview 5; Interview 6). As the Yanukovych family comes from the Donezk region in the East of the country and as they now take over key state positions, this phenomenon is called "Wave from Donezk" (Bidder 2012). The members and followers of "the Family" from this region enjoy a privileged access to public jobs at the central and regional level. Characteristically, Yanukovych has appointed the loyalist from Donetsk to all top jobs in the power ministries (Aslund 2012).

Concerning corruption and favoritism, the institutional legacy of the Soviet Union proves advantageous (Meissner 2013, p. 68). The fact that the transformation process in Ukraine remains uncompleted (cf. BTI 2012), it favours institutional ambiguity since laws, institutions and regulations can easily be abused, side-stepped, ignored and tailored to fit the ruling elite's interest. In the existing informal system, the institutions are neither capable nor willing to work appropriately. In Ukraine, institutional ambiguity is part of a well-established system, with legislators constantly implementing new and unclear laws. The law system is full of loopholes which enhance the willfulness of the civil servants (Interview 1; Interview 8). Furthermore, laws are often contradictory (Interview 9; Interview 10; Interview 11; Interview 12; Interview 13). In the judicial cases between citizens or companies and the state judges have nearly always ruled in favor of the latter. In the rare case of a victory there is no guarantee that the state will implement the verdict (Interview 9). In other cases, the side which has paid more is likely to win the trial (Interview 14; Interview 12; Interview 15). A company is able to win a lawsuit only in cases where an unambiguous interpretation plays to their favor (Interview 16). After a positive verdict, a tax inspection can be conducted as a result (Interview 12). This is only done in order fines and bribes to be collected, as local and foreign companies are automatically forced to conduct law infringements.

7 Consequences to International Business Activities

Both the oligarchs and the ruling family are active in lucrative branches (Interview 24) and protect economic sectors they are active in. According to our interviewees, this holds particularly true for metallurgy (Interview 16) agriculture (Interview 17), banking (Interview 9; Interview 11), financial sector, energy sector, airlines (Interview 9), solar energy sector (Interview 10), pharmaceutical industry (Interview 18), retail trade (Interview 8), pipe industry, construction, import of goods (Interview 7). In the case of agriculture, however, this is only true when the business activities go along with huge investments (Interview 17). Foreign companies that want to start business in the respective areas face not only financial risks, but sometimes also willfulness of the judiciary system (Interview 17). Beside all this, there has been evidence that the National Bank of Ukraine has blocked the access to auctions for foreign banks (Interview 19).

Another severe obstacle to independent business initiatives is that the ruling family tries capture flourishing companies not only from oligarchs (as in case of Kolomoyskyi), but also from domestic and foreign business people, or at least to get some stakes in them. It is a form of predictable unpredictability, since this can always take place as soon as turnover and profit reach a certain level (Interview 9 and Interview 12). It is most likely to happen in banking, agriculture and retail sectors (Interview 1). In those sectors big money can be made comparably easily and quickly. Foreign companies face not only financial risks, but sometimes also physical threats. In this context, they do not stop short of using the state security apparatus to defend their interests (Interview 9). In sectors that are vice versa depending on know-how and highly qualified employees, it is less likely to happen (Interview 17). In general, as long as foreign business takes place on a low scale or in hidden niches, they can work rather undisturbed (Interview 7 and Interview 16).

Ever since the Yanukovych family has come to power, they have started to particularly use state tenders in order to enrich themselves (Interview 13 and Interview 19). As the group appeared on the scene rather lately, all lucrative branches were already divided up among the previously established oligarchs. For this reason, they had to look out for new enrichment methods. A solution was to redirect state resources to their own networks. This is mainly done through tenders. It is particularly visible in the construction sector. Neither independent local companies nor international ones would have any chance to win a tender against an enterprise linked to the ruling family (Interview 13). In state procurement, the system is pretty much the same with purchase only being done by companies belonging to the group (Interview 4).

Working in Ukraine can also mean to get engaged in bribing and corruption. In some cases, foreign companies have a chance to win tenders, provided that they are ready to offer entrance payments and kickbacks. Regarding the renovation of an historical building complex in Kiev, there is evidence that foreign construction enterprises won the tender after having paid up to 20 % of the total project costs (Interview 13). Apart from that, any company is regularly confronted with high-

scale corruption. It is a particularly popular practice to use tax audits to demand and systematically collect corruption money (Interview 1; Interview 12). Foreign companies face not only financial risks, but sometimes also physical threats. A special Police unity fighting against organized crime offers a "Krisha" for suitable amount of money (Interview 16). At the same time, corruption affects all aspects of public life.

8   Strategic Choices for International Business Endeavors

The aim of international companies and businesses active in the Ukraine is to guarantee a sustainable and profitable presence in the market without being confronted with recurring administrative, bureaucratic or criminal challenges. Of course, a corrupt system can only survive and sustain itself if the demands expressed through public authorities are met by private representatives. We have shown in the theoretical section of this paper that corruption typically occurs at the interface of the public and the private sphere. Nevertheless, international companies have come up with a set of strategic options which help them minimize the potentially costly and harmful corrupt demands of the institutional environment.

A first strategy, certainly, is to avoid corruption. The firm avoids doing business with public authorities but restricts itself to private contractors only (Interview 12; Interview 15; Interview 18). However, in some industries this option is barely applicable since state run companies might dominate. Additionally, not contracting with public authorities does not mean the firm is out of reach of them. Audits, permissions, licenses etc. need to be obtained in any industry which makes it almost impossible not to get into contact with public authorities. The majority of our interlocutors have denied giving bribes. A representative of an insurance company confirmed a payment for an audit service which should be free of charge in Ukraine (Interview 11), and a representative of a construction company admitted giving gifts (Interview 12).

A grand strategic option frequently referred to by our interviewees was the so called "decoupling strategy". Decoupling describes that the local, i.e. Ukrainian, business activities are as much detached from the parent company as possible. Certainly this is always a decision between degree of control and ownership. The more decoupled local business is from the parent company, the less influence the latter can exert on the subsidiary. The major advantage, on the other hand, is that whatever happens on the local level when it comes to bribery and corruption cannot directly be attributed to the parent company's responsibility (Interview 20). Decoupling may also occur in very different forms and options. For instance, some companies set up local branches as separate legal entities that are solely staffed with local personnel. This strategy requires a high degree of risk in the partnering actors as the parent company has almost no legal possibilities to secure and save its stakes. Also, a popular strategy to avoid potential conflicts with compliance standards is to outsource critical areas of the business process to local

entrepreneurs or consultants (Interview 8; Interview 12; Interview 16 and Interview 21). For instance, a huge machinery equipment company from Germany sells its products to a local, independent retailer. Through whichever measures the local retailer sells to the final customer is no more in the responsibility of the German company which does not get into compliance conflicts.

Another grand strategic option to minimize the risk of expropriation is to keep local exposure at a minimum level. This can be reached through various measures. Instead of establishing a fully operating local subsidiary, the parent company only sets up a local representative branch which then outsources its activities to local firms or leaves the core processes with the parent company in the home country (Interview 15 and Interview 17). Another approach in this strategy would refer to property. To prevent your establishment from potential expropriation you have to avoid adding any property in the country. Instead, the firm rents its entire business infrastructure, from the building to the telephone (Interview 7 and Interview 22)

Once problems are looming, international businesses prefer the leverage of political pressure and lobbying to the judicial system. The latter is known to hardly ever come to verdicts based on jurisprudence. On the other hand, political pressure through embassies, chamber of commerce, European Union institutions or high level home government officials seems to show promising effects (Interview 1; Interview 6; Interview 7; Interview 8; Interview 9; Interview 13; Interview 14; Interview 17; Interview 18 and Interview 22). If the political option cannot be realized, then local lawyers are supposed to show much higher success rates than international law firms who do not have access to local networks nor do understand the local rules (Interview 1 and Interview 15). To avoid having trial under Ukrainian law, some companies can name in their legal agreement a third country as a place of jurisdiction (Interview 12).

Finally, the recruitment strategy plays a major role in coping with local particularities. Frequently, we could observe that the most critical organizational departments in the Ukrainian context, which are accounting and legal services, are generously and only locally staffed (Interview 1; Interview 10; Interview 12). This is because only the local employees know the relevant networks, the unofficial and informal prescriptions which are necessary to not getting attacked by government authorities, or they know how to best handle these attacks (Interview 14).

9   What's New in the End?

Political risk is a widely investigated topic in international business research. However, the discipline's concepts and tools for analyzing political risk factors could gain precision and explanatory power when recognizing political science approaches. Therefore, in this paper we first recall the most prominent models of political risk generated in the framework of international business studies and advance with more fine grained concepts from political science insights. In so doing, we could launch a more sophisticated tool that allows for analyzing political

risk factors that are highly relevant in the context of emerging and transition economies.

We apply our theoretical concept for the country specific analysis of Ukraine. By empirically examining the structural interrelations of business and politics under the framework of elite networks we could also unveil corrupt practices, favoritism and institutional ambiguity – challenges international companies have to face in Ukraine. Consequently, the empirical part of this paper also brings forward a set of business strategies that allow for successful maneuvering in the Ukrainian business environment.

The results of this paper are of particular interest for international companies that are interested in the market but do yet lack a country specific know-how. They could learn and adapt their entry strategies beforehand.

However, to draw a realistic picture of these results we also want to point to some limitations of this study. In order to understand the underlying mechanisms and relationships, a qualitative design was opted for, which means that these results have not yet been tested on a large scale survey. Therefore, we suggest a quantitative study to confirm -or not- our results on a broader scale.

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Investigating the Convergence Hypothesis in the Eu: More Evidence Accounting for Structural Breaks

Xanthippi Chapsa, Constantinos Katrakilidis, and Nikolaos Tabakis

Abstract The aim of this paper is to test the convergence hypothesis for the EU countries with Netherlands which is considered as the benchmark. The empirical analysis uses Gross Domestic Product (GDP) per capita in Purchasing Power Parity (PPP) in constant prices of 2005 and covers the period 1950–2010. The empirical approach complementarily employs unit root tests for stochastic convergence and a test proposed by Tomljanovich and Vogelsang (Empirical Econ 27: 49–62, 2002) and Nieswiadomy and Strazicich (Econ Inq 42: 323–340, 2004) that is based on Carlino and Mills' (J Monet Econ 32: 335–346, 1993) methodology. Applying the unit root tests for the relative per capita real GDP series for each country, we are able to reject the unit root hypothesis for 6 out of 14 countries. However, our results suggest there is stronger evidence in favor of convergence when we account for one or two endogenous structural breaks in the intercept and slope of the trend function. Based on Carlino and Mills methodology, we found strong evidence of a catch-up process until the mid-1980 towards the Netherlands for all countries except for the UK, although, after 1985, it is clear that the economies show different behavior which is probably associated with differences in the growth process.

Keywords Stochastic convergence • *β*-convergence • Trend test • Structural breaks

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1   Introduction

Are the European countries experiencing convergence in levels of GDP? Over the three past decades, an emerging body of literature addressing this question empirically provided several definitions of convergence, and thus different methodologies to test it. Ever since 1956, Solow's neoclassical model has produced endless debates on the empirical validity of its prediction upon income convergence. Mankiw et al. (1992) argue that poorer countries grow faster than richer ones, by augmenting Solow's model with human capital. Quah (1993) found no such convergence. Baumol (1986) found evidence of convergence, but only within developed countries. This debate goes on strong.

More specifically, in the context of the neoclassical model, there is "absolute" or "unconditional" convergence, if incomes across countries converge to a common steady state, regardless of their initial income level, whereas there is "conditional" convergence if per capita incomes converge to country-specific "steady states" or "compensating differentials" given differences in saving rates, population growth rates and technologies.

In addition, convergence can be considered as a movement towards a group "leader", the country with the best economic performance, or as a movement towards a group mean. In the convergence literature, Germany is traditionally used as the "leader" or the "benchmark" country. The choice of Germany is based on the central role of this country because of the alleged credibility of the policies of the Bundesbank and because it is the largest economy in the EU. However, Germany experienced considerable monetary and real turbulence in the early and mid-1990s due to the difficulties encountered in the reunification of the country (Brada et al. 2005).

In this paper, convergence of countries which first joined the European Union, namely EU-15, towards the Netherlands is addressed over the period 1950–2010. In our paper, the Netherlands is considered as the benchmark country as it presents the best economic performance in the EU-15 (except Luxembourg), it has not experienced the adjustment costs that Germany had and thus, it may serve as a more appropriate indicator for the performance comparisons among the EU members.

This article has three objectives: First, to test the stochastic convergence hypothesis of the older EU members towards the Netherlands, which is chosen as benchmark. Applying conventional unit root tests on the relative per capita real GDP series for each country, a non rejection of the unit root null hypothesis is interpreted as a rejection of the convergence hypothesis. This choice could be criticized as it neglects possible structural breaks in output gaps. Thus, the second aim is to examine if the introduction of one or two endogenous structural breaks in the intercept and slope of the trend function provides stronger evidence of a catch-up process towards the Netherlands. In this direction, we apply the Zivot and Andrews (1992) unit root tests with on break, and the LM unit root tests of Lee and Strazicich (2004) with one or two breaks endogenously determined. Third, we present the time series notion of β-convergence, first suggested by Carlino and Mills (1993), who

suggest two conditions for convergence. Shocks to relative per-capita incomes should be temporary (stochastic convergence) and countries having per capita incomes initially above their compensating differential should exhibit slower growth than those having per capita incomes initially below their compensating differential (β-convergence). Specifically, if per capita incomes are converging, then regression of the log relative income on an intercept and trend should yield statistically significant and of opposite sign coefficients.

The rest of the paper is organized as follows: Sect. 2, briefly discusses the convergence hypothesis and Sect. 3 reviews the empirical methodology. Section 4 presents the data set and the results of the empirical analysis, while some concluding remarks are provided in the final section.

2 The Convergence Hypothesis

In the relative literature researchers define the convergence hypothesis in several ways. Sala-i-Martin (1996), among others, provides the most-widely known definition of β-convergence: "there is absolute β-convergence if poor economies tend to grow faster than rich ones".

The first research efforts on convergence were cross-sectional studies with β-convergence to hold if the coefficient of a regression of GDP per capita growth rates on initial levels was negative. Early empirical work on convergence is based on the estimation of the following model:

$$g_{i0,T} = a + y_{i0}\beta + \varepsilon_{iT} \quad i = 1, 2, ...N \tag{1}$$

y_{it} is the logarithm of per capita output for economy i ($i = 1, 2, \ldots, N$) during period t, and $g_{it,T} = (y_{iT} - y_{it})/(T\text{-}t)$ is economy i's annual growth rate of GDP between t and T. A negative value for β provides evidence in favour of absolute β-convergence, whereas $\beta \geq 0$ supports non-convergence. See, for example Baumol (1986), De Long (1988), Grier and Tullock (1989), Barro (1991), and Barro and Sala-i-Martin (1992), etc. Cross sectional studies generally support the convergence hypothesis.

More formally, time series tests of convergence focus on the notion of "stochastic" convergence (shocks to relative incomes should be temporary), that is per capita income disparities between economies should follow a stationary process Bernard and Durlauf (1996).

Let y_{it} be the logarithm of GDP per capita for any economy i ($i = 1, 2, \ldots, N$) during t ($t = 1, 2, \ldots, T$) period of time. Taking into consideration the neoclassical growth model we should underline for economy i that:

$$\lim_{n \to \infty} E_t\big(y_{i,t+n} - a_{t+n}\big) = \mu_i \tag{2}$$

where, a_{t+n} is a common parameter determined as benchmark, and μ_i is the balanced growth path of economy i. This μ_i is non zero except from the case of similar countries. In case of absolute convergence, the relation (2) is written as follows:

$$\lim_{n \to \infty} E_t\big(y_{i,t+n} - a_{t+n}\big) = 0 \qquad (3)$$

that is, the long run average of the difference $y_{i,t+n} - a_{t+n}$ should converge to zero through time. In addition, the group leader can be the country with the best per capita economic performance. Therefore, the other countries should converge to the leader.

Time series tests provide mixed evidence of stochastic convergence. More specifically, Quah (1990), Bernard (1991), Bernard and Durlauf (1991) and Evans and Karras (1996) find little evidence of stationarity in per capita income disparities across countries. Furthermore, studies by Lowey and Papell (1996), Li and Papell (1999) and Lee and Strazicich (2003) are supportive of stochastic convergence. Contrary, Nelson and Plosser (1982), Campbell and Mankiw (1989), Cogley (1990), Bernard and Durlauf (1995), Cunado et al. (2003) and Beliu and Higgins (2004) do not find evidence of convergence. However, when structural breaks are taken in to account, the evidence of stochastic convergence is reinforced.

More recently, new testing procedures for the convergence hypothesis using panel data have been developed, see e.g. Evans and Karras (1996), Evans (1998), Kutan and Yigit (2005), Guetat and Serranito (2007), Lopez and Papell (2012), Borsi and Metiu (2013).

3 Methodological Issues

The Stochastic Convergence

The hypothesis that relative incomes are converging stochastically, can be examined by testing for a unit root in the logarithm of the ratio of per capita income in country i relative to the group average or to the leader. Rejection of the unit root null hypothesis is taken as evidence of convergence. Stochastic convergence can be evaluated by the use of several versions of unit root tests such as the conventional Dickey-Fuller (ADF) unit root tests, the DF-GLS, the Philips Perron, and the KPSS stationarity test. If no regressors are included in the procedure for testing the unit root hypothesis, stochastic convergence is consistent with the notion of "absolute" or "unconditional" convergence. In contrast, if a constant term is included in each test stochastic convergence is consistent with conditional convergence and country specific compensating differentials.

Perron (1989) pointed out that these tests perform poorly when there is a break in the constant or deterministic trend function and proposes to allow for one known, or

exogenous structural break in the augmented Dickey-Fuller (ADF) unit root test. However, Perron's method has been criticized on the grounds that the break point is chosen exogenously. Other authors, as Christiano (1992) Perron and Vogelsang (1992) or Zivot and Andrews (1992)[1], have developed methods to endogenously determine the break point from the data and have demonstrated that their test are robust and more powerful than the augmented Dickey and Fuller (1979) and Phillips and Perron (1988) tests. More specifically, the Zivot-Andrews test selects the breakpoint where the t-statistic, used to the unit root null hypothesis, is minimized (i.e. the most negative). However, these last procedures have also been criticized in the literature, since this type of tests derive their critical values assuming no breaks under the null, and thus, in the presence of a break, they tend to reject the null hypothesis suggesting that the time series is stationary around a break when it is non stationary with a break. Nunes et al. (1997) show that this assumption leads to size distortions in the presence of a unit root with break and Lee and Strazicich (2001, 2003) further investigate this issue and discover the source of the size distortions.

The break minimum LM unit root can be described as follows. According to the LM principle, a unit root test statistic can be obtained from the following regression:

$$\Delta yt = \delta' \Delta Z_t + \gamma \widetilde{S}_{t-1} + \sum_1^\kappa \gamma_i \Delta \widetilde{S}_{t-1} + \varepsilon_t \qquad (4)$$

where, $\widetilde{S}_t = y_t - Z_t \hat{\delta} - \hat{\Psi}_x$ as $t = 2, 3, \ldots, T$. The estimator $\hat{\delta}$ is the vector of coefficients obtained from the regression of Δy_t on ΔZ_t, $\hat{\Psi}_x = y_t - Z_t \delta$ The augmented terms $\Delta \widetilde{S}_{t-1}$, $i = 1, 2, \ldots, \kappa$, included in Eq. (4) provide the correction of autocorrelation. When $Z_t = [1, t]$, we have the statistic proposed in Schmidt and Phillips (1992). If we want to account for some structural breaks, we can extend the models A (which allows for a one-time change in level) and C (which allows for a change in both the level and trend) considered by Perron (1989) and define Z_t in the following ways: $Z_t = [1, t, D_{1t}, D_{2t}]$ for model A and $Z_t = [1, t, D_{1t}, D_{2t}, DT_{1t}, DT_{2t}]$ for model C, where D_{jt}, $j = 1, 2$ and DT_{jt}, $j = 1, 2$ denote dummies for level j and trend j, respectively, $D_{jt} = 1$ for $t \geq T_{Bj} + 1$ and zero otherwise, $DT_{jt} = t$ for $t \geq T_{Bj} + 1$ and zero otherwise, and T_{Bj} are the date of the breaks. The null of unit root hypothesis is $H_0 : \gamma = 0$.

If the LM test statistic indicates stationarity, then this result would be a statistical confirmation of the convergence hypothesis of the examined country with the benchmark.

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[1] Lumsdaine and Papell (1997) extended the Zivot and Andrews (1992) model to accommodate two structural breaks.

A Test of β-Convergence

Carlino and Mills (1993), estimate the intercept and trend coefficients for the relative income series in countries for which there is evidence of stochastic convergence. Opposite signs of the intercept and slope coefficients, indicate that countries, whose relative per capita income is initially below the group average, are trending (converging) up towards the average and vice versa. Tomljanovich and Vogelsang (2002) use the following regression for relative income:

$$RI_{it} = \mu + \beta t + u_{it} \tag{5}$$

where, RI_{it} is the log of relative per capita GDP in country i at time t, that is regressed on a constant and a linear time trend, and u_{it} follows a stationary process, β represents the average growth of RI_{it} over time and μ represents the initial level of RI_i^e.

   Given that we identify up to two structural breaks in level and trend in our unit root tests for several countries, we proceed by using this information in our time series tests for β-convergence. Following Tomljanovich and Vogelsang (2002) and Nieswiadomy and Strazicich (2004), to test for conditional convergence, we perform OLS regressions on the log relative per capita GDP series, for each of these time series, as follows:

$$RI = \mu_1 D_1 + \mu_2 D_2 + \mu_3 D_3 + \beta_1 T_1 + \beta_2 T_2 + \beta_3 T_3 + \varepsilon_t \tag{6}$$

where, D_1, D_2 and D_3 are intercept dummy variables and T_1, T_2 and T_3 are linear time trends. The coefficients μ_1, μ_2 and μ_3 denote whether the level of per capita real GDP in the country is above (+) or below (−) the leader's one prior to the first break, following the first break, and following the second break, respectively and β_1, β_2 and β_3 denote the growth rate of relative per capita real GDP over the same time periods, respectively. If we are interested in the most recent time period to determine if incomes are converging, we will compare the signs of the estimated coefficients μ_3 and β_3. If the real per capita GDP in country i is converging to the leader's per capita GDP, then μ_3 and β_3 will be of opposite signs. For countries with only one significant break, Eq. (6) would be estimated without D_3 and T_3 terms, and convergence imply opposite signs on μ_2 and β_2. For countries with no significant breaks, Eq. (6) would be estimated with only D_1 and T_1 and convergence would imply opposite μ_1 and β_1.

4 Data and Empirical Results

Data sources from the Pen World Table 7.1 of Summers et al. (2012), concerns the annual real per capita GDP in log form for the EU-15 and covers the period from 1950 to 2010. As convergence measure, we define the differentials of each of the log real per capita GDP series with that of Netherlands.

Stochastic Convergence

The results from the augmented Dickey-Fuller (ADF) and the ADF-GLS tests with only an intercept and with an intercept and a linear trend are reported in Table 1. We are unable to reject the unit root hypothesis in favor of conditional convergence towards the Netherlands for any of the countries under consideration.

We next proceeded to the Phillips-Perron test and the KPSS stationarity test. The results for the relative real per capita GDP series for each country with intercept and with intercept and trend are shown in Table 2.

Based on the Philips-Perron test without trend, we are able to reject the null of a unit root for Italy and Spain. Furthermore, applying the KPSS stationarity test without trend, we find evidence of stochastic convergence for Germany and the UK. When we include an intercept and a time trend in the model, we are able to reject the unit root null hypothesis in favor of the trend stationary alternative for Finland and Sweden. Summing up, based on the above tests, we find evidence of catch-up with Netherlands for 6 out of 14 European countries: Italy, Spain, Germany, the UK, Finland and Sweden.

However, it is well known that conventional unit root tests often fail to reject the unit root null hypothesis when there is a break in the intercept or in the trend function under the stationarity alternative hypothesis (Perron 1989, 1997; Banerjee et al. 1992; Zivot and Andrews 1992 and Vogelsang and Perron 1998). The lack of evidence of convergence could be due to the existence of different convergence speeds in the convergence process or the case in which countries pass through convergence to non convergence processes (or vice versa) (Cunado et al. 2006).

We next proceed to the Zivot-Andrews unit root tests that allow for one break. For each country, the statistics and the implied estimated break year are reported in Table 3. The results provide evidence of stationarity for 3 (Belgium, Finland and Spain) out of 14 countries when a break in the intercept is allowed. Moreover, when we apply unit root tests with break in intercept and trend we find evidence of stationarity for 6 out of the 14 examined relative incomes. Specifically, for Belgium, Finland, France, Portugal, Spain and the UK, the unit root null hypothesis is rejected in favor of the alternative that is interpreted as evidence of stochastic convergence.

Table 1 ADF and ADF-GLS unit root tests for the relative per capita GDP, 1950–2010

| Country | ADF | | | | ADF – GLS | | | |
| | Intercept | | Intercept & trend | | Intercept | | Intercept & trend | |
	k	Test statistic	k	Test statistic	k	Test statistic	k	Test statistic
Austria	0	−1.9366	0	−1.5140	0	.52159	0	−.98023
		(−2.9594)		(−3.5052)		(−2.3052)		(−3.0306)
Belgium	0	−.69485	0	−2.5990	0	−.28215	0	−2.3707
		(−2.9594)		(−3.5052)		(−2.3052)		(−3.0306)
Denmark	1	−2.1563	1	−2.4920	1	−2.0140	1	−2.5783
		(−2.9244)		(−3.5535)		(−2.3184)		(−3.0722)
Finland	1	−1.3097	1	−2.9184	1	−.53945	1	−3.0298
		(−2.9244)		(−3.5535)		(−2.3184)		(−3.0722)
France	2	−1.2617	2	−.21468	2	−.44162	2	−.43630
		(−2.9229)		(−3.5120)		(−2.2527)		(−3.0289)
Germany	1	−1.3216	1	−1.2782	1	−1.0222	1	−1.1819
		(−2.8607)		(−3.6589)		(−2.2759)		(−3.3715)
Greece	0	−2.2637	0	−1.3822	0	−.34399	0	−1.0015
		(−2.9846)		(−3.4601)		(−2.2596)		(−3.0887)
Ireland	1	−.55049	1	−2.6228	1	−.43071	1	−1.7870
		(−2.9244)		(−3.5535)		(−2.3184)		(−3.0722)
Italy	1	−1.6875	0	.0064123	1	−.32183	0	.049589
		(−2.9244)		(−3.5052)		(−2.3184)		(−3.0306)
Luxembourg	1	−.13123	0	−2.6153	1	−.26649	0	−1.0643
		(−2.9244)		(−3.5052)		(−2.3184)		(−3.0306)
Portugal	2	−1.4572	2	−.70389	2	.20853	2	−1.0627
		(−2.9229)		(−3.5120)		(−2.2527)		(−3.0289)
Spain	2	−2.3470	2	−.54392	2	.57509	2	−.23492
		(−2.9229)		(−3.5120)		(−2.2527)		(−3.0289)
Sweden	1	−2.3068	1	−2.1885	1	−1.5200	1	−2.5453
		(−2.9244)		(−3.5535)		(−2.3184)		(−3.0722)
UK	1	−1.8849	1	−2.6516	1	−1.5357	1	−1.7743
		(−2.9244)		(−3.5535)		(−2.3184)		(−3.0722)

Notes: The dependent variable is the logarithm of the ratio of per capita real GDP of country i relative to the Netherlands. The lag length k is chosen using AIC test. Numbers in the parentheses under the test statistic are the respective simulated critical values computed for unit rot tests by bootstrapping. The t-test is used for the null of a unit root. Rejection of the null hypothesis supports stochastic convergence

Table 2 Phillips-Perron and KPSS tests for the relative per capita GDP, 1950–2010

Country	Phillips-Perron		Kpss	
	Intercept	Intercept & trend	Intercept	Intercept & trend
	Test statistic	Test statistic	Test statistic	Test statistic
Austria	−2.7836	−2.1026	1.3913	0.32898
Belgium	−1.2199	−2.0567	1.3489	0.20908
Denmark	−2.0105	−2.0842	0.76615	0.16159
Finland	−1.9929	−2.7872	1.2523	0.12785*
France	−2.3968	−1.3246	0.87588	0.36102
Germany	−1.6163	−1.4180	0.33559*	0.32630
Greece	−1.9569	−1.1697	0.94715	0.33669
Ireland	−0.41923	−1.9613	1.2402	0.31794
Italy	−2.9417*	−1.0962	1.1733	0.33916
Luxembourg	−0.079159	−2.0019	1.0876	0.35585
Portugal	−2.1276	−1.2725	1.4921	0.31525
Spain	−3.5051*	−2.3899	1.3571	0.34415
Sweden	−1.4800	−2.1646	1.2529	0.098275*
UK	−1.2971	−1.5135	0.42361*	0.33364

*Indicates rejection of the unit root null hypothesis. Critical values for all the countries except Germany and Greece, for the model without trend is −2.9284 and for the model with trend is −3.3911. The values for Germany are −2.9607 and −3.4523 and for Greece −2.9255 and −3.4621

Table 3 Zivot and Andrews tests for the relative per capita GDP, 1950–2010

Country	Break in intercept			Break in both intercept & trend		
	k	t- statistics	Break year	k	t- statistics	Break year
Austria	0	−3.24229	1994	0	−4.25016	1979
Belgium	2	−5.83119[a]	1996	2	−6.15611[a]	1996
Denmark	2	−3.27442	1961	2	−4.26860	1982
Finland	1	−5.15823[a]	1991	2	−5.15217[b]	1991
France	2	−2.20802	1993	1	−6.41380[a]	1981
Germany	0	−3.46130	1996	0	−3.23663	1979
Greece	0	−3.13516	1963	0	−3.61275	1969
Ireland	2	−4.50289	1995	2	−2.77089	1983 ns
Italy	0	−2.19761	1996	0	−3.95203	1980
Luxembourg	2	−4.11079	1986	2	−3.22700	1975
Portugal	1	−3.11543	2002	1	−4.89001[c]	1990
Spain	0	−5.84360[a]	1961	0	−5.51598[b]	1961
Sweden	1	−3.16705	2002	1	−3.41121	1992
UK	2	−3.64645	1962	1	−4.94871[c]	1981

Notes: Critical values for the model with a break in intercept are: −5.34, −4.8 and −4.58 for the 1 %, 5 % and 10 % level of significance respectively. Critical values for the model with a break in both intercept and trend are: −5.57, −5.08 and −4.82 for the 1 %, 5 % and 10 % levels, respectively. [a], [b], and [c] denotes significance at the 1%, 5% and 10% levels, respectively

Table 4 LM unit root tests for the relative per capita GDP, 1950–2010

Country	No breaks Schmidt-Phillips test		Model A (one break)			Model C (one break)		
	k	t- statistics	k	t- statistics	Break year	k	t-statistics	Break year
Austria	3	−1.7334	3	−2.0337	1965	3	−3.6719	1992
Belgium	0	−1.5192	1	−1.9679	1975	2	−3.9184	1980
Denmark	1	−2.3158	1	−2.5368	1978	3	−4.6313[a]	1982
Finland	1	−2.7483	1	−3.0502	1989	1	−3.0391	1991
France	1	−1.2126	1	−1.3243	1965	1	−4.8034[a]	1990
Germany	1	−1.3073	3	−1.7722	1980	1	−2.3989	1994
Greece	3	−1.7275	3	−1.8794	1975	3	−2.4238	1988
Ireland	1	−1.4780	1	−1.5907	1989	3	−3.7968	1993
Italy	1	−0.8566	1	−1.0164	1975	1	−3.0611	1992
Luxembourg	1	−1.0479	3	−1.3465	1974	1	−3.7181	1983
Portugal	1	−1.8793	1	−2.2210	1967	1	−4.7415[a]	1988
Spain	1	−0.7103	3	−1.1736	1963	3	−4.2791[b]	1969
Sweden	1	−2.0988	3	−2.6364	1962	3	−3.0524	1962
UK	1	−1.6292	1	−1.7994	1961	1	−3.9373	1980

Notes: Critical values for the SP test: −4.545, −3.842 and −3.504 for the 1 %, 5 % and 10 % levels, respectively. Critical values for one break in the Model A: −4.239, −3.566 and −3.211 for the 1 %, 5 % and 10 % levels, respectively. Critical values for one break in the Model C: −5.11, 4.51 and −4.21 for the 1 %, 5 % and 10 % levels, respectively. [a] and [b] denotes significance at the 5 % and 10 % levels

The results for the relative real per capita GDP series for each country using the Schmidt-Phillips without break (SP) test, the Model A and the Model C[2] with one break are shown in Table 4. Based on the results of the SP test and the LM test of Lee and Strazicich with a break in the intercept (Model A), we are unable to reject the unit root null hypothesis for any of the countries. However, after allowing for a simultaneous break in the intercept and slope of the trend function, we are able to reject the unit root null hypothesis in favor of the trend-stationary alternative for 4 out of 14 countries (Denmark, France, Portugal and Spain).

In comparison with the Zivot-Andrews test, the Lee-Strazicich test provides less evidence of stochastic convergence as it fails to reject the unit root null hypothesis for any country when one break in the intercept is allowed. Similarly, when a simultaneous break in the intercept and the trend is considered, we find evidence of stochastic convergence for the following countries: Denmark, France, Portugal and Spain.

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[2] Perron considered three break models as follows: The "crash" Model A allows for a one-time change in level; the "changing growth" Model B considers a sudden change in slope of the trend function; and Model C allows for change in level and trend. Model B is omitted from this study, as it is commonly held that most economies time series can be described adequately by Model A or C (Lee and Strazicich 1999).

Table 5 LM unit root tests for the relative per capita GDP, 1950–2010

Country	Model A (two breaks)			Model C (two breaks)		
	k	t- statistics	Break year	k	t-statistics	Break year
Austria	3	−2.2931	1965, 1977	3	−4.7770	1965, 1982
Belgium	1	−2.1645	1961, 1975	3	−5.4869[a]	1970, 1994
Denmark	1	−2.6560	1968, 1981	3	−5.7690[a]	1961, 1981
Finland	3	−4.4242[a]	1978, 1990	3	−5.1194[b]	1978, 1991
France	1	−1.4486	1965, 1992	1	−5.5483[a]	1979, 1992
Germany	3	−1.9108	1980, 1992	1	−4.5051	1979, 1995
Greece	3	−1.9922	1964, 1976	0	−3.6270	1972, 2001
Ireland	3	−2.1665	1963, 1988	1	−4.4922	1990, 2000
Italy	1	−1.1465	1962, 1975	3	−5.4825[a]	1963, 1985
Luxembourg	3	−1.4192	1974, 1992	3	−5.3648[a]	1975, 1987
Portugal	1	−2.5283	1967, 1975	1	−6.2323[c]	1969, 1997
Spain	3	−1.2466	1963, 1978	3	−5.0032[c]	1968, 1985
Sweden	3	−2.8711	1962, 1977	3	−3.6180	1977, 1994
UK	1	−1.9758	1961, 1981	1	−4.8711	1966, 1982

Notes: Critical values for the Model A with two breaks are: −4.545, −3.842 and −3.504 for the 1 %, 5 % and 10 % levels, respectively. Critical values for the Model C with two breaks are: −5.825, −5.286 and −4.989 for the 1 %, 5 % and 10 % levels, respectively. [a], [b], and [c]denotes significance at the 1 %, 5 % and 10 % levels, respectively

We next consider the LM unit root tests with two breaks of Lee and Strazicich. The t-statistics with the estimated break years are reported in Table 5. Accounting for two breaks only in the intercept, we are able to reject the unit root null hypothesis only for Finland. On the contrary, when two breaks are allowed in both the intercept and the trend we find stronger evidence of convergence and more specifically, 8 out of 14 countries are found to converge stochastically towards the Netherlands. The results, compared to those of the unit root test with one break, provide evidence in favour of stochastic convergence for two additional countries, Italy and Luxembourg. Thus, all the applied tests together are able to provide evidence of stochastic convergence in 11 out of 14 countries. We can't reject the unit root null hypothesis in favour of stochastic convergence at the 10 % significance level only for Austria, Greece, and Ireland.

Testing for β-Convergence

According to Carlino and Mills (1993), in a given period to be considered "converging", a country's relative income series must: first reject the null hypothesis of a unit root and second, to have statistically significant intercept and trend coefficients of opposite signs.

Our testing methodology can be described as follows: After performing unit root tests on the log of relative series as described above, we identify those countries that

reject the unit root null hypothesis (at least at the 10 % level of significance). In our study, all the applied tests failed to reject the unit root null hypothesis for Austria, Greece and Ireland and therefore, these countries could be considered as diverging. For all the other countries, we found evidence of stationarity around one or two breaks in the mean and the trend.

As previously noted, the LM tests with one or two breaks of Lee and Strazicich present some more appropriate statistical properties over other unit root tests. More specifically, the LM test yields unbiased results by the assumption of endogenously determined breaks in the null hypothesis of unit root tests. For these reasons, our testing for β-convergence is based on these LM unit root results. In particular, applying the LM tests with one or two breaks in the intercept and the slope, we found evidence of stochastic convergence for 8 out of 11 countries. Actually, we failed to reject the unit root null hypothesis for Germany, Sweden and the UK. Thus, for Germany and Sweden we use complementarily the results obtained from the KPSS stationarity test without trend and with trend, respectively. For the UK, the break point detected by the one break test of Zivot and Andrews is taken into account.

For the rest of the countries, given that we identify one or two significant structural breaks in level and trend in our LM unit root tests, we wish to use this information in our time series tests for β-convergence. Thus, to test for β-convergence, we perform Ordinary Least Squares regressions as in Eq. (6), on the log relative income series for each country (except Austria, Greece and Ireland which are not found stochastically converging). For countries with only one significant break, the above equation would be estimated without the D_3 and T_3 terms. For countries with no significant breaks, equation would be estimated with only D_1 and T_1 and convergence would imply opposite signs on μ_1 and β_1.

We next examine the results of testing the time series notion of β-convergence as displayed in Table 6, which summarizes the results of Tables 1, 2, 3, 4, and 5. Following the notation of Tomljanovich and Vogelsang (2002), C denotes catch-up (coefficients that are consistent with β-convergence condition, that is μ and β of opposite sign, both significant at least at the 10 % level), c denotes catch-up (with μ and β consistent with β-convergence condition but with only one coefficient statistically significant at 10 %), D and d denotes divergence (coefficients of the same sign), where D signifies both coefficients are significant and d signifies one coefficient is statistically significant.[3] Finally, U indicates that we failed to reject the unit root hypothesis implying that the divergence could not be rejected, that is the case of Austria, Greece and Ireland.

An important result appearing in Table 6 is that μ_1 are negative and statistically different from zero for all countries for which the unit root null hypothesis was

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[3] According to Dawson and Sen (2007) two coefficients insignificantly different from zero indicate absolute convergence. Also, an intercept significantly different from zero with a trend that is not, implies steady state.

Table 6 Summary of time series test results for convergence, 1950–2010

Country		Intercept			Slope			Conclusion		
Austria	No stochastic convergence							U		
Greece	No stochastic convergence							U		
Ireland	No stochastic convergence							U		
Germany	No break	μ_1 = −.11525*			β_1 = .4846E-3			Steady state		
Sweden	No break	.11812*			−.0043798*			C		
	Break Year	μ_1	μ_2	μ_3	β_1	β_2	β_3	Pre-break	Post-break	Post-break
Denmark	1982	−.16273*	.015568		.0023582*	−.0039118*		C	c	
France	1990	−.33578*	−.085497*		.0074756*	−.0059324*		C	D	
Portugal	1988	−1.3106*	−.56313*		.017325*	−.0028721**		C	D	
Spain	1969	−.95098*	−.42704*		.025520*	.0041283*		C	C	
U.K.	1981	−.069046*	−.23288*		−.010344**	.0052466*		D	C	
Belgium	1970, 1994	−.23618*	−.18803*	−.090751*	−.7297E-4	.0066499*	.6953E-3	d	C	c
Finland	1978, 1991	−.44951*	−.21356*	−.29295*	.0051135*	.0099510*	.010394*	C	C	C

(continued)

Table 6 (continued)

Country								Conclusion		
Italy	1963, 1985	−.64885*	−.40313*	−.060814*	.021672*	.011480*	−.0084095*	C	C	D
Luxembourg	1975, 1987	.37158*	.063576*	.46222*	−.0084420*	.022907*	.011431*	C	D	D

Notes:

μ_1, μ_2, μ_3 and β_1, β_2 and β_3 are the estimated coefficients of Eq. (6): $RI = \mu_1 D_1 + \mu_2 D_2 + \mu_3 D_3 + \beta_1 T_1 + \beta_2 T_2 + \beta_3 T_3 + e_t$

μ_1, μ_2 and μ_3 denote whether the level of per capita real GDP in the country is above (+) or below (−) the leader's one prior to the first break, following the first break, and following the second break, respectively. β_1, β_2 and β_3 denote the growth rate of relative per capita real GDP over the same time periods, respectively

C: denotes opposite signs on the intercept and the trend coefficients, with both being statistically significant at the 10 % level

c: denotes opposite signs on the intercept and the trend coefficients, with only one coefficient significant at the 10 % level

D: denotes point estimates consistent with divergence, with intercept and trend coefficients both significant at the 10 % level

d: denotes point estimates consistent with divergence, with only one coefficient significant at the 10 % level

U: indicates that the null hypothesis of a unit root (with or without breaks) could not be rejected, implying that divergence could not be rejected

*Significant at 1 %

**Significant at 10 %

rejected (except Luxembourg), meaning that, in 1950 the real per capita GDP of all the countries were below the Netherlands.

As noted above, for countries with no significant breaks (Germany and Sweden) Eq. (6) is estimated with only D_1 and T_1. Furthermore, Dawson and Sen (2007) note that if the only rejection of the unit root null hypothesis occurs in the unit root test without trend as it is the case of Germany, the implication is a zero trend and thus, that the country has already reached its steady state. Regarding Sweden, the results of the OLS regression of the relative GDP on an intercept and a trend give evidence of a strong catch-up process towards the Netherlands.

For countries with one break, a comparison of μ_1 (the pre-break intercept) with the β_1 (the pre-break trend) from Table 6 is required to determine convergence in the pre-break period. Similarly, a comparison of μ_2 (the post-break intercept) with the β_2 (the post-break trend) is required to determine convergence in the post-break period. Finally, when two breaks are found to be significant, comparison of μ_3 with the β_3 is also required to determine convergence in the second break post period.

According to the results appearing in Table 6, we find strong evidence of a catch-up process in the pre-break period towards the Netherlands for all countries except Belgium and the UK. More specifically, the relative performance of Belgium is characterized by a first period of slow divergence (as the estimated coefficients are of the same sign, with the estimate on β_1 being statistically significant), a second episode of rapid convergence, and a third period of deceleration of this catch-up process. In addition, for the UK there is evidence of rapid divergence in the pre-break period and a strong evidence of a catch-up process in the post-break period. It is interesting to point out that Spain and Finland are the only countries for which there is strong evidence of a catch-up process towards the Netherlands in the pre-break-period as well as after the break(s), while in Denmark a period of rapid catch-up process is followed by a period of weak convergence. It is worthwhile to note that, in France, Portugal and Italy the break point occurs in late eighties, and the relative performance of these three countries is characterized by a pre-break period of strong catch-up process towards the Netherlands, and a strong divergence in the years after 1985.

Overall, our results of β-convergence indicate that there is strong evidence that real per capita income levels of the EU-15 have been converging towards the Netherlands since the beginning of the period 1950–2010. However, mainly after 1985, the economies show different behaviors. While Sweden, Denmark, Spain, Belgium and Finland have diminished per capita differences with the Netherlands, this is not the case for France, Portugal and Italy, for which the output gap from the Netherlands seems to be widening. Indeed, a closer look at the relative income series of these countries in Figs. 1, 2, and 3 indicates that such a behavior is confirmed in the period after the break points.

Of particular interest is the relative performance of Luxembourg which is characterized by one episode of rapid convergence and two episodes of strong divergence after a break around 1975 and 1987. If we take a closer look at convergence in Luxembourg, estimates for the intercept and trend coefficients being both positive, do not meet the criteria for convergence by strict application

Fig. 1 Log real per capita
GDP of France and
Netherlands, 1950–2010
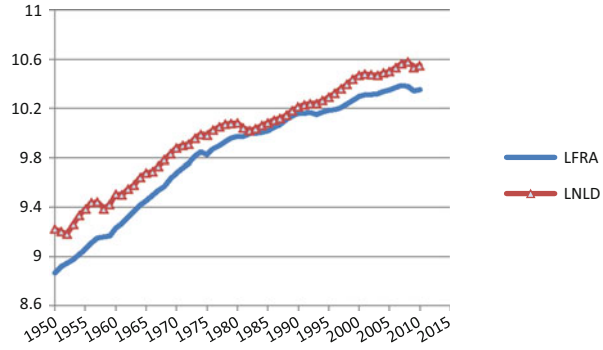
Fig. 2 Log real per capita
GDP of Portugal and
Netherlands, 1950–2010
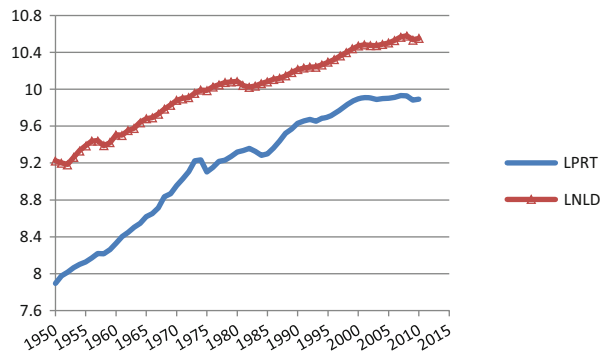
Fig. 3 Log real per capita
GDP of Italy and
Netherlands, 1950–2010
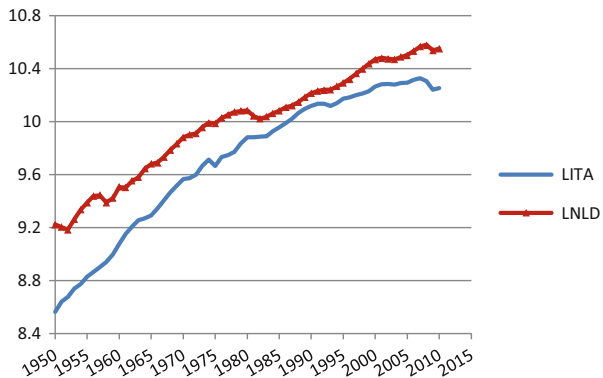
of the opposite-signs condition suggested by Carlino and Mills. However, Dawson
and Sen (2007) note that this test, strictly speaking, is a test for absolute conver-
gence and a finding of intercept and trend coefficients of the same sign does not
necessary rule out the possibility of conditional convergence. Such a finding is
consistent with a shock which leaves the country initially below its positive steady
state differential, but conditionally converging towards the differential. Visual

Fig. 4 Relative per capita GDP in Luxembourg, 1950–2010
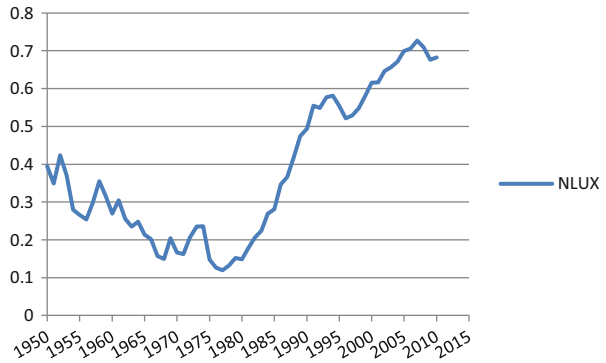
inspection of the relative income series in Fig. 4 indicates that just such a shock might have occurred in this country after the break points. Since then, the country has outperformed the real per capita GDP of Netherlands as it is indicated by μ_2 and μ_3 both of positive sign.

Conclusions

This paper examines the catch-up process of the EU-14 towards the Netherlands by means of two types of times series tests over the period 1950–2010. In a first step, the relative income series are examined for stationarity using the DF-type Unit Root tests, the Philips Perron unit root test and the KPSS stationarity test. The tests are applied to the relative real per capita GDP series of each country, measured as the log ratio of each individual country's real per capita GDP over the per capita real GDP of the Netherlands, which is considered as benchmark. Rejection of the unit root null hypothesis is evidence in favor of stochastic convergence towards the benchmark. Using these tests, we find evidence of stochastic convergence for 6 out of 14 countries (Italy, Spain, Germany, the UK, Finland and Sweden). Although these results are significant in their support for stochastic convergence, we wish to determine if more rejections of the null hypothesis are possible once structural breaks are allowed. Thus, we apply the Zivot-Andrews test that allows for one break, and we find evidence of stochastic convergence for Belgium, Finland, France, Spain, Sweden and the UK. To avoid problems of bias and spurious rejections, we then utilize the endogenous one or two break minimum Lagrange multiplier (LM) unit root tests and we find evidence of stochastic convergence for 8 countries out of 14 countries. All the applied tests failed to reject the unit root null hypothesis in favor of stochastic convergence for Austria, Greece and Ireland. Thus, relative per capita real GDP series are considered diverging in these countries. Based on Carlino and Mills methodology, we found strong evidence of a catch-up process until the mid-1980 towards the Netherlands for all countries except for the UK, although, after

(continued)

1985, it is clear that the economies show different behavior which is probably associated with differences in the growth process. While Sweden, Denmark, Spain, Belgium and Finland have diminished per capita differences with the Netherlands, this is not the case for France, Portugal and Italy, for which the output gap from the Netherlands seems to be widening.

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Empirical Analysis of the Shadow Economy of the South East European Countries

Luljeta Sadiku, Nimete Berisha, and Murat Sadiku

Abstract Shadow economy is related to the issue of non-reporting and/or underreporting of market transactions by economic agents. The prevalence of shadow economy can have serious impact on economic growth as well as on income distribution in a country. Findings in the literature about the size of shadow economy in SEE countries reveal relatively high levels of shadow economy. Therefore, the main purpose of this paper is to assess the size of shadow economy in the South East European countries by some new estimates covering the period from 2003 to 2011. The paper also investigates the response of the shadow economy to financial crisis. The Multiple Indicators Multiple Causes (MIMIC) estimation procedure is used in order to estimate the size of the shadow economy. The econometric results obtained show that the average size of shadow economy of SEE countries is at about 33 % of the official GDP. The last 3 years show a slightly increasing trend in the magnitude of shadow economy in most of the countries compared to the previous period. This trend highlights the fact that the financial crisis has negative implications on the shadow economic activities.

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1 Introduction

Shadow economies are an integral part of most countries in the world regardless of their respective level of development. However, in many developing countries, the shadow sector of economy is almost institutionalized. Thus, there is a qualitative difference between the shadow sector in the developed countries and the shadow sector of some of the least developed economies.[1]

Activities carried out in the shadow economy have serious economic, social and political implications. These include, among others, the following: lower tax revenue from economic activities, inadequate penetration and slower growth of the formal banking sector, uninformed economic planning based on incomplete information, distortion of labour market, lack of workers' protection against abuse and the perverse synergy of the shadow economy with other illegal activities. Furthermore, the existence of shadow economy might lead to inappropriate fiscal and monetary policies. In addition, failure to correctly measure and recognize the magnitude of the shadow economy may result in less efficient allocation of social welfare programs.

Paradoxically, despite the oft-cited negative effects of the shadow economy, there is yet no conclusive evidence on the sign of the relationship between the official and the unofficial economy. Some authors like Giles and Tedds (2002) for Canada, Chattopadhyay et al. (2003) for Asian countries find a positive relation between shadow economy and official GDP, while Kaufman and Kaliberda (1996) for Transition Countries, Loayza (1996) for Latin American countries, Dell'Anno et al. (2007) for three Mediterranean countries such as France, Spain and Greece find an inverse relationship between the official and the unofficial sectors of the economy. The indeterminate nature of the relationship is further highlighted by Schneider (2005) who finds contradictory evidence within the same study: a negative relationship for transition and developing countries and a positive relationship for developed countries.

Even though for more than 25 years researchers have been attempting to develop methods to estimate the size of shadow economy, there still exists a huge gap of knowledge about the ways to measure its exact dimensions, as well as to find consistent solutions for its formalization. Furthermore, the existing literature does not tell us much about the role of unofficial economy in economic development (La Porta and Shleifer 2008).

Measuring the size of the shadow economy is a very difficult and a challenging task due to lack of data. While there have been many multinational studies on shadow economy for developed and individual countries, a very few researchers

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[1] See Gerxhani (2004) for differences between developed and developing countries with respect to the shadow economy. See also, Schneider et al. (2010) about their recent evidence that the shadow economy's trend is decreasing in both developing and industrialized countries by 3 percentage points. However, this finding needs further corroboration to be generalized. See in the next section for a discussion of various concepts of shadow economy in comparison with other prevalent concepts.

have attempted to estimate the size of the shadow economy in the South East European (SEE) Countries. *Therefore, the main purpose of this paper is to assess the size of shadow economy in this area in which most of the countries are in transition, by some new estimates covering the period 2003–2011. The paper also investigates the response of the shadow economy to financial crisis.* To estimate the size of the shadow economy, we use the Multiple Indicators Multiple Causes (MIMIC) estimation procedure, which is a special specification of Structural Equation Modelling (SEM). This is a first attempt on measuring the size of the shadow economy for this set of countries.

Johnson, Kaufmann and Shleifer (1997) have estimated the shadow economy for transition countries and they have found that it varies from 7 % to 43 % in the period 1989–1993. More recently estimations have been provided by Schneider et al. (2010) for 162 countries, for the period 1999 to 2006/2007. According to this analysis the shadow economy has reached remarkable proportions, with a weighted average value of 17.2 % of official GDP over 162 countries for the sample period. The authors conclude that the weighted average size of the shadow economy in Sub-Saharan Africa is 38.7 %; in 21 Eastern European and Central Asian (mostly transition) countries is 36.5 % and in high – income OECD countries it is 13.5 %.[2] The authors find a negative trend in the size of the shadow economy, since the un-weighted average of 162 countries in 1999 was 34.0 % and in 2007 31 %.

The dimensions of the shadow economy seem to be leading to a conclusion that informal economy can be as important as formal economy and it should be considered a potential resource for *the economic growth* if governments attempt to reduce it.

The paper is structured in six sections. The first section illustrates some introductory points that characterize the shadow economy. The second section represents an overview on the definition of the shadow economy. In the third section characteristics and dimensions of the shadow economy in transition and SEE countries are discussed. In the fourth section, the empirical approach and data that are used for the empirical results are briefly explained. The fifth section explores the empirical findings by the MIMIC estimation procedure and the limitations of the study, while the last section presents the conclusions of the study.

2 Defining the Shadow Economy

No widely accepted definition of the shadow economy exists, as there is still no overall agreement on the terms used to describe it. Terms such as: underground, black, shadow, informal, unofficial, unrecorded, cash, hidden, grey, parallel, second, have been used in the professional literature to refer roughly to overlapping or

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[2] See Schneider et al. (2010).

the same phenomenon. Eilat and Zinnes (2000) have adopted the term "shadow", in the context of transition countries.

Different definitions have been employed by the researchers and economy theorists in order to capture different aspects of the shadow economy (SHE). *At an abstract level, shadow economy consists of all activities that are not taxed*. It is clear that defined as all activities that are not taxed, it includes not only illegal but also legal activities that are not reported, so that paying taxes can be avoided. In addition, shadow economy appears in the labour market in the form of unreported employees' payroll so that paying social security contributions can be avoided.

A definition provided by Tanzi (1980) says: "it is the part of gross national product that because of non-reporting and/or underreporting is not included in the official statistics". According to Schneider (1986), shadow economy is all economic activities that contribute to value added and should be included in national income in terms of national accounting conventions but are presently not registered by national measurement authorities. These definitions adopt a narrower view and consider shadow economy as simply unrecorded income. Whereas Feige (1990) defines the shadow economy as including those economic activities which go unreported or are unmeasured by the current techniques for monitoring economic activities. Thus, Feige's definition is broad and describes the shadow economy in terms of behavioural characteristics embracing those activities which are excluded from GDP as well as those which elude the measurement process.

Gerxhani (1999)[3] has classified various definitions of the shadow economy according to the domain and objectives of the study, emphasizing that: "it appears that no single definition of the underground economy could serve all these diverse domains (e.g., labor economics, sociology, finance, macroeconomics, statistics, criminology, etc.). Therefore, researchers gave up trying to formulate a unique definition, but instead, based on several criteria, they have attempted to define the informal sector in accordance with the problem at hand." Based on the literature review there are three main criteria that define the shadow economy: political, economic and social. From the economic perspective, the most relevant sub-criteria are:

- *Labour market*. The informal sector is the sum of all income-earning activities that do not involve contractual or legally regulated employment.
- *Tax evasion*. The informal sector comprises all income that is unreported in order to evade taxes.
- *Size of activity*. Under this criterion it is thought that the main feature of informal sector activities is the small scale of their operations.
- *Professional status*. Informal workers are defined as 'the sum of the self-employed, family workers and domestic servants'
- *Regulation or registration of the activity*. The informal sector refers to the activities of establishments that are unregistered and unlicensed.

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[3] See more Gerxhani (1999) 'The Informal Sector in Developed and Less Developed Countries: Literature Survay' Tinbergen Institute Discussion Paper, page 3.

- *National statistics*. This definition describes the informal economy as all activity which escapes from the official economic statistics, such as Gross Domestic Product (GDP), through accounting conventions, non-reporting or underreporting.

More specific definitions of the shadow economy are drawn on the OECD handbook (2002) in which the 'non-observed' economy is partitioned into five categories[4]:

- *Underground production*, 'defined as those activities that are productive and legal but are deliberately concealed from the public authorities to avoid payment of taxes or complying with regulations';
- *Illegal production*, 'defined as those productive activities that generate goods and services forbidden by law or that are unlawful when carried out by unauthorized producers';
- *Informal sector production*, 'defined as those productive activities conducted by unincorporated enterprises in the household sector that are unregistered and/or are less than a specified size in terms of employment, and that have some market production';
- *Production of households for own final use*, defined as those productive activities that result in goods or services consumed or capitalized by the households that produced them;
- *Production missed due to deficiencies in data collection* 'includes all productive activities that should be accounted for by the basic data collection program but are missed due to statistical deficiencies'.

Tedds (2005) points out that "whichever definition is used, it has become common practice to report the size of the underground economy as a percentage of GDP". This practice is simply a way of facilitating international and intertemporal comparisons by avoiding units of currency. The authors of these studies are not suggesting that reported GDP is mis-measured by this percentage amount. This is largely for two reasons: GDP is a value-added measure rather than a measure of total economic activity, whereas many measures of the hidden economy report total hidden activity that is not always measurable in terms of market value; and, depending on the definition employed, the measure of the underground economy usually includes both legal and illegal activities, the latter of which are often excluded in the definition of GDP"[5].

In this study the shadow economy is defined as the legal economic activities that are not included in national accounts (or measured GDP). This is a narrow definition of shadow economy since it is targeted only on the legal activities that are carried out in unofficial ways in order to evade or/and to avoid paying taxes.

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[4] For a comprehensive overview of each definition of these five categories see: Measuring the Non-Observed Economy – A Handbook, (2002). OECD.

[5] Tedds (2005), "The Underground economy in Canada", MPRA, page 3.

3 Characteristics and Dimensions of Shadow Economy in SEE Countries

The process of transition from a socialist to a market economy has been long and remains unfinished for many SEE countries.[6] Individuals and companies alike have to cope with the challenge of adjusting to a new economic, political, legal and social environment. As in many transition countries, a large shadow economy has grown alongside the formal sectors.

Joining the EU is a major stated objective of all SEE countries. For accelerating this process it has to show strong and sustainable GDP growth in addition to the other requirements that should be fulfilled. High unemployment rates and economic recessions are likely to force a large body of economic agents into the shadow economy. On the other side, the informal sector in the context of a transition economy is widely recognized to be a source of employment for a number of people who are adversely affected by the transition process and alleviates poverty. *For promoting sustainable economic growth, it is necessary to know the magnitude of the shadow economy and its proximate causes in order to be able to undertake adequate measures for reducing it.* While the tax system has been simplified for the most of SEE countries and the business registration has been improved, important challenges still remain.[7]

Table 1 presents the estimated results by Schneider et al. (2010) about the size and development of shadow economy over time, for the period 1999–2007. The average size of the shadow economy of these eight South East European countries was 32.8 % of official GDP in 1999 and increased to 35.3 % in 2006. The two countries with the smallest shadow economy compared to others are Greece and Slovenia with an average size over the period 1999 to 2006 of 28.9 %, and 28.0 %, respectively. Based on these estimations Bosnia & Herzegovina, FYROM, Romania and Albania are in the middle of the pack with 34.7 %, 36.2 %, 36.3 % and 36.3 %, respectively. The existence of the highest shadow economy is estimated to be in Bulgaria with an average of 38.5 % of official GDP for the period 1999–2007.

Different authors have reached different results related to the size of shadow economy as percentage of the GDP. As in the example of *Albania* it depends on the method used and the author. In 2002, INSTAT[8] estimated informal economy at 25 % of GDP while Schneider at about 35 %. Latest estimates are between 30 % and 60 %. *Bosnia and Herzegovina* is in a quite similar situation. In 2001, shadow economy was estimated at 21 % of GDP while 3 years later it was estimated 58 % of GDP. *Montenegro* also belongs to those SEE countries that have very high shadow economy. In Montenegro estimations set shadow economy at 27 % in 2001 but at 60 % in 2004. In *Bulgaria* estimations were between 16 % and 36 % in period

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[6] This sentence has been dedicated to countries such as: Albania, Bosnia & Herzegovina, FYROM, Republic of Kosovo, Montenegro, Serbia.

[7] See Transition Reports 2008.

[8] INSTAT is the state statistical office of Albania.

Table 1 The size of the shadow economy in SEE countries

Country	Shadow economy (in % of official GDP) using the DYMIMIC and currency demand method									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average
Albania	34.9	35.3	35.7	35.9	36.2	36.7	36.9	37.3	37.7	36.3
B&H	33.9	34.1	34.2	34.3	34.7	34.6	35	35.3	35.4	34.6
Bulgaria	36.5	36.9	37.2	37.7	38.3	39	39.7	40.4	41.2	38.5
Croatia	33	33.4	33.6	34.2	34.7	35.2	35.5	36	36.5	34.7
FYROM	34.9	35.7	34.8	35.1	35.5	36.4	36.9	37.7	38.8	36.2
Greece	27.7	27.4	28.7	30.1	30.5	29	29.3	28.8	-	28.9
Romania	34.6	34.4	35.1	35.4	36.1	37	37.3	38.3	38.95	36.3
Slovenia	26.9	27.1	27.5	27.6	27.8	28	28.4	28.9	28.1	28
Turkey	31.5	32.1	31.4	31.8	32.4	33.2	34.2	34.7	35.2	32.9

Source: Compiled from Schneider et al. (2010)

2000–2005 in different empirical researches. However, the Bulgarian government has stated that shadow economy has recently dropped to 25 %. Contrary to this, Schneider (2010), estimated the size of the shadow economy of Bulgaria at 41.2 point percentage in 2007. The estimations of shadow economy of *Croatia* also differ regarding the method used and the author. Generally, the size is between 23.5 % (average of the years 1990–1993), 32.4 % in 2001 and 34 % in 2005.[9] These high figures show that informality is a major concern for the SEE countries and needs some serious measures to be undertaken in order to reduce its extent.

4 Methodology and Data

The literature on shadow economy offers a great variety of methods for measuring this phenomenon.[10] None of the methods is perfect and all of them could be criticized for some weaknesses or the others. Also, the estimated size differs widely among them.[11] While there is no yet an overall agreement about the superiority of any particular method or approach, the use of a particular method depends on the availability of the data, the situations and the characteristics of the country under investigation.

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[9] This part draws heavily upon (SEE monitor 2006) Iceg Ec Corvinus.

[10] Comprehensive surveys of methods and empirical results are made by Schneider and Enste (2000) and Friedman and al. (2000).

[11] For instance, according to Feige's method, estimated size of the shadow economy of USA is 33 % of GDP for year 1979, and with Gutmann's (1977) method is 13 % of GDP for the same year. See more for a critical analysis of the different macro methods: Ph. Barthelemy (1988) "The Macroeconomic Estimates of Hidden Economy: A Critical Analysis".

In this paper, the MIMIC estimation procedure for estimating the size of the shadow economy is used and it considers multiple causes of shadow economy despite the monetary approach that considers only the tax burden as cause variable (Schneider et al. 2010). Although this approach seems to belong to the indirect methodology, it differs from other methods, since it is able to link the unobserved variables to observed indicators, using structural equations that model causal relationships among variables. It is based on the statistical theory that considers the shadow economy as a latent variable linked to a number of observable indicators, reflecting the changes in the size of shadow economy- to a set of observed cause variables that are the main determinants of the incentives of shadow economic activities. This approach was first used by Frey and Weck-Hannemann (1984).

The MIMIC model consists of two parts: the structural equation model and the measurement model. The following equation is the structural equation model where the shadow economy is specified as a latent variable in relationship with the causes variables. In this empirical research six causes variables, one latent variable and three indicators are considered:

$$\eta = \alpha + \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \xi \qquad (1)$$

Where η is the shadow economy index, X_q are causes variables and γ_q are coefficients that describe the relationship between the latent variable and its causes. Therefore, the shadow economy is linearly determined, subject to a disturbance, ξ, by a set of observable exogenous causes ($X_1, X_2, , X_6$) where X_1 is specified as the tax burden variable (tax revenues as share of GDP), X_2 is the unemployment rate, X_3 is business freedom index, X_4 is GDP per capita, X_5 is size of government (general government final consumption expenditure percent of GDP) and X_6 is the inflation rate.

The measurement model that links the indicators and the unobservable η is the following equations system:

$$Y_1 = \delta_1 + \lambda_1 \eta + \varepsilon_1 \qquad (2)$$
$$Y_2 = \delta_2 + \lambda_2 \eta + \varepsilon_2 \qquad (3)$$
$$Y_3 = \delta_3 + \lambda_3 \eta + \varepsilon_3 \qquad (4)$$

Where Y_p are indicator variables, λ_p are regression coefficients and ε_p are white noise disturbances; the latent variable η is linearly determined, subject to a disturbance ε by three observable endogenous indicators Y_1, Y_2, Y_3. Where Y_1 is real GDP index, Y_2 is labour force participation rate and Y_3 is Currency (M_0 over M_1).

Assuming that the errors are normally distributed and mutually uncorrelated with $(\xi) = \sigma_\xi^2$ and $cov(\varepsilon) = \Theta_\varepsilon$, the model can be solved as a function of observable variables by combining equations (1) with (2), (3) and (4).

$$Y_1 = \delta_1 + \lambda_1(\alpha + \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \xi) + \varepsilon_1 \quad (5)$$

$$Y_2 = \delta_2 + \lambda_2(\alpha + \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \xi) + \varepsilon_2 \quad (6)$$

$$Y_3 = \delta_3 + \lambda_3(\alpha + \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \xi) + \varepsilon_3 \quad (7)$$

Where $cov(\lambda\xi + \varepsilon) = E[\lambda\xi + \varepsilon)(\lambda\xi + \varepsilon)'] = \lambda\lambda'\sigma_\xi^2 + \Theta_\varepsilon$

Since the variables X_p and Y_q are observable variables, equations (5), (6) and (7) can be estimated by maximum likelihood estimation using restrictions implied in both, coefficients $\lambda\gamma$ and covariance, $\lambda\xi + \varepsilon$. Since the estimation of λ *and* γ is obtained by constraining one element of λ to some arbitrary value, it is useful to standardize the regression coefficients $\hat{\lambda}$ and $\hat{\gamma}$ as follows:

$$\hat{\lambda}^s = \hat{\lambda}\left(\frac{\hat{\sigma}_\eta}{\hat{\sigma}_{Yp}}\right) \quad and \quad \hat{\gamma}^s = \hat{\gamma}\left(\frac{\hat{\sigma}_{Xq}}{\hat{\sigma}_\eta}\right)$$

The standardized coefficients measure the expected change (in standard deviation units) of the dependent variable due to a one standard deviation change of the given explanatory variable, when the other variables are held constant.

Based on the estimation procedure of Schneider et al. (2010), the first step in the MIMIC model is to confirm the hypothesized relationship between the shadow economy (the latent variable) and its causes and indicators. Once the relationships are identified and parameters estimated, the MIMIC model results are used to calculate the MIMIC index. This estimation procedure provides only relative estimates of the size of the shadow economy. For this reason, a benchmarking procedure is required in order to calculate absolute values of the size of the shadow economy. These values are presented in the next section.

The Data

The data used in this empirical research consists of annual observations for the period 2003–2011. This cross-section study considers 8 SEE countries (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, FYROM, Romania, Slovenia and Turkey). The data are provided from five main sources from the World Bank database (WDI), United Nations statistical database, the countries' National Banks, National Statistical Offices and the Heritage Foundation.[12] By applying the Dickey –Fuller and Philip – Perron test, it is found that time series are non-stationary in their levels, but they are stationary in the first difference, for this reason they are considered at the first difference.

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[12] The data for some years and some variables are not available for the Republic of Kosovo, Montenegro and Serbia, for this reason they are excluded from the sample.

a. Cause variables

   Tax burden is considered to be the most important cause variable of the shadow economy (Schneider 2002, 2005). The hypothesis is that an increase of the tax burden increases the incentives to operate in the shadow economy, so the expected sign for this variable is positive. This variable consists of total taxes such as: direct taxes, indirect taxes and social security contributions as share of GDP.

   Unemployment rate and shadow economy are expected to be positively correlated, since an increase in unemployment may imply an increase of the informal labour sector. However, Tanzi (1999) points out that there are people who have both an official and unofficial job at the same time. So this variable may have a weak relationship with shadow economy (see also Dell'Anno (2006)).

   Business freedom following Schneider et al. (2010) is used as a variable to measure the intensity of regulation or the impact of regulation on the decision of whether to work or not in the informal economy. It is a subcomponent of the Heritage Foundation's economic freedom index that measures the time and efforts of a business activity. It ranges from 0 to 100, where 0 is least business freedom and 100 maximum business freedom. The expected sign of this variable is negative.

   GDP per capita: GDP per capita based on purchasing power parity (PPP) measured in constant prices of 2005 in international $. The hypothesis is that higher GDP per capita imply the lower shadow economy, so the expected sign for this variable is negative.

   Size of government: this variable consists of general government final consumption expenditures as percent of GDP. The hypothesis is that the higher the government expenditure the higher the shadow economy; positive sign expected. The logic is that the higher the government expenditures on compensation of employees and social securities the higher the shadow economy.

   Inflation rate: this variable consists of GDP deflator (annual rate in percent) which shows the rate of price changes in the economy. The expected sign of this variable is positive.

b. Indicator variables

   Real GDP index (2005 = 100): this variable is used as an indicator variable of the latent variable. Following Dell'Anno (2006) this variable is chosen as a variable of scale (or reference variable) despite Schneider (2010) that uses the currency variable as reference. The coefficient of λ_1 is fixed to a nonzero value. The choice of its value is restricted between two alternatives (+1 or −1), depending on which variable is used as scale variable. By a unitary base for normalization, the estimated coefficients are more easily comparable (Dell'Anno et al. 2007).

   Labour force participation rate: this variable is calculated as the ratio of the total active labour force and the population of working age (15–64 years old). A decline of this rate may reflect a movement of the workforce from official into unofficial economy (Giles 1998).

Currency: this variable is defined as M_0 over M_1. Where M_0 is currency in circulation and M_1 is M_0 plus deposits. The key assumption for this indicator variable is that transactions in the shadow economy are conducted in cash and increase in the size of the shadow economy increases the demand for cash (Tanzi 1983, 1999).

5   Empirical Findings

The econometric results of the MIMIC model are presented in Table 2. Coefficients of the model are estimated by the maximum likelihood function and the choice of the model is based on statistical significance of parameters. Namely, the insignificant variables were left out. Econometric results in Table 2 show that the coefficients on the causal and indicator variables have the expected signs, but only five cause variables were found to be statistically significant at 5% or 10 % level. In this case, the business freedom variable is not significant. Hence, one standard deviation increase in the tax burden, unemployment rate, size of government and inflation increases the size of the shadow economy by 0.34, 0.21, 0.017 and 0.32 standard deviations, respectively, whereas one standard deviation increase in GDP per capita decreases the shadow economy by 0.08 standard deviations, respectively. The joint influence of these six cause variables explains approximately 67 % of the variance of the shadow economy.

Regarding the indicators, the currency ratio M_0/M_1 is not statistically significant for this set of data and the period analysed, no matter if it has the expected positive sign. The labour force participation rate is statistically significant at 10 % level. An increase in the shadow economy reduces the labour force participation rate. Since the index of real GDP is considered as reference variable, in this case λ_1 is restricted to -1 that indicates an inverse relationship between the formal and shadow economy. We consider the MIMIC 5-1-2 as the best model for estimating the shadow economy for SEE countries.

Benchmarking Procedure and Estimation

The shadow economy as percentage of GDP will be calculated by converting the index of shadow economy estimated by the equation (1) of the structural model. It must be emphasized that the latent variable has the same scale as the reference variable. Following the two steps estimation procedure of Dell'Anno (2006), to maintain the proportional relationship between the indicator and the latent variable, the first difference is divided into the biannual official GDP by a base year which is the year that has the estimates of shadow economy for countries in our sample. The

Table 2 Estimated coefficients of the MIMIC

Models	Tax Burden	Unemployment rate	Business freedom	GDP per capita	Size of Government	Inflation rate	Labour force participation rate	Currency
6-1-3	0.29*	0.23	0.017	−0.079	0.015	0.30	−0.17	0.77
	(2.15)	(1.88)	(0.86)	(3.24)	(2.28)	(3.77)	(2.03)	(0.151)
5-1-2	0.34*	0.21*	—	0.083**	0.017*	0.32**	−0.16*	—
	(2.41)	(1.92)		(3.36)	(2.44)	(4.16)	(1.98)	

Models	Chi-square	(p-value)[a]	RMSEA	(p-value)[b]	Degrees of freedom[c]	Intercept		
Global Goodness of fit						(α)		
6-1-3	11.74	(0.137)	0.061	(0.552)	11	−0.76		
						(−0.99)		
5-1-2	9.36	(0.129)	0.089	(0.429)	7	−0.81		
						(−0.99)		

Note: Absolute z-statistics in parentheses

** and * denote significance level at 5 % and 10 % significance levels, respectively. All variables are used as their standardized deviations from the mean

[a] If the structural equation model is correct and the population parameters are known, then the sample covariance matrix will equal Σ (θ), therefore the perfect fitting correspond to p-value = 1

[b] P-value for test of close fit (RMSEA < 0.05)

[c] The degrees of freedom are determined by $0.5(p+q)(p+q+1)+m-t$, where "p" is the number of indicators, "q" the number of causes, the number of means and intercepts, and "t" is the number of free parameters

index of changes of the shadow economy in SEE countries as percentage of GDP in 2005 is linked to the index of changes of real GDP as follows[13]:

$$\text{Measurement equation}: \quad \frac{GDP_t - GDP_{t-1}}{GDP_{2005}} = -\frac{\widetilde{\eta}_t - \widetilde{\eta}_{t-1}}{GDP_{2005}} \quad (8)$$

The estimates of the structural model are used to obtain an ordinal time series index for the latent variable

Structural equation:

$$\frac{\widetilde{\eta}_t}{GDP_{2005}} = 0.34\Delta X_{1t} + 0.21\Delta X_{2t} + 0.083\Delta X_{4t} + 0.17\Delta X_{5t} + 0.32\Delta X_{6t} \quad (9)$$

The index is scaled to take up the values of shadow economy in 2005 and further transformed from changes respect to the GDP in 2005 to the shadow economy as ratio of current GDP.

$$\frac{\widetilde{\eta}_t}{GDP_{2005}} \frac{\eta^*_{2005}}{GDP_{2005}} \frac{GDP_{2005}}{\widetilde{\eta}_{2005}} \frac{GDP_{2005}}{GDP_t} = \frac{\hat{\eta}_t}{GDP_t} \quad (10)$$

This equation can be simplified to:

$$\frac{\widetilde{\eta}_t}{\widetilde{\eta}_{2005}} \frac{\eta^*_{2005}}{GDP_t} = \frac{\hat{\eta}_t}{GDP_t} \quad (11)$$

Where $\frac{\widetilde{\eta}_t}{GDP_{2005}}$ is calculated by equation (9); $\frac{\eta^*_{2005}}{GDP_{2005}}$ is the exogenous estimate of shadow economy; $\frac{\widetilde{\eta}_{2005}}{GDP_{2005}}$ is the value of index estimated by equation (9); $\frac{GDP_{2005}}{GDP_t}$ is to convert the index of changes respect to base year in shadow economy respect to current GDP; $\frac{\hat{\eta}_t}{GDP_t}$ is the estimated shadow economy as a percentage of official GDP.

In Table 3 below is presented the estimated size of shadow economy of eight South East European countries for the period 2003–2011.

The size of the shadow economy differs across countries. The average size of shadow economy of these eight South East European countries is at about 33 %. Based on these results, the countries with the highest shadow economy are Bosnia & Herzegovina, Albania and FYROM with 36.4 %, 36.1 % and 34.5 % of official GDP, respectively, while Bulgaria and Croatia are in the middle of the pack with 33.08 % and 33.07 % respectively. The three countries with the smallest shadow economy are Slovenia, Turkey and Romania[14] with 25.7 %, 30.2 % and 31.6 %

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[13] The estimations for the base year 2005 for each country are considered those of Schneider et al. (2010).

[14] The countries: Bulgaria, Romania and Slovenia are member states of the European Union. Bulgaria and Romania are among countries with the highest shadow economy in the EU.

Table 3 The estimations of the size of shadow economy in eight SEE countries

Country	Shadow Economy (in % of official GDP) using the MIMIC method									
	Year									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
Albania	36.2	37.1	36.4	35.8	35.0	35.2	36.3	36.5	36.6	36.1
Bosna & Herc.	35.9	36.6	36.2	36.9	35.4	35.6	36.3	37.7	37.0	36.4
Bulgaria	34.5	35.6	34.2	33.7	31.3	32.4	32.5	32.4	31.2	33.08
Croatia	32.6	32.4	34.6	33.2	32.7	32.2	33.9	33.7	32.5	33.07
FYROM	36.9	36.7	35.4	36.2	33.5	33.4	33.7	32.9	32.8	34.5
Romania	32.6	32.4	32.2	31.4	30.1	31.4	31.7	31.9	30.8	31.6
Slovenia	26.9	26.1	26.5	25.9	24.2	24.7	25.5	25.8	24.1	25.7
Turkey	30.5	31.1	30.4	29.7	28.9	29.2	29.8	30.7	31.2	30.2

Authors' calculations
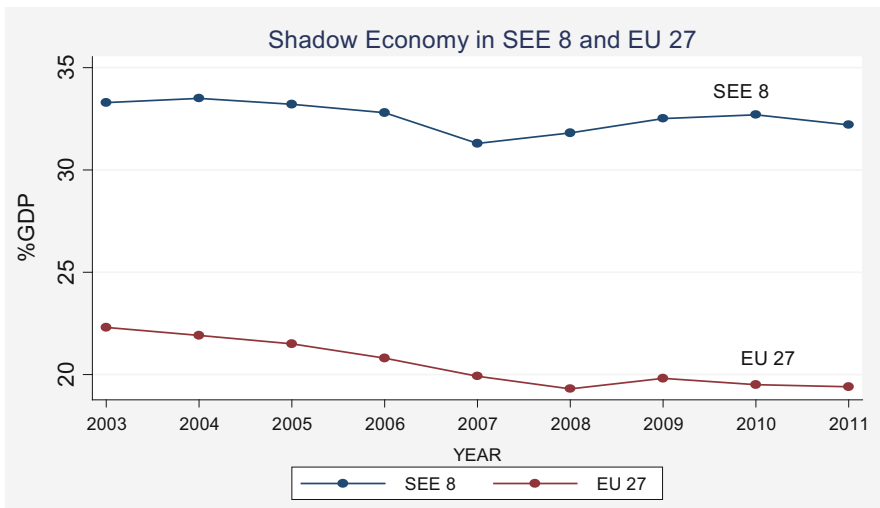
Fig. 1 Shadow economy in SEE 8 countries and EU 27 average 2003–2011 (Source: SEE 8 own calculations; EU 27 Schneider, (2011))

respectively. Contrary to estimates of Schneider (2010) for the period 2000–2007,[15] Bulgaria, Romania and Albania are among countries with the highest shadow economy.

As it can be seen in Fig. 1, there is significant difference in the size of shadow economy for the entire period almost 12 % between EU 27 and SEE countries. This figure reflects the fact of a decline of shadow economy in 2007, and then a slight

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[15] See in the previous section.

increase starting in 2008. It leads to a conclusion that the financial crisis had negative effects on the shadow economic activities.

Conclusion

This paper estimates the size of the shadow economy for eight South East European countries for the period 2003–2011. It is the first study to address such an issue for this set of countries. Using the MIMIC approach that considers the shadow economy as a latent variable with several causes and consequences, it was found that higher tax burden, higher unemployment rate, lower GDP per capita, higher government expenditures and higher inflation are the key factors determining the shadow economy for these countries, representing altogether around 67 % of the shadow economy variance. The results also reveal that higher shadow economy reduces the labour force participation rate.

The size of the shadow economy differs across countries. The average size of shadow economy of these eight South East European countries is at about 33 %. Based on these results, the countries with the highest shadow economy are Bosnia & Herzegovina, Albania and FYROM with 36.4 %, 36.1 % and 34.5 % of official GDP, respectively, while Bulgaria and Croatia are in the middle of the pack with 33.08 % and 33.07 % respectively. The three countries with the smallest shadow economy are Slovenia, Turkey and Romania with 25.7 %, 30.2 % and 31.6 %, respectively. The last three years show a slightly increasing trend in the magnitude of shadow economy in the most of the countries compared to the previous period. This finding highlights the fact that the financial crisis had negative implications on the shadow economic activities.

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Optimum Currency Area Theory, Nominal and Real Convergence Controversies and the European Experience After the Recent Global Economic Crisis

Georgios Makris

Abstract The traditional theory of Optimum Currency Areas (OCA) has provided the conceptual explanation of currency unions for nearly half a century and played a dominant role in shaping the idea of the European monetary integration, whereas it further offered a basis for the creation of the eurozone. Nominal convergence, in accordance with the OCA theory, represents the final stage of the process and involves monetary and fiscal variables, while its relationship with real convergence turns out to be complex and insufficiently defined both in contemporary economic theory and empirical research. The emergence of the world economic crisis in 2008 further accentuated the problem of the relation between nominal and real convergence especially following the worsening of the macroeconomic disequilibria of many "old" and "new" member states. This article firstly aims to approach the Optimum Currency Areas theory in its evolution and to underscore its weak points. We shall then consider the criteria and the main suggested methods of estimating real convergence. We shall finally attempt a meta-analysis of the often contradictory results of empirical researches on real convergence, both within the context of the eurozone and the European Union in view of the above mentioned theoretical controversy. Our conclusions lead to skepticism on the evolution of the real convergence process, in particular since the recent global economic crisis erupted.

Keywords OCA • Nominal real convergence controversy • E.U

JEL Classification Codes E52 • F15 • O11

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1   Introduction

As early as 1958, and when the process of economic integration started in Europe, the idea of a common currency was present, yet without being included in the Treaties of the time. As the collapse of the Bretton Woods system was approaching, the Werner Report proposed in 1970 the creation of the Economic and Monetary Union (EMU), but its realization was delayed due to exchange rate volatility in the 1970s and due to oil crises. Subsequently, monetary cooperation was confirmed by the creation of the European Monetary System in 1979. Eventually, with the signature of the Single European Act in 1986 and its implementation in the following year, the path towards the monetary union was open, a fact that was documented in the Emerson Report of the Commission in 1990. The creation of the EMU aimed at preserving real convergence obtained by the European Economic Community, and appeared to be the only alternative.

The issue of European integration was framed by theoretical analyses most of which were undertaken as part of the orthodoxy of Optimum Currency Areas. The traditional OCA theory holds that in a monetary union of countries which meet certain criteria, namely a minimum level of convergence, less developed economies are expanding faster than developed ones. As a result, there is convergence of the levels of per capita income with the one of developed economies, namely real convergence. The arguments of this theory received strong criticism, thus giving rise to the endogenous OCA theory, according to which these criteria can be met ex post. The MT imposed criteria of monetary inspiration for entrance in the EMU, related to monetary and fiscal variables, sparking debate around the already controversial relationship between nominal and real convergence and the chances of success of the European project. The empirical verification of the theory of OCA-despite the problems of the methods used- did not prove the 'absolute' convergence supported by the 'old' approach, except in cases of relatively homogeneous economies. In most cases the term 'conditional' convergence was verified, which depends on important structural factors of the economy, like human capital, capital accumulation, innovations and other institutional factors. Cases of divergent economies and signs of 'club' convergence have also been examined. The problems of effectiveness of the EMU and future entrance of other members of the EU worsened after the recent global economic crisis and brought the weaknesses of the monetary union to the foreground, enforcing internal imbalances of and between member states.

2   The Optimum Currency Areas Theory and Its Evolution

The initial formation of the Optimum Currency Areas theory, inspired by Keynesian theory and based on the negative slope Phillips curve, is mainly the result of the contribution of Mundell (1961), Ingram (1962), McKinnon (1963) and Kenen

(1969). Nevertheless Milton Friedman (1953), supporting the position in favor of flexible exchange rates as early as the 1950s, was in fact referring to the notion of OCA.[1] This early period of construction of the theory concerns the formulation of the most significant criteria and the cost-benefit analysis of monetary integration. It is already well known that the criteria in hand are free mobility of production factors, flexibility of prices and wages, the degree of openness of the economies, the number and intensity of asymmetric shocks, the size of the economy, the degree of diversification of production and consumption, the similarity of economic structures, the similarity of inflation rates, fiscal policy and financial integration. These criteria should be met by the prospective members of an OCA, which implies the cost caused by the abandonment of the national monetary policy and the adjustments of exchange rate of these countries. The conduct of monetary policy now belongs to a transnational authority (Central Bank) and we have either an implementation of an irrevocable exchange rates structure, or an introduction of a common currency. Pegged exchange rates or the common currency can only fluctuate relative to the rest of the world.

The anticipated benefits from the creation of an OCA, which must outbalance the relative cost, concern the reinforcement of internal and external equilibria and must facilitate the response to shocks. The main benefits include the elimination of the uncertainty involved in the exchange rate fluctuations – as trade between the members of the OCA and specialization are reinforced and scale economies are created – and the elimination of transaction costs and exchange rate risks.

The neoclassical growth theory, as expressed by the model developed initially by Solow (1956), Swan (1956), Cass (1965) and Koopmans (1965), was based on the notion of diminishing return on the productive capital which was leading directly to a convergence process. This constitutes the natural growth boundary. More specifically, because of capital flows towards it, an open and poor economy would tend to converge with richer ones, under similar circumstances of population growth, saving behaviour, and exogenous technology. The comparatively faster growth rate would be guaranteed by the higher marginal productivity of capital, due to a lower capital-output ratio. Free mobility of production factors and free trade are considered necessary conditions for the acceleration of the process of growth. The same rationale would also apply to a closed economy, through the domestic saving effort and the respective investment. As expected, economic policy should be restricted to ensuring the smooth operation of market forces and macroeconomic stability. The assumptions behind the neoclassical theory of growth by Solow have been severely criticized as unrealistic, as evidenced by the relevant literature. Part of the criticism is the unrealistic assumption that technology is an exogenous and public good accessible to all economies. As stated by Abramovitz (1986), the convergence results from the 'social capability' of a country to absorb and exploit

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[1] Some writers, such as Lerner, Meade and Scitovsky, analyzing in previous decades the effectiveness of interregional adjustments within a country in the Keynesian framework, mentioned some features of the theory of OCA (Cesarano 2006).

new technologies, namely from a number of structural factors such as education, technological competence, knowledge and business organizational culture.

Coming back to the previously mentioned criteria for the creation of an OCA, one can observe an inability to safely assess the effects between some of them (Robson 1987) as well as the absence of a single analytical framework, which results from the fact that the options proposed depend on which criteria are taken into account (The 'problem of inconclusiveness' and the 'problem of inconsistency', Tavlas 1994).

The scientific interest for the theory of the OCA dropped for almost 20 years, namely in the 1970s and 1980s. As Ishiyama (1975) has typically stated, the theory of the OCA was now seen as a pedantic conversation, not offering any effective solutions to the practical problems concerning monetary policy and monetary reform. For instance, the comparison between costs and benefits for participation in a monetary union should be examined according to the interests of each country. Moreover, depending on the level of openness of each country's economy, the ability to use discretional macroeconomic policy for the maintenance of internal balances might be restricted by the external limits the union as a whole is facing (Tower and Willett 1976). Despite the fact that the discussion about the criteria for the creation of an OCA and the subject of economic policy choices by the national governments was intensified during this period, empirical analysis for some other criteria had not yet achieved any progress.

Since the early 1990s, growing interest in the experience of the European currency union and developments in academic thinking brought attention back to the theory of OCA (Dellas and Tavlas 2009). The publication of the work of Emerson et al. in 1992 reaffirmed the belief that the 'old' theory of OCA could not offer the analytical framework for the assessment of cost and benefit of an economic and monetary union. The revival of interest in the OCA was accompanied by a shift of focus from the requirements each country should satisfy to the reliability and the instruments of the monetary policy. As a result, the Keynesian analytical framework was abandoned. This framework, according to which the aim of an economic policy is the search for the most appropriate point along the long-term Phillips curve, was attacked by 'new classical economy'.[2]

In theory the monetarist views prevailed, and under the influence of the rationale expectations hypothesis, they supported that the long-term Phillips curve is vertical. Consequently, the interest was shifted to the 'natural rate of unemployment' (NRU) rendering the loss of independence of the monetary policy, caused by the involvement in a monetary union, less important than was thought before. The focal point of macro-economic policy was now the maintenance of price stability under an OCA, displacing the target of the desired level of employment and economic activity (Artis 1991). More recent publications, having approached the issue of

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[2] See notably Friedman (1968) and Phelps (1970).

the loss of independence of the monetary policy from different perspectives, reach the same conclusions. There were, however, opposing views.[3]

Other views which were developed within the framework of the 'new' approach of the OCAs[4] concern, first and foremost, the benefits of obtaining reliability in an economic policy, without the similarity of inflation rates being a prerequisite, as it can be obtained ex-post under the framework of a union. In addition, the effectiveness of adjusting the exchange rate for the restoration of external balance was challenged, and there was a study of the impact of a single currency on the labour market of a member state, which depends on the institutional structure of each country.

This 'new' approach to OCA revealed a new issue which restricts the power of this theory significantly: the endogenous nature of an OCA. The discussion begun with the works by Romer (1986, 1987), Lucas (1988) and Frankel and Rose (1998, 2002), in which the correlation between two of the criteria for membership of a country in an OCA is explored – and more specifically the impact of the trade integration level on the degree of the cross-country correlation of business cycles. The authors claim that this relationship is dubious. The endogenous growth theory supports that growth is the result of endogenous rather than exogenous forces, namely of human capital, innovation and of knowledge, and was based on the notion of constant returns. Since technology is now treated as endogenous, the factors which determine it – namely the higher transmission efficiency of production methods and the benefits from the elimination of economic boundaries – explain the continuous product growth, supporting nevertheless that the differences between countries will remain. Convergence, according to the endogenous growth theory is not the norm but the exception.

Yet in particular these authors support that trade integration can possibly lead to an increase in the specialization of each country (depending on a country's comparative advantage) and consequently to greater sensitivity towards a shock in the industrial sector, leading to more asymmetric business cycles. The authors believe that the latter is more plausible, but leave the question open. They also conclude that the creation of the EMU is easily justified ex-post. This conclusion is also supported by the argument of the endogenous nature of financial integration,[5] as well as by considering as endogenous characteristics the necessary criteria of the degree of openness of an economy, the labour and product market flexibility, and the similarity of economic policies.

The overall conclusion is that the monetary union can strengthen trade integration and the synchronization of business cycles. Thus according to the theory of endogeneity, a process of structural transformations renders the member states more capable of satisfying the criteria of optimization ex-post.

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[3] See, for example, Akerlof et al. (2000).

[4] For a detailed presentation, see Mongelli (2002).

[5] See Schiavo (2008).

It should be noted however that certain authors, like Krugman (1993), have supported the 'specialization' hypothesis, based on the international trade theory and on increasing returns. In their view, the strengthening of trade relations between monetary partners will inevitably push them towards the specialization of production according to each one's comparative advantages. In that case, it is not possible to support the argument of diversification of the production structures of the economies, resulting in a minor correlation of business cycles. Nevertheless, the instability of the theoretical model of specialization[6] as well as the fact that demand shocks tend to spread to the monetary partners as well (due to interdependencies), reduce the initial asymmetry and make the specialization hypothesis appear weaker.

3 Real Convergence and Its Measuring

The strong interest for a discussion concerning the economic convergence hypothesis was triggered by the need for empirical verification of two of the most significant theories of economic growth that dominated in the late 1980s and early 1990s: the earlier neoclassical growth theory and the much more recent endogenous growth theory. The latter has increasingly attracted the attention of many economists. The issue was of great importance, since the response would suggest the position of economic policy with regard to one of its main objectives: economic growth. Another important reason for this theoretical and practical interest was its role in the expected convergence of the economies within the gradually expanding European Union (EU) and subsequently the Eurozone, as an OCA.

The methods developed for the verification of the above theories concern the measurement of real convergence. The ones used relatively more often are 'absolute' convergence of the neoclassical growth model, 'conditional' convergence of the endogenous growth theory and 'club' convergence, all of which attempt the measurement of the respective country variables – usually in income per capita or in productivity- and participate in a regional integration.

In non-technical terms, according to absolute convergence, which results from the conclusions of the orthodox neoclassical growth theory, there is a long-term convergence of per capita national income towards the same level, regardless of the initial conditions. Conditional convergence – also of neoclassical tradition – constitutes a core notion of the theory of endogenous development (Barro and Sala-i-Martin 1992 and Mankiw et al. 1992): per capita income of the countries of a region with similar characteristics converges towards the same level in the long term, regardless of initial conditions. In essence, this is the case where each economy converges towards its own steady state and the convergence rate becomes greater as economies deviate from it, a fact that depends on endogenous factors. The term

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[6] See Frankel and Rose (1998).

'club convergence' corresponds to the view that per capita income of groups of countries with similar structural features, such as preferences, technology, rate of demographic growth, government policy, etc. converge towards the same level in the long term, provided that the initial conditions are sufficiently similar. Despite the fact that club convergence may be considered to differ from the notion of conditional convergence, Galor (1996) proved that they both originate from the neoclassical model. They simply introduce a number of important variables and concepts, such as spillovers and market distortions.

In empirical research and apart from the already known income inequality indexes, like the Gini, Theil and Atkinson indexes, a series of tests have been developed that correspond to some form of convergence. First of all, the concept of "absolute beta-convergence", developed by Barro and Sala-i-Martin (1990, 1991, 1992), is based on the neo-classical growth model and studies the relation between growth and per capita income within a given period and the initial level of per capita income of different regions or economies. The effect of the belief that, according to the theory of economic growth there is a convergence between economies, made beta-convergence extremely famous, although the authors supported that it does not necessarily lead to a reduction in income inequality. This approach received criticism by Friedman (1992) and Quah (1993a), both as to the interpretation of the parameter b, whose classical method of estimation ignores the heterogeneity of economies and other determinants of growth, and as to the use of cross-section data. This resulted to the development of the concept of "conditional beta-convergence", a convergence which is confirmed when the variables determining the steady state are tested. It turns out though that the conditional beta-convergence may be accompanied by decreasing or increasing income inequality (Gluschenko 2012). Acceptance of the conditional beta-convergence has serious consequences for the economy, as far as the effectiveness of economic policy and, consequently, its ability to remove the obstacles for growth is acceptable. In contrast, if the power of absolute beta-convergence had been proved, one might expect economic policy to restrict itself to safeguarding the smooth operation of the market. However, conditional beta-convergence seems not to be able to anticipate the evolution of income inequality, but simply concludes that the behaviour of a group of countries is foreseen by the neoclassical theory without predicting the evolution of income disparities between them. As Gluschenko (2012) has stated, the problem is not that beta-convergence is wrong, but that it has been interpreted in the wrong way, appearing able to answer questions it cannot really address.

Another test, "sigma convergence", which was also introduced by Barro and Sala-i-Martin, examines the reduction of dispersion of real per capita income between regions over time. This technique is an alternative to the beta-convergence, but does not help in understanding the mobility of each region or economy. However, empirical studies have shown that there are cases of beta-convergence, without the presence of sigma-convergence (Barro and Sala-i-Martin 1991). Thus beta-convergence is a necessary, but not a sufficient condition for observing sigma-convergence. According to Sala-i-Martin (1994, 1996), beta-convergence is more important because it allows the identification of pathways and rates of convergence,

and whether it is absolute or conditional. Islam (1995) considers the assessment of the parameter b to be more accurate because the problem of the variables associated with heterogeneity is handled when approached by using panel data.

Quah (1993a, 1996) showed that neither beta-convergence, nor sigma-convergence can give satisfactory answers to the phenomenon of convergence, and turned his attention to club convergence.[7] The analysis of club convergence highlights trends that lead groups of countries to converge together. As explained by Quah (1996), it is not important whether a single economy tends to converge towards its own steady state. What is important is the behaviour of the distribution of economies that form a group, as a whole. This approach helps in better understanding the problem of economic growth. The relevant empirical findings however cannot be derived from standard cross-section techniques or panel regressions, or even from time series methods, in absolute or in conditional convergence. Friedman (1992) and Leung and Quah (1996) argue that convergence as a concept of "catch-up" is not an effective means of standard regression analysis of a representative economy, as it only describes a representative behavior of the income distribution between countries. It does not help in understanding the dynamics of this distribution. For this reason, other techniques, such as the Markov chains – which allow the detection and estimation of the dynamic evolution of the above distribution – and the Medd (Model of Explicit Distribution Dynamics). This approach revealed, through empirical research by Bernard and Durlauf (1994), Quah (1997) and Epstein et al. (2000), convergence regularities in the form of clubs, polarization or stratification. The literature on club convergence has grown significantly with the construction of advanced models, such as the ones by Azariadis and Drazen (1990) or by Howitt and Mayer-Foulkes (2002). Furthermore, empirical evidence for club convergence using various methodologies has been proposed among others by Desdoigts (1999), Durlauf and Johnson (1995) and Kourtellos (2000).

Addressing the convergence in the distribution dynamics approach is therefore the most appropriate way for the emergence of club convergence. It is based on a comparison of the distribution of real per capita GDP of member states over time. The advantage of this technique is that it identifies not only the possible convergence, but also the existence of club convergence, when the distribution is multimodal. The general observation resulting from numerous empirical studies over the last 25 years is that absolute convergence is not verified, except in certain cases involving homogeneous economies, as sometimes less developed economies fail to cover the distance from more developed ones. As a result they remain low and the gap between them is widening. Alternative tests indicate a world where economies tend to be richer or poorer in the long term, while those situated in the middle income category decrease, thus dispelling the view that poor countries develop faster. The approach of club convergence seems to better and more dynamically

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[7] Quah (1993b) shows that standard cross-section regression tests which are used by the classical approach to convergence lead to wrong conclusions, suggesting an analogy to the famous Galton's fallacy.

interpret the issue of real convergence, explaining the factors that determine the differences between countries in the path towards development.

4   Nominal Versus Real Convergence in the European Union's Framework and the Post-Crisis Trends

The term 'convergence' regularly reappears in the E.U. terminology, yet the meaning of the concept has changed over time. In particular, Council Decision No 74/120/EEC of 1974 concerned achieving a high degree of convergence of economic policies and aimed at organizing the coordination of fiscal policies of member states. As noted by Pisani-Ferry (1994), the Keynesian positioning of this decision gave way to another one,[8] which aims at the gradual convergence of political and economic results. The E.U., using this term during the first stage of EMU and after the violent crisis of European currencies in the late 1980s, explains that the principles that should inspire common policy are price stability, sound public finances, monetary conditions and current accounts, the opening of markets and competitive conditions. In other words, what is now called 'nominal' convergence and is confirmed by the MT – regarding exchange rate and price stability, long term interest rate, and the condition of fiscal deficits and debt – has a key role and is a prerequisite for joining the single currency.

The predominance of nominal criteria in the E.U. philosophy coincides, as mentioned in the first part, with the abandonment of the Keynesian view of the OCA and the adoption of monetary views. The shift has fuelled a number of criticisms, and the debate for the relationship between nominal and real convergence continues to this day. Yet there is no consensus as to the nature of this relationship, neither on a theoretical nor on a practical level. For many economists, monetary convergence is the final stage in a real or structural – as is often referred to – convergence process. On the other hand, monetarists view it as a prerequisite stage or the initiation of the process. Moreover, these criteria of convergence were accused of having been designed by countries whose characteristics were very different from those of countries of subsequent enlargements, in terms of structure of economies, development of financial sector, level of prosperity, etc. (Halpern and Wyplosz 2001).

In fact the E.U., with the Delors Report (1989) sought to implement a policy of compromise between these two positions; namely it aimed for both these goals, a fact which was characterized more as an economic policy rather than as an implementation of economic logic (De Grauwe 1993). The belief of many economists, however, that a process of real convergence on a theoretical level would continue, tends to be elusive. This policy arose from the need to reconcile objectives relating both to equal treatment and to the future behaviour of candidate countries, but also their actual capability to implement strict economic policy.

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[8] Decision 90/141/EEC.

Clearly this solution did not allow the prevalence of the criteria arising from the theory of OCA, resulting to the adoption of nominal criteria only. However, ignoring the goals of real convergence and necessary adjustments until the entrance in the common currency, was a threat which appeared later and in strong terms after the global financial crisis in 2007. These risks were identified early, by Emerson et al. (1992) for example, and mainly concern the asymmetries observed in the structure and behaviour between the economies of the member states of the union. Since the loss of monetary independence deprives a state of the ability to use the exchange rate for the adjustment of relative prices, after a shock, the existence of asymmetries may have high costs. The same can happen in the case of common shocks, because asymmetries may cause different reactions from member states. These asymmetries were not very evident until the 1990s and when after the successful currency devaluations of the United Kingdom and Italy, the size of the potential costs of the loss of monetary independence was demonstrated. Empirical studies conducted at the time on regional disparities between the United States of America and the European Community (EC) and on shock absorption, by Sachs and Sala-i-Martin (1992), Bini-Smaghi and Vori (1993) and Bayoumi and Eichengreen (1993) among others, showed that asymmetric shocks in the case of the EC reflect less the asymmetries in the production structure than those in economic or political behaviour. Also the absorption of asymmetric shocks in the case of Europe seems to be made through price rather than quantity adjustments and that migration and labour market flexibility are minimally involved. In fact, as shown by many empirical studies (de Grauwe and Vanhaverbeke 1993; Barro and Sala-i-Martin 1990, 1991; Eichengreen 1992), labour mobility in Europe is limited. Therefore what remains, according to the orthodox theory, is only the adjustment through prices, namely through reducing wages and deregulation of the labour market. Moreover, fiscal adjustments have little chance of being implemented in dealing with asymmetric shocks, as they are permanently enacted at a national level, especially after the Stability and Growth Pact (SGP) in 1997 and the Euro Plus Pact in 2011. Of course, according to the IS-LM-BP model, monetary policy is fully effective under a flexible exchange rate regime, such as that of the euro. However, in the short term, a return to fiscal balance requires a primary surplus, which reduces demand and growth in order to be achieved. This is the pro-cyclical policy, especially perilous in a crisis. Therefore, the cost of adjustments in case of an asymmetric shock can be large, especially for less 'virtuous' economies of the union, which for better or worse chose to join the common currency. As addressing their deficits is not effectively connected with collective responsibility, the risk of sovereign default cases cannot be excluded.

A problem that complicated the situation of countries in transition that have entered the EU was the incompatibility between exchange rate and inflation, due to the Balassa-Samuelson (BS) effect.[9] Various empirical studies, such as the one by

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[9] A survey of the existing empirical literature on BS effect for the New Member States is provided in Egert et al. (2006).

Égert (2010) argue that the BS effect is not the most important factor of inflation for the countries of Central and Eastern Europe (CEECs). The rapid growth of productivity in the service sector reduces the distance from the productivity of the tradable sector and contributes to the rise of inflation. Moreover, accumulation of productive capital seems to be leading to the same effect. As shown in the analysis of the general equilibrium model by Bhagwati (Gerard 2008), an increase in capital per capita causes a relative increase in the price of services. This price convergence in CEECs is associated with capital inflows of Foreign Direct Investments (FDI), which until the transmission of the global economic crisis to the region had enabled the creation and maintenance of significant current account deficits. That is, mass imports of intermediate goods and mechanic equipment, which were facilitated by inflow funds, not only contributed to the trade deficits, but to the increase of per capita capital as well, a fact which in turn contributed to inflationist pressures. Especially for countries with a fixed exchange rate or with a peg to a strong currency (euro) or intend to enter the currency union, free capital flow leads to a convergence of real interest rates, namely to their reduction. The result is a reduction in household savings and an increase in borrowing, and in fact in foreign borrowing, and the transmission of upward pressure on demand and prices, as observed in many cases.

Especially for those countries, the impact of rapid productivity growth of the tradable sector on inflation means that inflationary pressures will be retained. In the trade-off between exchange rate stability and inflation target, both in the period of ERM during the process towards the single currency and after entering the EMU, there will be a need for austere restrictive economic policy. However, by doing so, they compromise the development policy and therefore real convergence (Halpern and Wyplosz 2001; de Grauwe and Schnabl 2005; Hein and Truger 2002). The same concerns have been expressed by other researchers, such as Björkstén (2000), who believed that only in the long term can real convergence of per capita income and living standards in the Eurozone be expected, while there are signs of club convergence. The diverging levels of structural inflation however, after further enlargements will be a bigger obstacle to real convergence due to common monetary policy.[10]

Already from the beginning of the first decade of this century, the theoretical and empirical debate about the relationship between nominal and real convergence resulted in more concrete conclusions. Hein and Truger (2002) among others concluded that the operation of the Eurozone was marked by a rather restrictive macroeconomic policy mix which did not achieve the objectives of economic growth and real convergence. Instead, a flexible financial policy, which would abandon monetarist views, would have a greater chance of success. Soukiazis and Castro (2005) conducted a thorough and remarkable study, using panel data analysis, on the effect of the Maastricht criteria and later of the SGP, on the convergence process among EU countries. The study comes to mixed conclusions. Some of them

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[10] See also, Jacquelin (2004).

reinforce the view that the post-Maastricht period is characterized by slower convergence of per capita income, due to the adaptation of the economic policy of many countries to the requirements of the above conditions. In contrast, there was a positive effect on the productivity, although the quantitative result was small. The same period had a rather negative effect on the behaviour of investment and unemployment. Finally, convergence is probably conditional and convergence of per capita product continues with a low annual rate, which verifies the convergence estimate of Sala-i-Martin (1996) by 2 %, with the method of cross-section.

More recent empirical studies on nominal convergence, agree that up until the economic crisis of 2008 there was satisfactory progress both at an EU and at a Eurozone level (Marelli and Signorelli 2010), although the new members seem to struggle. As far as real convergence is concerned however, the conclusions are not clear. Initially, there seem to be differences between old and new EU members in the convergence of per capita income and productivity. New members perform better, but diverge mainly in their labour market indicators and specialization. Other authors (Vieira and Vieira 2011) estimate that during the last decade all the characteristics of an OCA are improved for almost all EU countries. EMU does not seem to contribute in any special way. Furthermore, the expected rapid convergence in the EMU was not achieved. Other writers reach similar conclusions, including Christodoulakis (2009), who observes a reversal in the trend prior to the EMU, on convergence of per capita income, while the business cycles seem to converge more after the creation of the union. In line with these conclusions, Zarotiadis and Gkagka (2013) point out that the trend towards per capita income divergence among EU countries, observed during the 1980s, is nowadays confirmed as a continuous process.

According to the latest statistic data, the economic crisis in Europe is characterized as an asymmetric shock that affects some countries more than others. This crisis is not only due to the global economic crisis which began in 2007 with the crisis in the mortgage sector in the U.S.A. Part of the cause can also be found in the imbalances that have accumulated within the EU itself and especially within the Eurozone. It is generally accepted that the convergence of member states of the Eurozone did not evolve as anticipated by the theory of OCA. In some cases, as real interest rates remained at low levels in countries with higher rates of price increase, such as Ireland, Greece or Spain, growth was driven by excessive household consumption debt and by the expansion of the construction sector. The result was deterioration in the external imbalances of these countries without increasing their competitiveness. As explained by Christodoulakis (2009), after the entry of these countries into the EMU, current account deficits did not follow fiscal deficits, but are due to the different direction followed by FDI within the union. More specifically, these countries received inflows of capital towards the real estate market, with relative capital intensity in producing non-tradable goods, resulting in housing-bubbles. Instead, the countries that followed the strategy of growth through increasing competitiveness, based on the reduction of wages and domestic demand, attracted capital inflows towards the capital-intensive export industries and exhibited external surpluses. For countries with external imbalances, according to

the rationale of the OCA, there should be labour costs and employment reduction in the short term. Moreover, when confronted with the financial markets, the cost of their external debt soared.

The convergence of CEECs was characterized by a rapid growth, but, as was previously mentioned, with imbalances in inflationary pressure and external balances. Imported initially, the crisis of 2008 became evident in different countries in 2009, depending on the degree of those imbalances, altering substantially the whole progress towards meeting the Maastricht criteria. The propagation of the crisis was based on a pattern with the following characteristics: reduction in exports due to the shock of demand in the Eurozone, reduction in domestic demand, reduction in inflows of investment funds and volatile capital outflow, private loans service needs in foreign currency, reduction of bank credit of foreign banks and depreciation of fluctuating currencies (Gardó and Martin 2010). Of course, in some cases, there was a reduction in external deficits and inflation due to the recession, and extensive readjustments in stock and property markets. But as commitments to fiscal policy do not allow anti-cyclical policy and automatic stabilizers collapsed, external borrowing increased – with higher spreads – and budget deficits widened. These developments reinforce doubts about the success of real convergence and the confirmation of the club convergence trend (Halmai and Vásáry 2010). Despite some improvement in macroeconomic indicators, uncertainty about the recovery of real convergence remains, causing the desire and potential for future entry of more countries in the euro zone to diminish (Milea et al. 2010; Avramov 2009).

Conclusion

Both the 'old' or endogenous approach of Optimal Currency Areas and the relative empirical research produced different conclusions about the issue of the creation and success of the EMU and the E.U. Firstly, it is accepted that the member countries of the EMU do not all meet the criteria for participation in an OCA. These criteria and the assumptions of the traditional theory, proved unrealistic in their majority, ruling absolute real convergence out of non-homogeneous economies. Influenced by the theory of endogenous growth, the relative approach gained more evidential power and was connected with the real conditional convergence, and more appropriate econometric techniques brought the existence of club convergence to light. At the same time, the abandonment of Keynesian principles and the adoption of the monetarist Maastricht criteria, although confirmed by nominal convergence to a great extent, they gave rise to strong concerns about the sustainability of the EMU. Ignoring the heterogeneity of member states of the union and imposing uniform rules of economic policy, in combination with the involvement of political factors, created internal and external imbalances in the member states. These imbalances were reinforced by the global financial and economic crisis both within the EMU, and in the majority of the new EU

members, creating debt crises and sovereign default risks. The European institutions have not provided an effective collective solution to the problem of the debt crisis. It was this gap that, within the framework of globalization, allowed dependence of problematic EU countries on international financial markets on high cost. This issue, in conjunction with the revision of the theoretical analytical framework of European integration can be a topic for future discussion.

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The Annual Demand for Seasonal Immigrant Labor in Greece During the Crisis Period

Simeon Karafolas and Alexandros Alexandrakis

Abstract The paper investigates the annual inflow of legal immigrants in Greece the last 6 years, 2007–2012, on the basis of the demand of Greek employers for seasonal immigrant labor in provenance from non European Union countries. This process is determined by the new legislative framework described by the Law 3386/2005 *on the entrance, accommodation and social integration of third country nationals in the Greek territory.*

Every year Greek authorities determine the maximum number of residence and work permits that will be given to non EU immigrants. Permits concern mainly seasonal jobs and are provided basically to Albanian workers.

Local needs for work determine the number of immigrants on the local level. Local demand is expressed through prefectures, (Greece is divided administratively in 54 prefectures). The local needs determine the national demand, and therefore the annual inflow, for legal economic immigrants from non EU countries. Some prefectures in the North of Greece concentrate the majority of this immigrant population.

The paper analyses the evolution of this demand during the crisis period and tries to investigate if the economic crisis and especially unemployment influenced this evolution.

The analysis is based on a prefectural level because it permits a more qualitative approach of the evolution since we can have a more specific result.

Keywords Labor market • Migration

JEL Classification Codes O15 • J15

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1   Introduction

Since the early 1990s, Greece has been transformed into a host country for immigrant populations. A major part of this population, coming from Albania, was due to the illegal inflow of immigrants that was almost uncontrolled. The Greek governments of that period tried to manage this migration phenomenon and adjust the entry, residence and social integration of immigrants by introducing several legislative measures. With two laws, Law 1975/1991, followed by Law 2910/2001, the Greek authorities aimed to protect the country's frontier and control illegal immigration. These legislative efforts became more systematic and detailed during the next decade, 2001–2010. The first step was the introduction of Law 3386/2005 (Government Gazette 2005), complemented by Law 3536/2007 (Government Gazette 2007); the objective was the registration of the immigrants and refugees, the rapid issue of resident permits, the organization of and links between administrative bodies related to immigration. Law 3386/2005 is the regulatory framework of the actual Greek policy on the procedure for inviting third-country nationals to work. Any non-European Union country is considered to be a third country. This invitation procedure permits the entry and residence of third-country nationals to work for a specific employer, for a predetermined time period and a specific kind of occupation. Immigrants' work is divided into dependent and seasonal work. Seasonal occupation concerns more than 80 % of invited workers. The main body of seasonal immigrant workers is made up of Albanian workers. Thus, the examination of seasonal workers in this paper refers almost solely to Albanian immigrants.

Greece is the principal host country of Albanian immigrants. More than 430,000 Albanian immigrants were legally registered in the population census of 2001 (National Statistical Service of Greece, 2007), while in the second most important host country, Italy, only 164,000 were registered (Bonifazi and Sabatino 2003), and only some tens of thousands in all other countries, (Carletto et al. 2006). In 2006, the number of Albanian immigrants rose to 482,000, that is to say, 69.2 % of all foreign citizens in Greece (Hellenic Statistical Authority 2006). As a consequence, Greece is the main sending country for Albanian immigrant remittances. Total Albanian immigrant remittances reached, on average, 13.9 % of the Albanian GDP during the time period 1994–2007 (Karafolas and Konteos 2010).

This paper focuses on immigrant entry based on the demand for immigrants from employers in Greece for the time period 2007–2012, which is laid out in the new legislative framework of Law 3386/2005 (followed by some significant changes). The paper analyses the evolution of this demand and tries to examine the factors that influence this evolution. Are these factors institutional or circumstantial? In particular, has the crisis influenced this demand? The paper examines the demand through a regional presentation (by prefecture). An explanation can be sought regarding the structure of demand (for dependent and seasonal immigrant employees) by prefecture.[1] This examination permits a more qualitative approach to this movement.

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[1] Greece is divided administratively into 13 regions and 54 prefectures. Each region has a number of prefectures.

The objectives of this paper set it apart from all previous studies on the immigration movement in Greece, even those related to employment issues. In his study that was closer to the subject, Karafolas (2012) does not refer to the crisis period. Vaiou and Xatzimihalis (1997) examined the role of immigrants in the Greek labor market, focusing on the low labor cost. By examining the cases of two prefectures, Imathia and Pella, they notice that, historically, the immigrant population was, at first, composed of Poles and Bulgarians, who, at the beginning of the 1990s, were replaced by Albanian immigrants, mainly due to the lower cost. Examining the case of the prefecture of Kavala, Karasavoglou et al. (1996) conclude that 80 % of foreigners have seasonal work and only 20 % have permanent occupations. Most of these workers were employed in the agricultural sector. During the decade of 2000, a study on the employment of Albanian immigrants in the city of Thessaloniki (the second biggest city in Greece) found that 30 % of Albanian immigrants work in construction, 24 % in light industry and 9 % work as apprentices. Employment in these areas increased whereas jobs in agriculture in this region declined (Lamprianidis and Lymperaki 2001). In another study, Kavounidis (2002), found that 34 % of immigrants work in the construction sector, 26 % in cleaning and domestic services and 18 % in industry as factory workers. Examining employment in the agricultural sector and particularly in three prefectures of the regions of Peloponnese, Crete and Epirus, Kasimis et al. (2002) observed that immigrants, Albanians for the most part, tend to replace Greek workers where physically strenuous work is required.

This paper is organized as follows; after the introduction, Sect. 2 examines the procedure for the entry of third-country nationals into Greece under the new legislative framework; this section specifies the changes prorogued by the new legislation regarding employers' obligations; Sect. 3 discusses the evolution of employers' demands for those immigrants, mainly Albanians, while Sect. 4 provides conclusions.

2 The Procedure for the Invitation of Immigrants Based on Law 3386/2005

The Legislative Framework

Previous legislation efforts by Greek governments to deal with the immigration problem, Law 1975/1991 and Law 2910/2001, concentrated mainly on protecting the Greek frontiers and restricting illegal immigration. Nevertheless, the immigration phenomenon has turned out to be much more complex. Problems such as social integration, criteria for the entry of immigrants and collaboration of different services have remained crucial problems. Law 3386/2005, on the "Entry, residence

and social integration of third-country nationals in Greece" tried to resolve these problems (Government Gazette 2005). This law was complemented by a new one, Law 3536/2007, on "Special provisions relating to immigration policy" (Government Gazette 2007) that aimed to resolve problems with a view to achieving smoother integration of immigrants into Greek society. The Greek government specified the procedure regarding the criteria for entry, the granting of a residence permit and its renewal by publishing two decrees; Decree 13703/2007 on the "Setting of documents required for the issuing and renewal of a residence permit" and Decree 16632/2008 on "The definition of criteria for the procedure and terms relative to the employment of third-country nationals".

The Definition of "Dependent" and "Seasonal" Worker

Law 3386/2005 defines the residence permits a third-country national can have in Greece. A third-country national is an individual who does not have Greek citizenship or that of any other European Union country, according to the definition of article 17, paragraph 1 of the European Community Treaty (Government Gazette 2005). The residence permit offers its holder access to the labor market (Government Gazette 2005). This law specifies eight categories of residence permits for work; of these, the most significant are "Dependent work or offer of services or project" and "Seasonal work".

For "Dependent work", the residence permit is valid for the duration of 1 year, with an option for renewal for two more years; it can be converted to indefinite duration if the required conditions are fulfilled. During his residence, the holder of this permit has to fulfill certain conditions. His/her salary must be equal or superior to the salary of an unskilled worker. For the renewal of his/her residence permit, an immigrant must fulfill his/her tax and insurance obligations 2 months before the expiration of the old permit. The holder of a permit for dependent work may be insured with the Social Security Institution (IKA), or the Agricultural Security Organization (OGA) if he works in the agricultural sector. The holder of this permit can also work in other prefectures of the same or other region for 1 year after the granting of the first residence permit.

"Seasonal work" in Greece concerns employment for a maximum time period of 6 months per calendar year. A seasonal worker is employed by a specific employer on a fixed-term employment contract. The contract must mention the immigrant's particular line of work. In this case, the renewal of the residence permit is not permissible. The entry, residence and the time period of seasonal work are determined by the bilateral or multilateral agreements between Greece and other countries.

Greece signed bilateral agreements for dependent and seasonal work with Bulgaria, (Government Gazette 1996), Albania (Government Gazette 1997) and Egypt (Government Gazette 2005). Bulgaria joined the European Union on 1st

January 2007. Greece asked for and obtained a 2-year extension to consider Bulgarian citizens as third-country nationals with regard to the residence permit. Only since 1st January 2009, have Bulgarian nationals been free to work, no longer submitted to any bilateral agreement with Greece. Since this date, bilateral agreements apply to Albanian and Egyptian immigrants but only for work in the fishing industry.

The Procedure for the Invitation of a Third-Country National for Employment

a. General aspects

A third-country national can come to Greece for dependent employment with a specific employer for a specific type of employment (Government Gazette 2005). The procedure may concern an invitation for dependent employment, with the exception of work in agriculture and fishing; or it may concern seasonal or dependent employment in agriculture and fishing. Law 3386/2005 is the regulatory framework but recent circulars have led to certain differentiations by updating the initial text (Ministry of the Interior 2008).

By the end of September, an employer should indicate to his local municipality or community the number of immigrants he wants, the employment specialization, the nationality of the immigrant and the time period of the employment. For this dependent employment, the employer needs to have an annual revenue of 24,000 euros, if he is a private individual or a gross annual revenue of 60,000 euros if he is a legal body or company. The specialization of the immigrant must relate to the company's field of business. To employ an immigrant in agriculture, the employer must prove that he owns the cultivated area or the livestock which he plans to have it tended by the immigrant. The local municipality or community sends the request to the Immigration Service of the region, which then submits the request to the local Man Power Employment Organization Bureau (OAED) for them to examine whether the employer's request can be covered by Greeks or third-country immigrants already resident in the local prefecture. The local OAED sends the details on to the Immigration Service of the region. These requests only apply to dependent employment. They do not apply to employment in agriculture, fishing or seasonal employment because OAED does not have statistics for them (Ministry of the Interior 2008). OAED submit their report to the regional Immigration Service Committee. This Committee is made up of: a chairman, who is either the General Secretary of the Region or the Head of the Foreigners and Immigration Service, the head of the Labor Inspectorate Body, a representative of Prefectural Administrations of Greece, a representative of OAED, a representative of the Region's central Employment Bureau, a representative of local Chambers of Commerce and a representative of the General Confederation of Agricultural Unions or the Hellenic Confederation of

Agricultural Unions, as regular members, along with their designated substitutes. If the report indicates that the request does not comply with the required criteria, the request is rejected. The criteria set are:

- the interests of the national economy,
- whether the request for a specialty has already been covered during the previous year, with the result that there is no need for new requests for this specialty,
- the employer's compliance with all the required obligations,
- statistical details from the Unemployment Bureau with regard to offers of labor from Greeks and local immigrant residents on the requested specialization.

The possibility of supplementary invitations, up to 10 % of the fixed number, can be considered for emergency cases. In this case, a common decision by the Ministries of the Interior, Public Administration and Decentralization, Foreign Affairs and Employment fixes the maximum number of residence permits for employment, on the basis of the report. This number is issued every year for third-country nationals, per prefecture, nationality, type and duration of employment. This decision is forwarded to the relevant regions and OAED, as well as other relevant Ministries and the Hellenic Consulate authorities in the immigrants' native countries.

b. The procedure for dependent employment

Each employer, based on the national list, submits an application to the municipality or the community of his place of accommodation or residence, in order to hire employees with a contract of dependent employment. He also submits a letter of guarantee from a bank or the Deposit and Loan Fund, which ensures an amount equal to the income of an unskilled worker, reflecting the cost of living for an immigrant in Greece for 3 months.

The employer makes a commitment to hire the employees and cover the necessary expenses.

The employer signs a labor contract for every employee, indicating the wage and the kind of occupation. The salary cannot be lower than that of an unskilled worker.

c. The procedure for seasonal employment

In this case, the letter of guarantee ensures only the monthly salary of an unskilled worker.

The employer makes a commitment to hire the employees and cover the necessary expenses.

The labor contract for every employee must be signed by the employer, indicating the wage and the kind of occupation. The salary cannot be lower than that of an unskilled worker.

The employer makes a commitment to offer accommodation to the employee.

d. The procedure on the part of the immigrant

  The immigrant must have a 90-day visa (dating from his arrival in Greece). During this period, he has to pay a deposit (this was 150 euros until the end of 2010) to the municipality and present his contract signed by his employer, medical certificate and social security registration. Thus, the immigrant will be given work permit and tax registration number, and will be considered self employed.

e. Legislative changes to the insurance of third country immigrants

  In 2012, the Greek government tried to simplify the bureaucratic procedures for third country immigrants arriving to work in Greece. Simplified procedures would benefit not only immigrant workers but employers as well. Practically, the modifications would bring about a drop in demand. According to Law 215/2011 on the "Reorganization of the licensing system for foreigners staying in the country. . ." (Government Gazette 2011a), the seasonal work of third country citizens can be of 6 months per year (in any 12 month period) and in a sector whose activities have seasonal character. This law introduced an essential differentiation in relation to the previous measure, since the employer has to deposit a fixed amount of 150 euros in favor of the Greek republic; this amount is increased according to the number of employees. Additionally, the employer has to prepay the insurance organization the total amount of insurance contributions for any immigrant employee, for the total period of his work. That insurance contribution may be refunded to the employer only if the immigrant employee does not obtain an entry visa; additionally, if he leaves the country, the contribution refunded corresponds only to the period the immigrant employee did not work because of his departure from Greece. A recent law reduced the period for the prepayment of insurance contributions to 2 months; thus, Law 66/2012 permits the employer to prepay insurance contributions for 2 months before the entry of the immigrant he will recruit; after the arrival of the immigrant and for the rest of the period, the insurance contributions will be paid by the employer every 2 months (Government Gazette 2012a). This law permitted the employer to reduce the amount to be prepaid. However, it didn't restore the previous situation, where the employer was not subject to social security contributions.

3 The Evolution of the Demand for Third Country Nationals for Dependent and Seasonal Work

Methodology and Sources

Our research is based on the determination of the maximum number of residence permits for work for third-country nationals. This kind of residence permit has been fixed through bilateral agreements between Greece and other countries, namely Albania, Bulgaria and Egypt. The bilateral agreement with Egypt concerned only

employment in the fishing industry (Law 1453/1984, see Government Gazette 2005). The agreement passed in 1996 between Greece and Bulgaria, for the entry of Bulgarian nationals to Greece for seasonal employment (Government Gazette 1996), expired at the end of 2008, due to Bulgaria's entry to the European Union. Since the beginning of 2009, Bulgarians are no more considered third-country nationals in Greece. Up until 2008, Bulgarians were registered mainly in some prefectures adjacent to their country. The analogous bilateral agreement between Greece and Albania has been valid since 1997 (Government Gazette 1997). Since 2009, third-country nationals who come to Greece for dependent and seasonal employment have been exclusively those from Albania, with the exception of Egyptians (only for jobs in the fishing industry in designated coastal areas).

The demand for seasonal employment is concentrated on field workers at more than 90 %, with the rest on breeding and grazing livestock, and aviculture. All these occupations are considered as belonging to the agricultural sector. Agriculture is also the principal sector for dependent employment, with fewer jobs offered in tourism and domestic help. Since the agricultural sector is the main host sector, this research has also focused on the evolution of agricultural production and stockbreeding in the main host prefectures, in order to find out whether the evolution of the demand for employment is determined or influenced by agricultural production. The comparison focused on some agricultural products characterizing the agricultural production of these prefectures and related to the dependent and seasonal occupation of immigrants. This survey permits more qualitative results regarding the explanation for the demand for seasonal jobs. The evolution of unemployment has also been examined as a factor that could influence the demand for these workers. Increasing unemployment would disadvantage the demand for foreign workers.

The investigation is based on a prefecture level because it permits more specific results and is therefore closer to reality. The registered demand is the one fixed at a local level by the end of the year. It concerns workers that will be employed over the following year. For example, the demand in 2012 is registered at a local level by the end of 2011 and it refers to employees invited to work in 2012. By the end of the year, employers and local authorities present an accurate outlook of unemployment at a local level, of the agricultural production and the cultivated areas that may influence employment during the following year.

The time period chosen for this investigation is 2007–2012. This period includes two different economic situations in Greece, characterized by the economic crisis. From 2007 to 2009, Greece is still not really influenced by the economic crisis, although some signs appear. From 2010 to 2012, the Greek economy is extensively affected by the memorandum policy; the two main parameters of this policy are the economic recession and the growth of unemployment. Therefore, the behavior of employers and even the unemployed in Greece, regarding the demand for and arrival of third country seasonal employees, can be clarified during the examined period.

Sources for the investigation are provided by publications in the Government Gazette. The maximum number of residence permits for dependent and seasonal

employment is registered in this official Gazette within the first 2 months of the year. The Government Gazette publishes all demands concerning prefecture, type of employment and specialization. This publication offers a very detailed image of the demand for third-country nationals. Sources for data regarding agriculture were provided by the Ministry of Rural Development and Food and the local services of the examined prefectures. Particular emphasis must be placed on the interviews with the immigration services of the examined prefectures. The data regarding unemployment were provided by the Greek Statistical Authority. A significant part of the investigation has been based on local sources even though they do not concern statistical data. Interviews with local authorities, employers and organizations have been of the utmost importance in reaching adequate conclusions.

The Total Demand

Employers' requests for third-country nationals, registered at the end of the year, are presented in Table 1. The total number of applications reached 36,744 immigrants in 2007, as against 24,070 in 2010, and only 4,267 in 2012, registering a decrease of more than 32,000 immigrants from the beginning of the examined period.

This evolution is characterized by a continuous decrease that is more significant in the two last years, 2011 and 2012. The significant drop in demand that appeared in 2008 is influenced by the fact that Bulgarian immigrants were no longer registered as third-country nationals. The Bulgarian immigrant population, estimated at 22 % in 2007 and 12 % in 2008, was concentrated mainly in Greek prefectures adjacent to Bulgaria (calculation based on data from Table 2).[2]

Albanians constitute the main part of the immigrant population during this period, more especially from 2008 onwards, when they comprise more than 90 % of the total. Egyptian workers make up only a small part of this population; they work mainly in the fishing industry. Seasonal occupation in agriculture was the principal category of occupation requested by Greek employers during the period 2007–2011, comprising 80 % of the demand for third-country immigrants. The picture is totally different in 2012, when dependent immigrants constitute the majority of this demand, almost 66 %. These data indicate that Greek employers requested immigrant labor from Albania for work in Greece, primarily as seasonal workers in the agriculture sector, but only up till 2012.

The image for the examined period changes considerably in the last 2 years, 2011 and 2012. The first reaction would be to relate it to consequences of the crisis in Greece. Nevertheless, other explanations must be investigated.

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[2] Author's interview with the Immigration Office in Serres (12th October 2010).

Table 1 Demand for seasonal non EU immigrants at the end of the year[a]

Occupation	2007	2008	2009	2010	2011	2012
Seasonal	29,378	22,029	20,599	19,795	14,222	1,885
Dependent	7,366	6,857	5,063	4,275	2,896	2,382
Total	36,744	28,471	25,662	24,070	17,118	4,267
Evolution (%)		−22.5	−9.9	−6.2	−28.9	−75.1

Source: Government Gazette 2006a, b; Ministry of Employment and Social Protection 2007, Government Gazette years: 2008, 2009, 2010, 2011b, 2012b and 2013, (author's calculations)
[a]Immigrants to be employed the following year

Table 2 Demand for seasonal non EU immigrants per prefecture at the end of the year[a]

Prefectures	2007	2008	2009	2010	2011	2012
Imathia	7,482	9,156	7,829	7,692	5,472	965
Pella	8,587	5,913	6,270	6,365	5,420	574
Pieria	5,076	4,433	3,876	3,777	2,551	304
Kozani	964	372	609	692	174	114
Kavala[b]	1,399	701	631	611	307	175
Kastoria	815	681	642	518	295	98
Salonika	608	629	615	422	233	179
Larisa	1,130	424	540	327	228	35
Halkidiki	617	183	376	317	186	151
Florina	340	197	265	260	155	108
Grevena	504	361	306	191	110	28
Serres[b]	1,684	223	259	150	9	20
Magnisia	347	133	152	135	120	64
Karditsa	340	194	170	95	23	14
Thesprotia	94	96	96	95	37	15
Evros[b]	679	190	147	84	39	37
Kilkis[b]	172	183	236	80	61	29
Xanthi[b]	297	90	53	67	50	33
Chania	400	116	70	53	30	25
Drama[b]	332	321	129	42	32	11
Etoloakarnania	72	61	61	22	9	6
Trikala	66	54	44	19	19	7
Rodopi[b]	368	65	23	18	19	14
Rest of Greece	4,371	3,695	2,263	2,234	1,539	1,261
Total Greece	36,744	28,471	25,662	24,266	17,118	4,267

Source: Idem. Table 1
[a]Immigrants to be employed the following year
[b]Prefectures adjacent to Bulgaria

Structure of the Demand Per Prefecture

Employers' demand for third-country nationals is observed in all prefectures. This demand is not homogenous within prefectures; on the contrary, a very strong concentration is noticed in some prefectures in northern Greece. Three prefectures in the Region of Central Macedonia, Imathia, Pella and Pieria, accumulate between 50 % and 70 % of the demand for immigrants during the examined period (calculations based on the data of Table 2). As a percentage of the total number of immigrants, their proportion of the demand grew considerably from 2008 onwards, when Bulgarian immigrants were no longer registered as third-country nationals. Therefore, these three prefectures accumulate more than 2/3 of invited Albanian immigrants, (Table 2). However, contrary to previous years, in 2012, the three prefectures accumulate only 43.2 % of this population, due to the substantial drop in demand, particularly for this year.

The number of invited seasonal immigrants is quite significant compared to the labor forces in these prefectures. According to the Ministry of Macedonia and Thrace (2013), in 2007, the economically active population in Imathia was 65,400, in Pella 62,200 and in Pieria 58,200 (Ministry of Macedonia and Thrace 2013). Thus, the average number of seasonal immigrants during the examined period was 9.8 % of the economically active population in Imathia, 5.3 % in Pella and 9.5 % in Pieria.

The three primary labor demanding prefectures, Imathia, Pella and Pieria, are among the most important agricultural areas in Greece. All three are very significant producers of fruit and legumes, and Pieria of tobacco as well. The demand for third-country nationals for dependent and more particularly for seasonal occupation is related to agricultural work. Two issues merit examination: is this demand for foreign workers, mainly Albanians, influenced by unemployment and does the previous year's evolution of specific agricultural products influence this demand? These questions refer particularly to the primary labor demanding prefectures, Imathia, Pella and Pieria.

The Demand for Seasonal Immigrants and Unemployment at the Most Interested Prefectures

The growth of unemployment could provoke a decrease in the demand for foreign workers and regions with high unemployment could eventually cease to demand foreign workers, seasonal or dependent.

In the examined period, the official unemployment numbers in Greece present continuous growth, except for the year 2008. This becomes most significant during the two last years, 2011 and 2012 (Table 3).

Employers' requests for third-country workers also decreased during the same period albeit in irregular stages that register three substantial decreases, in 2008,

Table 3 Unemployment and demand for seasonal non EU immigrants in Greece, (%)[a]

	2007	2008	2009	2010	2011	2012
Unemployment	8.3	7.6	9.5	12.5	17.7	24.2
Demand evolution (%)		−22.5	−9.9	−6.2	−28.9	−75.1

Source: Idem. Table 1 and National Statistical Service of Greece, letter to author, 2011, and Hellenic Statistical Authority 2013
[a]Immigrants to be employed the following year

2011 and mainly in 2012. To a certain degree, particularly in 2011–2012, this drop in demand followed the unemployment trends (Table 3).

To argue whether the rise in unemployment determined the evolution of the demand for foreign seasonal workers, we have to examine the three main host prefectures of this immigrant population. We would expect that a low unemployment rate in these prefectures would provoke a demand for foreign workers in order to cover the scarcity of available native Greek employees. We observe, on the contrary, that unemployment rates, especially in Pieria and Imathia, are higher than the national rate for some years, during the period 2007–2012, (Table 4). Furthermore, in 2012, the year with a very sharp drop in demand for seasonal immigrants, unemployment in Imathia and Pella was lower than the national average, whereas in Pieria, it was close to the national one (Table 4).

These observations show that unemployment is not a determining factor for the demand for foreign seasonal workers. There is even a paradox that the areas with high unemployment are the main applicants for seasonal immigrant workers. An explanation for this paradox is the unwillingness of local Greek unemployed workers, especially those laid off from jobs in industry, to be employed in agricultural work, which is considered to be strenuous work and badly paid.[3]

Employers' Demand and Agricultural Production in the Primary Labor Demanding Prefectures

The primary labor demanding prefectures, Imathia, Pella and Pieria, are significant fruit producers in Greece. Imathia is a significant producer of peaches, cherries, apples and kiwifruit; Pella of peaches, cherries, apples and asparagus; and Pieria of kiwifruit, tobacco, peaches, cherries and watermelons. Furthermore, the prefecture of Pieria employs the immigrant population for activities related to tourism since Pieria is a coastal area. Agricultural production needs seasonal manpower that can be provided by third-country immigrants; as a consequence, the three prefectures have been the primary labor demanding areas for this immigrant population. A question to be answered is whether fluctuations in production could explain growth

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[3] Author's interview with the Immigration Offices in Imathia (7th July 2010), Pella (8th October 2010), Pieria (11th October 2010).

Table 4 Unemployment and demand for seasonal non EU immigrants in the three primary labor demanding prefectures at the end of the year[a]

Prefectures		2007	2008	2009	2010	2011	2012
Imathia	Unemployment rate (%)	12.9	9.2	7.9	11.3	14.5	20.1
	Demand for immigrants	7,482	9,156	7,829	7,692	5,472	965
Pella	Unemployment rate (%)	8.9	6.2	6.7	8.9	15.0	22.6
	Demand for immigrants	8,587	5,193	6,270	6,365	5,420	574
Pieria	Unemployment rate (%)	9.2	10.0	9.4	13.6	22.7	25.0
	Demand for immigrants	5,076	4,433	3,876	3,777	2,551	304
Sub total	*Demand for immigrants*	*21,145*	*19,502*	*17,975*	*17,834*	*13,443*	*1,843*
	Proportion of total demand (%)	*57.5*	*68.5*	*70.0*	*73.5*	*78.5*	*43.2*
Greece	Unemployment rate (%)	8.3	7.6	9.5	12.5	17.7	24.2
	Demand for immigrants	36,744	28,471	25,662	24,266	17,118	4,267
	Demand evolution (%)		−21.4	−11.2	−6.2	−28.9	−75.1

Source: Idem. Table 1 and Hellenic Statistical Authority (2011)
[a]Immigrants to be employed the following year

or decrease in demand. Up until 2010, no strong connection appears between the fluctuation of estimated production and the demand for seasonal immigrants (Karafolas 2012). In 2011, and more particularly in 2012, when a huge decrease in demand for immigrant labor is observed, estimations concerning the principal agricultural products do not show notable fluctuations in production and more specifically, no decrease in production is predicted; on the contrary, a moderate growth in these agricultural productions was estimated (see Incofruit 2011 for summer fruit and Agrotype 2012 for kiwifruit). Therefore, a change in the needs for seasonal manpower was not predicted for agricultural production.

The Impact of New Measure on Employers' Obligations

The first significant decrease in demand for immigrant labor was observed in 2011; this was followed by a huge decrease in 2012. What is the reason for this decrease in the demand for seasonal immigrants? Unemployment is not the decisive cause, particularly in the three primary labor demanding prefectures. Estimations concerning the agricultural production for the following year forecast an increase in the agricultural production related to the immigrants' occupations, which would lead to an increase rather than a decrease in the demand for immigrant labor. One explanation for the decrease in demand may be linked to the new law 215/2011, which obliges employers to pay a fixed amount of 150 euros as well as insurance costs for every immigrant they request for the period in question. These expenses seemed considerable and even prohibitive for many employers, making it impos-

sible for them to accept all the seasonal immigrants they had asked for.[4] As a consequence, the final number of seasonal immigrants accepted by employers during the harvesting period of 2012 was much lower than what they had asked for in September-October 2011. For this reason the Greek authorities revised the demand number of seasonal immigrants for 2012 to a number much lower than the employers' demands.[4] Nevertheless, the question that remains is whether the number of seasonal immigrants requested by the Greek authorities for 2013 is sufficient to cover the manpower needs for agricultural work in the three primary labor demanding prefectures? And if not, are there any immigrants to cover this need? The answer is that the necessary manpower is provided either by permanent immigrants in Greece in these regions or by immigrants visiting Greece as tourists; they are allowed to have a visa for 2 months that can be used for seasonal work, mainly in agriculture, even if this is considered undeclared and therefore illegal work. Another question remains, which is why this work is not covered by indigenous workers. Reports and studies (see Christou 2012 and Karafolas 2012), as well as interviews with local employers and immigration offices show the indifference or unwillingness of the unemployed population in this regard; reasons for this unwillingness include the status of the agricultural worker, in comparison to the educated population, the uncertainty of this type of employment, the relatively strenuous nature of agricultural work, and the low wages. In addition to all these reasons, there is inadequate information available from unemployment offices in the big urban centers, more specifically Athens and Thessaloniki, with the latter to be the nearest big city to the three primary labor demanding prefectures.[5]

Conclusion

This paper has investigated the annual evolution of the demand for seasonal foreign labor by Greek employers and the eventual influences the crisis had on this demand. Since 2005, this demand has determined the entry of legal third-country immigrants. The clear formulation of employers' requests for manpower was a result of enforcing Greek legislative measures in order to deal with illegal immigration in Greece. This was set out mainly by Law 3386/2005, which was followed by several other laws and decrees. The entry of third-country nationals mainly concerns seasonal immigrants, who are primarily Albanians. Till the end of 2008, a proportion of these immigrants were Bulgarians, located mainly in the prefectures bordering Bulgaria. Another limited proportion concerns Egyptian immigrants, who work exclusively in the fishing industry. Thus, Albanians constitute the majority of the

(continued)

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[4] This opinion was expressed by the Immigration Offices in Imathia and Pella. Interview with the author (April 2013).

[5] Author's interview with the Immigration Offices in Pella (April 2013).

employers' immigrant workforce and they are employed mainly in the agricultural sector, particularly in crop production.

The investigation showed a decline in this demand during the examined period, 2007–2012. The total number of immigrants requested reached 24,000 in 2010 before the huge drop in 2011 and more particularly 2012; in that year, the demand dwindled to 4,200 seasonal immigrants.

The investigation was focused at a prefecture level in order to have more qualitative results. It showed that three prefectures in Central Macedonia, Imathia, Pella and Pieria accumulate 70 % of the national demand for foreign labor and that, almost exclusively, they ask for Albanian immigrants. This demand is primarily concerned with employment in the farming sector, for the cultivation and harvesting of specific agricultural products, for certain months of the year, mainly in summer and autumn.

Analysis of data in these three prefectures showed that agriculture remains the determining factor in the demand for foreign seasonal workers. Though it could be expected, unemployment does not play a determining role. In the main foreign labor demanding prefecture, Pieria, especially, unemployment is much higher than it is at a national level. This phenomenon may seem to be a paradox but it can be explained by the reluctance of unemployed industrial workers to work in the agricultural sector.

At the present time, the economic crisis appears to have only a limited influence on the demand for foreign labor since this concerns seasonal work, for a limited time period and for specific agricultural jobs, where there is no local manpower available or interested in taking up such jobs. On the contrary, new legislative measures that have obliged employers to pay a fixed amount for every immigrant they request and, in addition, to prepay all insurance costs for each of these immigrants for the whole period of their employment (by means of a new measure every 2 months) seem to be the most decisive factor that prorogued a huge decrease for this demand. Even so, the need for manpower to cover the agricultural work remains; this need is covered by the permanent immigrant population and through illegal employment of those arriving in Greece as tourists.

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Part II
Risk Management, Agriculture

A Country's Process of Development as Described by a Cusp Catastrophe Model

The Case of Eastern European and Baltic Countries

Vasilis Angelis, Athanasios Angelis-Dimakis, and Katerina Dimaki

Abstract For a long of time a country's development has been synonymous with its economic growth and GDP per capita has been the main indicator expressing a country's prosperity. Over the last years, however, economies and societies have been undergoing dramatic changes. Globalization, international integration, technological innovation and mobility of capital have changed the picture and make it extremely difficult to predict the future of countries. Economic changes test the ability of all countries to compete and the gap between leading and lagging countries in terms of growth, income and employment may be widening. Social changes test the ability of states and governments to provide an appropriate social framework for their people. Environmental factors test the ability of national and local governments to manage resources in a sustainable manner and to maintain and improve the quality and safety of life. These changes have led to a modification of the targets of development and to the acceptance that the concept of development has to embody human well-being alongside with economic growth. Sustainable development refers to the ability of our societies to meet the needs of the present without sacrificing the ability of future generations to meet their own needs. Measuring sustainable development means going beyond a purely economic description of human activities; requires integration of economic, social and

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environmental concerns. In other words, sustainable development means ensuring economic efficiency while respecting social equity and safeguarding ecological integrity. New techniques are required in order to benchmark performance, highlight leaders and laggards on various aspects of development and facilitate efforts to identify best practices. New tools have to be designed so as to make sustainability decision-making more objective, systematic and rigorous. Many tools and methodologies have been used over the past years to measure the progress towards sustainability. The majority of those methodologies make use of a single indicator in order to measure separately the evolution of each component i.e. the economic, the social and the environmental. Our objective in the present paper is to (a) outline the process of a country's development taking into account all its three dimensions, economic, social and environmental; (b) present a model for quantifying its process of development encompassing all those dimensions; (c) apply the model to Eastern European and Baltic countries and (d) discuss the results.

1 Introduction

A country's process of development is a multi-dimensional concept, including economic, social and environmental perspectives. In the early stages of a country's life, development is synonymous to economic growth. However, as the development process progresses, the role of the social factors is gradually strengthened and in some cases becomes decisive. Environmental factors are usually the last to be considered when people realize that the rapid growth of the socioeconomic subsystem has begun to overload some of the capabilities of the ecosystem locally as well as globally.

The present paper outlines the process of a country's development taking into account all its three dimensions: economic, social and environmental. Furthermore, a model is presented for quantifying its process of development encompassing all those dimensions. Finally, this model is applied to Eastern European and Baltic countries and the obtained results are discussed.

2   The Changing Role of the Economic, Social and Environmental Dimensions in Sustainable Development

The concept of development is used to express the achievements or the positive changes in the basic elements of human socio-economic behaviour. Those who seek for a scientific definition for development disregard the fact that development is not only a technical subject. It has an important ideological content and reflects a strong set of values. Thereby the term development is identified in the twentieth century with the terms economic growth and industrialisation. Economic policies have typically measured development with the growth of per capita income or consumption.

Sustainable development is not a new concept. J.A. Du Pisani (2006) points out that, as early as the ancient Egyptian, Mesopotamian, Greek and Roman civilizations, environmental problems such as deforestation, salination and loss of soil fertility occurred, which we would today refer to as sustainability problems. Plato in the fifth century BC, Strabo and Columella in the first century BC and Pliny the Elder in the first century AD discussed different types of environmental degradation resulting from human activities such as farming, logging and mining. These authors were not only aware of environmental degradation, but also recommended what we call sustainable practices to maintain the "everlasting youth" of the earth. J.S. Mill (1883), one of the great economists of the nineteenth century showed his concern by focusing on issues such as the ultimate point to which society is tending by its industrial progress and the conditions mankind will have to face when this progress seizes. Many years later, R. Solow (1991), another leading and Nobel prize winner economist, focusing on the same subject, stated that sustainability must be understood as an obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are. Furthermore, he urged the decision makers to take all the measures needed to ensure a distributional equity between the present and the future.

Today, the territorial organisation of economies and societies is undergoing dramatic change. Sustainable development is a strategy by which communities seek economic development approaches that also benefit the local environment and quality of life. It provides a framework under which communities can use resources efficiently, create sufficient infrastructures, protect and enhance quality of life, and create new businesses to strengthen their economies. It can help us create healthy communities that can sustain our generation, as well as those that follow us.

Environmental degradation is one of the basic problems most countries around the world are facing today. Furthermore, it has been found that one of the main causes of this problem is their fast economic growth. Obviously this finding raises a very important point, as fast economic growth has, for many years, been considered as the centrepiece of a country's progress. Hence, the concept of development has to be reconsidered. A new environmental aspect of development may be added to

the economic and social ones and the blending of all three dimensions in defining sustainable development over time should be examined. The changing role of these three dimensions is briefly outlined below.

In the 1950s and 1960s the focus of economic progress was on growth and increase in output, based mainly on the concept of economic efficiency. Environment was not yet taken into account since it didn't seem to affect the economic performance.

By the early 1970s the large and growing numbers of poor in the developing world led to greater efforts of directly improving income distribution. The development paradigm shifted towards equitable growth, where social objectives were recognized as distinct from and as important as economic efficiency. The end of this decade also marks the appearance of environment as a new factor affecting economic activity but with limited importance. Environmental threats are conceived of as local in time and space, and hence easy to overcome. Furthermore, at that time, economic growth and environmental quality were largely perceived as opposing each other.

Protection of the environment is the emerging strong new concern in the next decade. At that time the importance of reconciling economic growth with the environment had come to be generally recognized providing an intellectual underpinning to efforts to elevate the importance of environmental issues in policy making. By the early 1980s protection of the environment has become the third objective of development showing that environmental degradation was a major barrier to progress. The concept of sustainable development has therefore evolved to encompass three major points of view: economic, social and environmental. Furthermore by the end of the decade environmental concern is for the first time integrated into the business decision making process.

In the 1990s and at the beginning of the twenty-first century, the crucial role of the environmental dimension and its increasing contribution to sustainable development has been further established. Environmental matters are considered to be a major component of the wider economic activity. Furthermore, environmental threats are now perceived as emerging on a very large scale, often related to socio-economic turbulent factors and requiring immediate corrective action.

Measuring sustainable development means going beyond a purely economic description of human activities and integrates economic, social and environmental concerns. In other words, sustainable development means ensuring economic efficiency while respecting social equity and safeguarding ecological integrity. Many tools and methodologies have been used over the past years to measure the progress towards sustainability (Munda 2006; Karol and Brunner 2009; Yigitcanlar and Dur 2010). The majority of those methodologies make use of a single indicator in order to measure separately the evolution of each component i.e. the economic, the social, the environmental. The criteria, according to which indicators are selected for measuring sustainable development, are exhaustive in literature (Barrios and Komoto 2006; Singh et al. 2009). In conclusion, it can be said that measuring sustainable development requires at a minimum integration of economic, social and environmental concerns. This is not an easy task and requires

the design of a specific tool. In this paper, we introduce the concept of a country's image, a measure of its overall progress towards sustainable development, which encompasses all the three dimensions and suggest ways of measuring it.

3 The Concept of a Country's Image

The term image is currently used in a variety of contexts. Image is a sum of beliefs, ideas and impressions. It is the total impression an entity makes on the minds of people, and exerts a powerful influence on the way people perceive things and react to them (Dowling 1998; Dichter 1985). Relevant literature suggests that image is important in this process and identifies different types, including projected and received entity images (Kotler et al. 1993). Projected place images can be conceived as the ideas and impressions of a place that are available for people's consideration. This type of images reach people by an image transmission or diffusion process through various channels of communication, which themselves can alter the character of the message. The received place images are formed from the interaction between these projected messages and people' own needs, motivations, prior knowledge, experience, preferences, and other personal characteristics. In this way people create their own unique representations or mental constructs, resulting in their own personal images of a place (Ashworth and Voogd 1990; Gartner 1993; Bramwell and Rawding 1996).

In this paper, image is defined in a slightly different way, as a function of objectively measured factors, which influence people. It is clear that a country's image, based on objectively measured factors and expressing its current state of development, may be improved through marketing and promotion activities. Nevertheless, it is believed that the impact of those activities on the country's image is temporary and limited and the only lasting effect is the objective improvement of the various attributes of this image.

Different people hold quite different images of the same place. Because a country consists of a number of groups of people that have a different type of interaction with it, each of these groups is likely to have a different image of the particular country. Hence, a country does not have an image, but multiple images (Dowling 1998).

Based on the above, it can be said that at each stage of the process of a country's development we can observe its image. In other words, it can be argued that, at each point in time, the country "sends out" its image and, depending on its impact on the people, the country may be considered attractive or non attractive. One may also argue that since people "receiving" the image of the country belong to various distinct groups and are sensitive to different factors, the impact of the country's image on the members of each particular group will be different (Kotler et al. 1999; Bryson and Daniels 2007).

Whilst this argument is plausible, the available evidence suggests that all groups of people react similarly to a basic set of factors; more precisely, a set of minimum

standards, largely common to all groups, must be satisfied if the country is to be considered attractive.

To reconcile these two views we refine the concept of a country's image by introducing the following two concepts: the Basic Image and the Specific Image.

- The Basic Image of a given country measures the degree to which the country satisfies a set of basic criteria, common for all people.
- The Specific Image of a given country, as perceived by a particular group of people, measures the degree to which people belonging to that particular group consider the country as their first preference.

The remainder of this paper will focus on a country's Basic Image, a summary measure of its current state of development and future prospects as perceived by all groups of people. A physically realizable measure for the Basic Image is difficult to find. What may be measured more easily, are the net changes in the values of a number of economic welfare indicators. However, those measurable changes may be generally considered the delayed and smoothed consequence of prior changes in the Basic Image. Hence, the study of the mechanisms governing the shaping and the changes of a country's Basic Image is a task of imperative importance.

On the basis of all the above, the Basic Image of a country may be defined as a function of a number of variables which may be divided into two sets, according to whether they express the economic or the social/environmental function of the country.

The factors of the first set (e.g. Financial Conditions, Employment Conditions, Research and Development Conditions) provide a measure of the country's economic development prospects. This measure is referred to as the *Economic Indicator of country i* (IND_i^1) Similarly, the factors of the second set (e.g. Housing Conditions, Education Conditions, Social Conditions, Environmental Conditions) provide a measure of a country's social profile. This measure is referred to as the *Social Indicator of country i* (IND_i^2) Hence, a country's Basic Image is a function of those two Indicators, i.e. Basic Image $= \varphi(IND_i^1, IND_i^2)$.

At this point it should be mentioned that the growth of a country may be expressed both in absolute or relative terms. In the latter and most interesting case, the development pattern of a given country is compared to that of a hypothetical country, which is referred to as the "typical" country and expresses, as far as possible, an average of the main countries of a similar type to that under study. In this paper, we shall be looking at the relative development patterns of a country. Hence, all the factors affecting its Basic Image should be expressed in relative terms as compared to the corresponding values of the "typical" country.

We have so far defined a country's Basic Image as a function of two indicators. In order to get a first feeling of the shape of its graph we start by stating the following simple observations describing the way in which the two indicators operate.

1. The higher the Economic Indicator of a country, the more attractive its Basic Image.

2. The higher the Social Indicator of a country, the more attractive its Basic Image.
3. If the Economic Indicator of a country is continuously increasing but, at the same time, its Social Indicator is continuously decreasing, the Basic Image of the country may be either attractive or non attractive and sudden changes in its state may be expected.

Observation (3) is the most interesting because it implies that the graph we want to draw may be discontinuous. Furthermore, the available evidence shows that sustainability issues are characterized by a high degree of conflict. In the 1980s, the awareness of actual and potential conflicts between economic growth, social progress and preservation of the environment led to the concept of sustainable development. Since then, all governments have declared, and still claim, their willingness to pursue economic growth under the flag of sustainable development although often development and sustainability are contradictory terms. The concept of sustainable development has wide appeal because it carries the ideal of a harmonization or simultaneous realization of economic growth, social progress and environmental concerns (Munda 2005). Sustainable development aims to achieve simultaneously environmental system goals (genetic diversity, resilience, biological productivity), economic system goals (satisfaction of basic needs, enhancement of equity, increasing useful goods and services), and social system goals (cultural diversity, institutional sustainability, social justice, participation). This definition correctly points out that sustainable development is a multidimensional concept, but as our everyday life teaches us, it is generally impossible to maximize different objectives at the same time and compromised solutions must be found (Barbier 1987).

When dealing with sustainability issues no reductionism, economic, social or environmental is possible. A reductionist approach for building a model can be defined as the use of just one measurable indicator (e.g. GDP per capita), one dimension (e.g. economic), one objective (e.g. the maximization of economic efficiency) and one time horizon. If one wants to avoid reductionism, there is a clear need to take into account incommensurable dimensions using the proper techniques so as to reach a solution.

As a tool for conflict management, multi-criteria evaluation has demonstrated its usefulness in many sustainability policy and management problems (see e.g. Romero and Rehman 1989; Nijkamp et al. 1990; Beinat and Nijkamp 1998; Janssen 1992; Munda 1995, 2005, 2006; Munda et al. 1998; Ringius et al. 1998; Janssen and Munda 1999; Hayashi 2000; Bell et al. 2001; Munda and Nardo 2009). In this paper, in order to model the process of shaping a country's Basic Image involving the conflict between the various dimensions of development we use a different tool, Catastrophe Theory. The same tool has been used in modeling the process of shaping a region's Basic Image (Angelis and Dimaki 2011). Catastrophe Theory (Thom 1975; Zeeman 1973) is the general mathematical theory of discontinuous and divergent behavior from continuous underlying forces. The theory is derived from Topology and is based upon some new theorems in the geometry of many dimensions, which classify the ways in which discontinuities may occur, in

terms of a few archetypal forms, called elementary catastrophes (Poston and Stewart 1996). Although the underlying mathematics are difficult and the proofs of the theorems involved complicated, the elementary catastrophes themselves are relatively easy to understand and can be used effectively, even by non-experts in the subject. Catastrophe theory was developed and popularized in the early 1970s. After a period of criticism, it is now well established and widely applied (Rosser 2007). Today, the theory is very much alive and numerous nonlinear phenomena that exhibit discontinuous jumps in behavior have been modeled by using the theory, for instance in chemistry (e.g. Wales 2001), in physics (e.g. Aerts et al. 2003), in psychology (e.g. Van der Mass et al. 2003) in clinical studies (e.g. Smerz and Guastello 2008) and in the social sciences (e.g. Smith et al. 2005; Dou and Ghose 2006; Huang 2008).

Table 1 summarizes the elementary catastrophes in the case where a process is expressed through one behaviour variable depending on one up to four control variables. In the case of a process, for example, whose behaviour depends on two control variables, it is sufficient to know that a theorem exists giving the qualitative shape of a 3-dimensional surface, which shows all possible ways in which a discontinuity in the behaviour may occur. The two control variables are usually referred to as normal and splitting factor, respectively.

Returning to the present case, it must be reminded that the Basic Image of a country has been defined as a function of two potentially conflicting indicators. Therefore, according to Catastrophe Theory, the appropriate elementary catastrophe for its description is the Cusp Catastrophe Model (Thom 1975; Zeeman 1973; Gilmore 1993; Poston and Stewart 1996). More specifically, the value x_i, $i = 1,2,\ldots$ n, of the *ith* country's Basic Image, at each point in time, is given as a solution of the equation:

$$x_i^3 - Bx_i - A = 0$$

with,

$$\begin{cases} A = m\left(IND_i^1 - IND_0^1\right) + \left(IND_i^2 - IND_0^2\right) \\ B = \left(IND_i^1 - IND_0^1\right) - m\left(IND_i^2 - IND_0^2\right) \end{cases} \; if \, m \leq 1$$

and

$$\begin{cases} A = m\left(IND_i^1 - IND_0^1\right) + (1/m)\left(IND_i^2 - IND_0^2\right) \\ B = (1/m)\left(IND_i^1 - IND_0^1\right) - \left(IND_i^2 - IND_0^2\right) \end{cases} \; if \, m > 1$$

Equation (1) is referred to as the *Basic Image Equation* and IND_i^1 and IND_i^2 express the values of the two Indicators for the *ith* country, while IND_0^1, IND_0^2 express the values of those two Indicators for the "typical" country. The variable m expresses the relative weights attached to each one of the two indicators in defining the Basic Image (Angelis and Dimaki 2011).

Table 1 Some elementary catastrophes

Number of behavior variables	Number of control variables	Type of catastrophe
1	1	Fold
1	2	Cusp
1	3	Swallowtail
1	4	Butterfly

Table 2 The economic and social indicators of the *ith* country

$IND_i^1 = \sqrt[3]{\prod\limits_{j=1}^{3} SbI_{ij}^1}, \quad i = 1, 2, \ldots, n$		$IND_i^2 = \sqrt[3]{\prod\limits_{j=1}^{3} SbI_{ij}^2}, \quad i = 1, 2, \ldots, n$	
Where			
IND_i^1	The Economic Indicator of country i	IND_i^2	The Social Indicator of country i
SbI_{i1}^1	The Financial Conditions Sub indicator of country i	SbI_{i1}^2	The Education Conditions Sub indicator of country i
SbI_{i2}^1	The Employment Sub indicator of country i	SbI_{i2}^2	The Housing Conditions Sub indicator of country i
SbI_{i3}^1	The R & D Sub indicator of country i	SbI_{i3}^2	The Social Conditions Sub indicator of country i
		SbI_{i4}^2	The Environmental Conditions Sub indicator of country i

For the purposes of this work, the values of all Indicators lie in the interval [0,1], whereas the value of the Basic Image lies in the interval [−1,1]. The value of the "typical" country's Basic Image is 0. Hence, positive Basic Image indicates an attractive country. Furthermore, each of those Indicators is expressed as the geometric mean of several Sub indicators, as shown in Table 2.

A clear overview of the variables affecting a country's Basic Image and their conversion through Sub-Indices, Relative Sub indices, Relative Indices and Sub indicators into the two Indicators, Economic and Social, which eventually determine the country's Basic Image, is given in Tables 3 and 4, respectively.

4 Application of the Proposed Model

The methodology presented in the previous section has been used for the estimation of the Basic Image for 15 Eastern European and Baltic countries (Fig. 1) over the period 2000–2010. The results are summarized in Tables 5, 6, and 7 and Figs. 2, 3, and 4.

Table 5 and Fig. 2 present the Economic Indicator values for all 15 countries over the period 2000–2010 and the following conclusions may be drawn:

- Austria has by far the highest Economic Indicator values, which remain around 0.67 throughout the period under study.

Table 3 Conversion of the variables affecting the Economic Indicator of the *ith* country

Sub indicators	Relative Indices	Relative Sub indices	Sub-indices	Variables
The Financial Conditions Sub indicator SbI_{i1}^1	Relative Financial Conditions Index RI_{i1}^1	Relative Sub index for gross domestic product per inhabitant $\left(RSI_{i1_1}^1\right)$	Sub index for gross domestic product per inhabitant $SI_{i1_1}^1$	Gross domestic product
				Population
		Relative Sub index for energy expenditure per inhabitant $\left(RSI_{i1_2}^1\right)$	Sub index for energy expenditure per inhabitant $SI_{i1_2}^1$	Energy expenditure
				Population
The Employment Sub indicator SbI_{i2}^1	Relative Employment Index RI_{i2}^1			Persons aged 20–64 in employment
				Population of the same age group
The R & D Sub indicator SbI_{i3}^1	Relative R & D Index RI_{i3}^1			Gross domestic expenditure on R&D
				Gross domestic product

- Slovenia and Czech Republic follow Austria and their Economic Indicator values remain around 0.55 throughout the period. Estonia and Hungary are also close with Economic Indicator values around 0.50.
- All the remaining countries have Economic Indicator values between 0.40 and 0.47 throughout the period.

Table 6 and Fig. 3 present the Social Indicator values for all 15 countries over the period 2000–2010 and the following conclusions may be drawn:

- Austria has, again, by far the highest Social Indicator values, which remain around 0.65 throughout the period under study.
- Slovenia and Latvia follow Austria and their Social Indicator values remain over 0.5 throughout the period.
- Greece, Lithuania and Croatia form a third group of countries with Social Indicator values over 0.4 throughout the period.
- All remaining countries begin with Social Indicator values slightly below 0.4 and end up with values just over 0.4. The only exception is Bulgaria, with Social Indicator values below 0.4 throughout the period.

Table 4 Conversion of the variables affecting the Social Indicator of the *ith* country

Sub indicators	Relative Indices	Relative Sub indices	Sub indices	Variables
The Education Sub indicator SbI_{i1}^2	Relative Education Index RI_{i1}^2	Relative Sub index for persons with upper secondary or tertiary education $\left(RSI_{i1_1}^2\right)$	Sub index for persons with upper secondary or tertiary education $\left(SI_{i1_1}^2\right)$	Persons with upper secondary or tertiary education (15–64 years)
				Population of the same age group
		Relative Sub index for public expenditure on education $\left(RSI_{i1_2}^2\right)$	Sub index for public expenditure on education $\left(SI_{i1_2}^2\right)$	Public expenditure on education
				Gross domestic product
The Health Sub indicator SbI_{i2}^2	Relative health Index RI_{i2}^2	Relative Sub index for public expenditure on health $\left(RSI_{i2_1}^2\right)$	Sub index for public expenditure on health $\left(SI_{i2_1}^2\right)$	Public expenditure on health
				Gross domestic product
		Relative hospital beds Sub index $\left(RSI_{i2_2}^2\right)$	Sub index for hospital beds $\left(SI_{i2_2}^2\right)$	Hospital beds (per 100,000 inhabitants)
The Social Conditions Sub indicator SbI_{i3}^2	Relative Social Conditions Index RI_{i3}^2			Social protection expenditure
				Population
The Environmental Conditions Sub indicator SbI_{i4}^2	Relative Renewable Energy Sources (RES) Index (RI_{i4}^2)	Relative Sub index for share of RES in electricity generation $\left(RSI_{i1_1}^3\right)$	Sub index for share of RES in electricity generation $\left(SI_{i1_1}^3\right)$	Share of RES in electricity generation
		Relative Sub index for share of RES in gross FEC $\left(RSI_{i1_2}^3\right)$	Sub index for share of RES in gross FEC $\left(SI_{i1_2}^3\right)$	Total RES consumption
				Total FEC
	Relative energy efficiency Index (RI_{i5}^2)			Gross inland consumption of energy
				Gross domestic product
	Relative climate change Index (RI_{i6}^2)			Total greenhouse gas emissions
				Population

Fig. 1 The 15 Eastern
European and Baltic
countries

Table 7 and Fig. 4 present the Basic Image values for all 15 countries over the period 2000–2010 and the following conclusions may be drawn:

- Only three countries Austria, Slovenia and Greece show positive Basic Image values throughout the period under study. More specifically, Austria has by far the highest Basic Image values, which remain over 0.7 throughout the period and it is followed by Slovenia, with a Basic Image value between 0.5 and 0.56 throughout the period. Finally, Greece begins with a Basic Image value around 0.16, and ends up with a Basic Image value just above zero.
- Latvia begins with a positive Basic Image value around 0.17, which remains positive up to the last year when it becomes marginally negative.
- Croatia begins with a positive Basic Image value around 0.3, which turns negative in 2006, positive again in 2008 and finally negative in 2009 and thereafter.
- All remaining countries have negative Basic Image values throughout the period under study, with Lithuania being the leader in this group with a Basic Image value of around 0.25, and Bulgaria the laggard with a Basic Image value below −0.5 throughout the period.

Table 5 The Economic Indicator of the 15 Eastern European and Baltic countries, 2000–2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Bulgaria	0.478	0.454	0.462	0.466	0.469	0.470	0.479	0.477	0.475	0.478	0.483
Czech Rep	0.545	0.534	0.530	0.537	0.536	0.548	0.557	0.558	0.543	0.541	0.544
Estonia	0.470	0.476	0.480	0.489	0.499	0.509	0.532	0.525	0.535	0.533	0.540
Greece	0.469	0.465	0.466	0.471	0.467	0.473	0.477	0.474	0.467	0.470	0.467
Cyprus	0.447	0.443	0.450	0.461	0.460	0.465	0.472	0.470	0.464	0.475	0.478
Latvia	0.439	0.427	0.434	0.438	0.443	0.465	0.481	0.465	0.459	0.438	0.452
Lithuania	0.462	0.463	0.466	0.473	0.482	0.484	0.488	0.490	0.477	0.473	0.468
Hungary	0.492	0.495	0.498	0.495	0.486	0.493	0.504	0.497	0.494	0.507	0.503
Austria	0.678	0.675	0.676	0.679	0.672	0.676	0.672	0.673	0.674	0.675	0.675
Poland	0.458	0.441	0.433	0.442	0.445	0.446	0.451	0.454	0.452	0.467	0.468
Romania	0.473	0.470	0.460	0.464	0.460	0.452	0.458	0.456	0.459	0.455	0.455
Slovenia	0.563	0.565	0.564	0.548	0.560	0.564	0.571	0.565	0.574	0.577	0.584
Slovakia	0.475	0.464	0.455	0.459	0.446	0.448	0.451	0.446	0.441	0.436	0.451
Croatia	0.487	0.479	0.486	0.490	0.500	0.481	0.470	0.477	0.481	0.470	0.457
Turkey	0.414	0.431	0.431	0.428	0.429	0.435	0.441	0.453	0.454	0.463	0.459
Typical	0.490	0.485	0.486	0.489	0.490	0.494	0.500	0.499	0.496	0.497	0.499

Table 6 The Social Indicator of the 15 Eastern European and Baltic countries, 2000–2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Bulgaria	0.332	0.327	0.340	0.354	0.359	0.366	0.367	0.360	0.366	0.376	0.384
Czech Rep	0.362	0.367	0.380	0.380	0.381	0.388	0.394	0.395	0.400	0.407	0.409
Estonia	0.371	0.369	0.374	0.373	0.375	0.380	0.384	0.381	0.396	0.409	0.401
Greece	0.463	0.458	0.463	0.481	0.477	0.485	0.496	0.487	0.484	0.486	0.497
Cyprus	0.383	0.385	0.401	0.416	0.415	0.419	0.420	0.415	0.421	0.427	0.443
Latvia	0.506	0.501	0.501	0.501	0.507	0.511	0.517	0.521	0.528	0.518	0.501
Lithuania	0.429	0.422	0.419	0.423	0.423	0.430	0.439	0.442	0.449	0.456	0.474
Hungary	0.380	0.387	0.401	0.416	0.421	0.437	0.438	0.442	0.443	0.440	0.442
Austria	0.655	0.652	0.646	0.641	0.639	0.636	0.641	0.649	0.647	0.646	0.638
Poland	0.370	0.386	0.388	0.390	0.392	0.399	0.399	0.402	0.412	0.412	0.413
Romania	0.388	0.391	0.398	0.398	0.405	0.418	0.418	0.429	0.436	0.437	0.437
Slovenia	0.530	0.527	0.517	0.521	0.520	0.513	0.514	0.508	0.509	0.519	0.518
Slovakia	0.386	0.387	0.393	0.391	0.392	0.397	0.407	0.426	0.423	0.436	0.436
Croatia	0.473	0.480	0.459	0.457	0.464	0.467	0.470	0.459	0.471	0.466	0.474
Turkey	0.396	0.396	0.390	0.408	0.414	0.412	0.412	0.410	0.408	0.404	0.409
Typical	0.428	0.429	0.431	0.437	0.439	0.444	0.448	0.448	0.453	0.456	0.458

Table 7 The Basic Image of the 15 Eastern European and Baltic countries, 2000–2010

|	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Bulgaria	−0.53	−0.56	−0.53	−0.51	−0.51	−0.51	−0.51	−0.53	−0.52	−0.51	−0.49
Czech Rep	−0.39	−0.38	−0.34	−0.36	−0.37	−0.34	−0.32	−0.30	−0.34	−0.33	−0.33
Estonia	−0.46	−0.45	−0.44	−0.45	−0.44	−0.44	−0.41	−0.43	−0.38	−0.34	−0.38
Greece	0.17	0.13	0.15	0.23	0.17	0.20	0.21	0.15	0.03	0.05	0.08
Cyprus	−0.45	−0.44	−0.40	−0.36	−0.37	−0.37	−0.38	−0.40	−0.40	−0.38	−0.33
Latvia	0.17	0.10	0.13	0.10	0.15	0.25	0.29	0.24	0.23	0.03	−0.04
Lithuania	−0.27	−0.30	−0.31	−0.31	−0.30	−0.29	−0.27	−0.25	−0.27	−0.26	−0.19
Hungary	−0.41	−0.37	−0.32	−0.29	−0.30	−0.21	−0.21	−0.21	−0.25	−0.23	−0.26
Austria	0.73	0.73	0.73	0.73	0.72	0.72	0.70	0.71	0.71	0.71	0.71
Poland	−0.47	−0.44	−0.45	−0.45	−0.45	−0.45	−0.46	−0.45	−0.44	−0.43	−0.44
Romania	−0.40	−0.40	−0.40	−0.41	−0.40	−0.39	−0.41	−0.38	−0.36	−0.37	−0.38
Slovenia	0.54	0.55	0.54	0.51	0.53	0.52	0.52	0.51	0.53	0.53	0.54
Slovakia	−0.41	−0.42	−0.42	−0.44	−0.45	−0.45	−0.44	−0.40	−0.42	−0.40	−0.39
Croatia	0.30	0.30	0.00	0.25	0.31	0.16	−0.12	−0.18	0.08	−0.21	−0.23
Turkey	−0.45	−0.43	−0.45	−0.42	−0.42	−0.43	−0.44	−0.43	−0.45	−0.46	−0.45
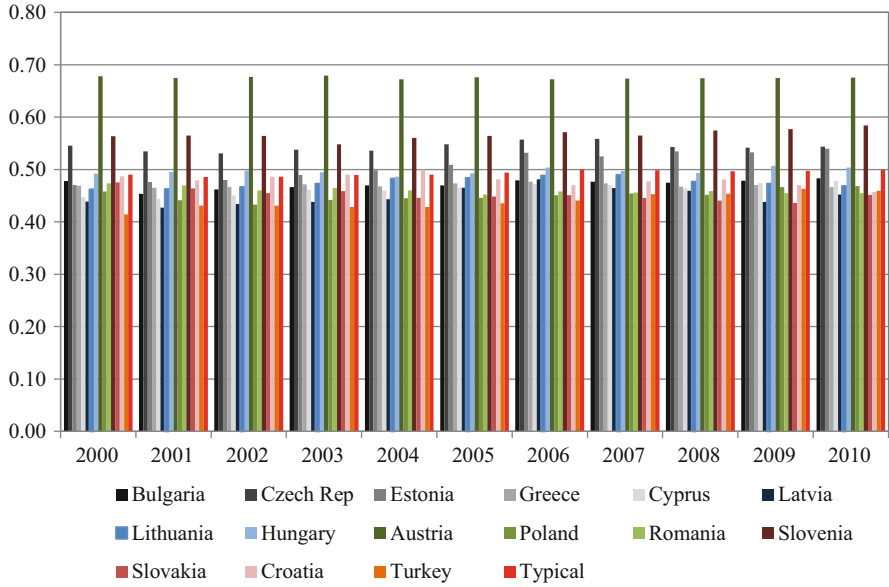
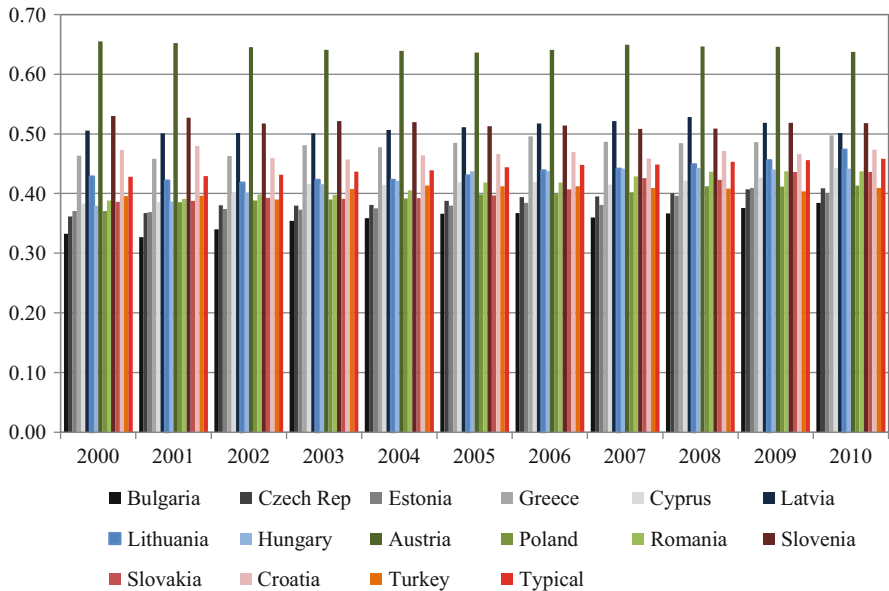**Fig. 2** The Economic Indicator of the 15 Eastern European and Baltic countries, 2000–2010

Fig. 3 The Social Indicator of the 15 Eastern European and Baltic countries, 2000–2010
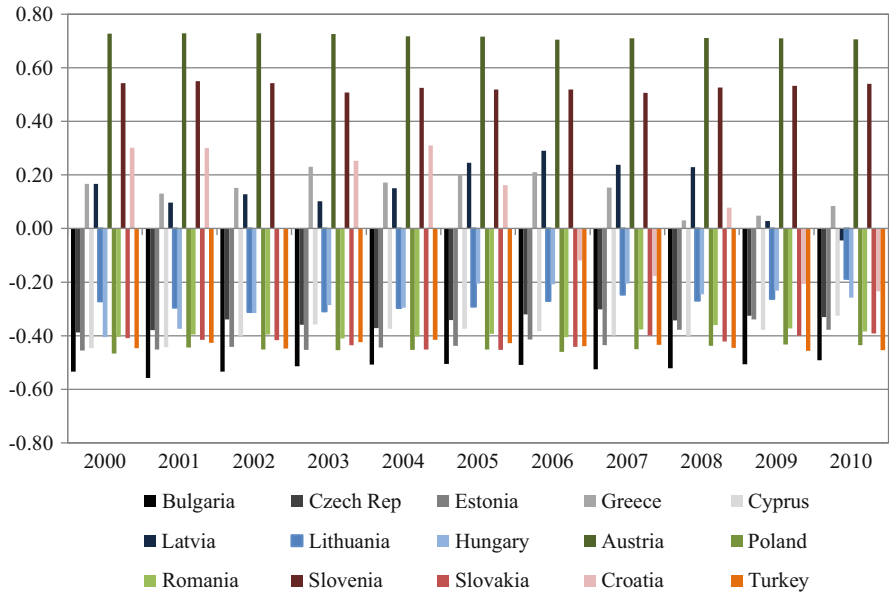
Fig. 4 The Basic Image of the 15 Eastern European and Baltic countries, 2000–2010

Conclusions and Suggestions for Further Research

A country's path of growth depends on its ability to tackle the conflicts characterizing sustainability issues. This ability is reflected on what we call the Image of a country, a measure expressing at each point in time the country's current state of development and its future prospects.

The paper introduced the concept of a country's Basic Image, developed a mathematical model for its estimation, applied the model to the case of 15 Eastern European and Baltic countries and presented the results. The Basic Image gives a "true" picture of a country's development and an early warning of any future problems. Furthermore, its structure allows a researcher to identify not only the changes in the Basic Image values, but also the causes of those changes and, hence, take the necessary measures. Consequently, the Basic Image may prove to be a very useful managerial tool, which can help the authorities to improve the country's attractiveness and future prospects of development.

The application results seem logical and expected. They show that the proposed model expresses a country's process of development in a realistic way, in the sense that it quantifies the country's appeal to the full range of people.

The Basic Image, as defined so far, has left out or underestimated a number of important variables, endogenous or exogenous. Hence, an area of further research would be to redefine a country's Basic Image, so as to include or upgrade some of those variables. A first set of such variables may be those related to the country's environmental conditions. A number of such factors have been taken into account in the Social Indicator. These factors, perhaps enriched, could be grouped and define a distinct indicator, which may be referred to as Environmental Indicator. A second set of variables may be those related to the prevailing socio-economic environment in which the country operates and could define a fourth indicator, which may be referred to as the General Economic Climate Indicator. As it has been mentioned already, in the case of three or four indicators the most appropriate elementary catastrophes are the Swallowtail and the Butterfly catastrophes, respectively. Hence, our task will be to examine how those elementary catastrophes may be used to model the enriched Basic Image.

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Catastrophic Risk in Local Government Units: Search for Optimal Risk Management

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Abstract The multiplicity of meanings of the word "risk" used in the literature and risk management standards lead us to a question about the possibility of creating a universal definition and its application in the risk management process and the implementation of the agreements of insurance. The authors point to the basic elements of such a definition. But above all, in the article the concept of risk in relation to local government units has been operationalized. Based on a survey, the authors made the identification of events that the head of local government units is afraid of. Additionally, there is specified level of losses that officials in charge of local governments consider catastrophic. Based on studies and analysis of government documents, the article demonstrates significant gaps in the identification and financing of catastrophic phenomena. Local government entities do not take action within the risk management process relating to catastrophic risks, even in the narrow sense, especially referring only to the effects of nature.

It should be noted that the application of the procedures of risk management has been imposed on local government by the Act of August 27, 2009, the Public Finance Act, which introduced the obligation for public sector entities management control, as one of its objectives is to provide the risk management.

The authors' risk management model is based on the concept of "risk owner", which was first defined in ISO 31000. This standard contains numerous links between risk management and the management of the entire organization. This relationship may involve both strategic and operational areas. Detailed activities are based on the separation of areas where risks are identified or created. In the next step the risk is assessed by a series of questionnaires and interviews with employees in a lower-level unit of local government. The end result is recommendations for further action, which should be consistent between different areas.

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1 Introduction

Nowadays the risk management process is seen as necessary in every-day functioning of every organization. It exists alongside normal management, based on specific frameworks of functioning. It is supposed to realise goals defined by an organization. However, optimal risk management standard requires proper preparation of a set of basic concepts. This study is an attempt of operationalization of the concept of risk based on a constructivist approach. The authors refer to weather hazards in the functioning of local government units in order to base the arguments on a particular case. Pilot studies were used conducted within the framework of the research project N N113 360740 "Risk management in the activities of local government units with particular emphasis on catastrophic risk".

2 Defining the Concept of "Risk"

For many years, reference books and practise have been based on the analysis of the concept of risk on the views defined by F. Knight. He perceived risk through the lens of probability. This means, that the uncertainty becomes a risk only if we have statistical data necessary to estimate the future. In such circumstances it is difficult to name all other phenomena a risk and they remain immeasurable (that is un certainty in the strict sense) (Knight 1921, p. 47). As a consequence, we can assume the existence of measurable uncertainty (risk) and immeasurable uncertainty (uncertainty in the strict sense). This division is based on the possibility or impossibility of the use of statistical measures to estimate uncertainty.

A huge mathematical apparatus was developed on the basis of this assumption.[1] The objective was to analyse probability and to draw specific conclusions on this basis. It causes a situation where we can name only two ways of defining the concept of risk[2] in this regard: risk as the probability of loss occurrence and risk as the probability of a result different than expected.

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[1] The studies of lawyers and economists were also based on these views: (Kowalewski 1994, p. 11).

[2] The Authors are aware of abundance and variety of risk estimating both in the scope of quality (risk matrix, Pareto diagram [ABC method], Suzuki method [ABCD], Ishikawa graph) and quantity (Bays networks, Monte Carlo simulation, methods based on an endangered value or models based on probability distribution – binomial, Poisson, normal, Weibull distribution).

Risk as the probability of loss occurrence: In this case risk is the probability of occurring of a given event. The effect is a definition of risk as the chance of loss which is quantifiable (as probability) as a percent-age or as a fraction. It can be presented as the formula:

$$P(A) = \lim_{N \to \infty} \frac{n}{N} \tag{1}$$

where:

P (A) – probability of a loss occurrence,

N – number of objects studied,

n – number of objects in which the loss occurred.

However, it is problematic to identify the risk only and exclusively with this measure. A similar view has already been proclaimed by A. H. Willett who linked the risk with an objective uncertainty of the undesirable event occurring. Thus, it has changed together with uncertainty and not with the level of probability (Willett 1901, p. 33). In the context of risk management, it should be assumed that probability is one of the parameters describing risk and not the risk itself.

Risk as the probability of a result different than it was expected: In this perspective, risk is an objective probability that the actual result will differ from the assumed. The degree of this probability is the measure of a relative frequency based on scientific knowledge. The well-known distribution models of a random variable are used to describe this value. Figure 1 illustrates this definition of risk on the example of normal distribution.

This view, however, is difficult to be defended in the face of the changing world. The incredible speed of the events is observed even over the period of the last several years. Has anyone tried to calculate the probability of occurrence of the events of 11 September 2001 or has there been specified the probability of introducing in Ukraine the decree preventing bankruptcy of indebted agricultural companies?
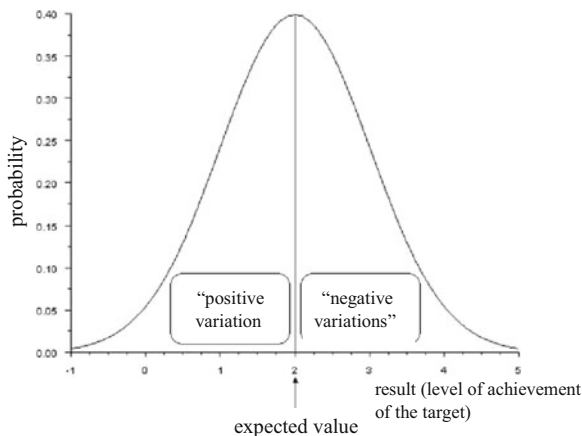

Fig. 1 Risk as the probability of a result different than expected (Source: [Wagner 2000, p. 8])

The approach to the concept of risk presented earlier is a subject to criticism, mainly by the representatives of social sciences. They postulate the creation of a new sub-discipline – sociology of risk – which could lead to verification of the concept of risk in relation to particular social groups (Perrow, 1999, p. 309). This means departing from perceiving risk as an objectively existing being in favour of treating it as a creation "produced" by public perception. In its extreme form it means, on the one hand, that the risk itself does not exist because it is the decision of people to build the phenomenon around with concepts of risk and danger that causes assigning this feature and creating social risks. On the other hand, we can say that everything is a risk because every object, every phenomenon may become a risky business.
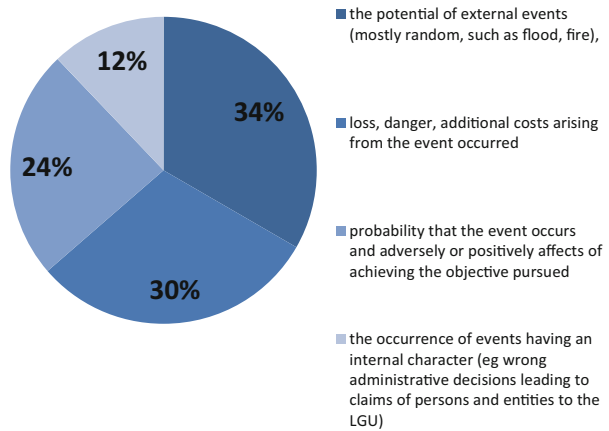
Another example can be the studies of J. Michalak from the Department of Insurance of Poznań University of Economics [UEP], who casts doubt on statements like "risk is something that has always accompanied the man" (Kaczmarek 2008, p. 23). He states that risk occurs when certain value is threatened in relation to the culture of certain society (Michalak 2004, p. 121). As a consequence, the concept of danger should be understood as a cause of prejudice or complete destruction of a positive value. As a result risk is the concept concerning the future with respect to certain potentiality. It can be assumed that risk experienced by certain entity is a creation of what the entity understands by this concept. It is not the product of the scientists' work but individual, threatened entities (Beck 2004, p. 92). Paraphrasing U. Beck we can state that everyone becomes a scientist in this understanding of the concept of risk (Arnoldi 2011, p. 65). As a result, more and more often risk is perceived not as a social phenomenon (that is the state, the properties of a particular entity objectively perceived as negative on the basis of certain culture) but as an individual phenomenon (that is subjective determination of a situation by a given entity, which is not accepted by them – risk as a construct). Such approach to the concepts of threat and risk provokes asking a few basic questions: What shapes does the perception of the scale of individual threat by a given entity? Which threats are perceived by a given entity as large and which as small ones? How do individual traits affect the magnitude of the risk construction by this entity? (Trembaczowski 2008, p. 15).

Attempts to answer these questions in relation to particular types of activities can be found in the publications of employees of the Department of Insurance of UEP (Osak 2008, p. 151; Kaczała and Łyskawa 2008, p. 38). In this paper an attempt to answer these questions has been made on the basis of knowledge and the perception of risk by the employees of these units in relation to the functioning of local government units.

In summer 2012, pilot studies regarding the risk construct among the members were carried out by the members of the Gdańsk Metropolitan Area[3] (GOM).

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[3] Established on 15 September 2001 self-government association has the aim to tighten the cooperation and to bring to harmonious development of the whole metropolitan area around Gdańsk. The organization affiliates 42 self-governments on different levels of operation. GOM's activity is characterized by a wide scope of cooperation among the affiliated entities maintaining their distinctiveness and specificity.

Fig. 2 Perception of the risk concept by local government units (Source: own study)

- the potential of external events (mostly random, such as flood, fire),
- loss, danger, additional costs arising from the event occurred
- probability that the event occurs and adversely or positively affects of achieving the objective pursued
- the occurrence of events having an internal character (eg wrong administrative decisions leading to claims of persons and entities to the LGU)

34%
30%
24%
12%

Answers to questions about the identification of risk, damages in the commune, risk management and insurances held were provided by more than half of the entities affiliated in GOM (26 items). The results in the scope of selected questions are presented in the following Fig. 2.

The first of the analysed questions was to define the concept of risk in the imagination of the LGU [local government units] employees. In most cases they identify this concept with the possibility of occurrence of events (originating from the outside or inside of an organization). However, a significant element is the fact that 30 % of respondents indicate a loss as a statement identical to risk. As a result it can be assumed that for many respondents these possibilities are associated with negative results, which lead us to perceive the concept of risk through the prism of unacceptable appropriateness of an entity that may occur in the future – risk as a construct (Łyskawa and Osak 2013, p. 250) (Fig. 3).

Another question asked in the study and helped us to be close to the definition of the concept of risk concerned the determination of the level of loss. Constructing risk by the employees of LGU becomes the borderline to determine the unacceptable state after the events occurring. In almost 40 % of cases the respondents selected the lowest range of loss, that is the loss equal to or less than 10 % of the planned annual commune expenditure. This means that LGU employees involved in the study (in most cases the heads of department and secretaries) are characterised with low risk acceptance. It is important to add that virtually every incident disturbing the planned expenditures is perceived as risk (Janowicz-Lomott and Łyskawa 2013, p. 349).

This study focuses on catastrophic risks associated with the emergence of financial losses as a result of natural disasters which – according to the Act of 18 April 2002 on the State of Natural Disaster – are understood as events "associated with the acts of nature, in particular, lightning discharge, seismic shocks, strong winds, heavy rain/snowfalls, prolonged occurrence of extreme temperatures, landslides, fires, droughts, floods, ice phenomena on rivers, sea, lakes and water reservoirs, mass occurrence of pests, diseases of plants or animals, or human infectious diseases, or the act of a different element". Everyday speech creates the concepts of a natural catastrophe and natural disaster as unequivocal. Earlier on,
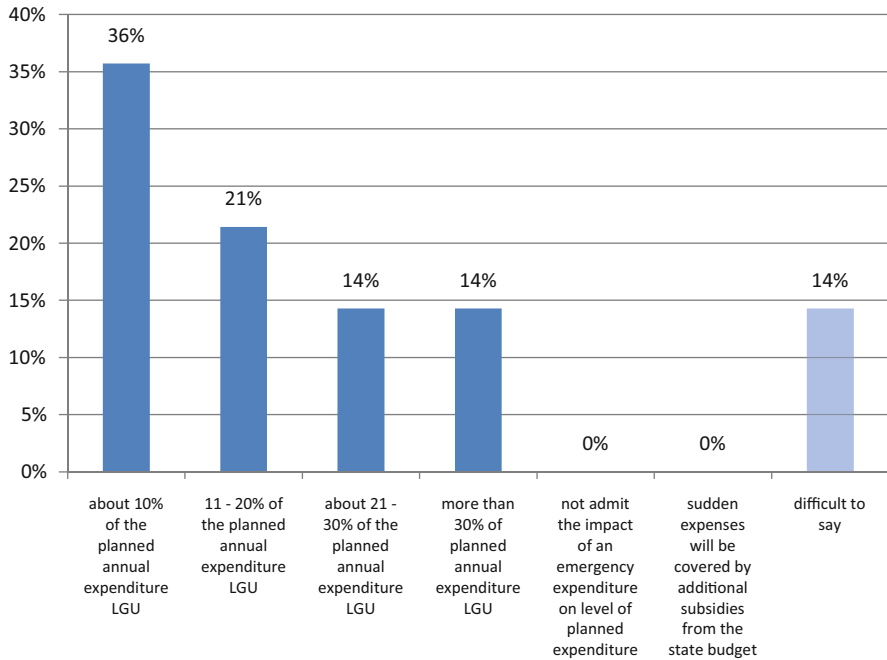
Fig. 3 Construction of catastrophic risks (Source: own study)

the before mentioned Act (Act of 18 April 2002) explains the differences between these two concepts. A natural disaster is a broader concept which includes in addition to natural catastrophes, technical failure that is the anthropogenic factor.

3 The Concept of Risk in the Risk Management Standards: Operationalization Methods

Evolution of the concept of risk may also be observed in the standards of risk management functioning in our reality. In the FERMA standard (Federation of European Risk Management Associations 2002) the concept of risk is identified with a combination of the probability of the occurrence of an event and its consequences, that is, according to the traditional approach, seeking specific values, numbers. Limitation of this approach is suggested by a number of publications. However, within the scope of risk management in local government units this issue is well explained by the OECD (Majone 2010, p. 102) which points to inadequacy of only two parameters characterizing risk without regard to the aim of operation of an organization.

In another standard, the American COSO II, the concept of risk is identified with the possibility that an event will occur and will negatively affect achievement of objectives. This possibility is measurable in connection with the activity run, causes

Table 1 Defining risk management process in particular standards

Standard name	Process definition
FERMA	Process by which an organization in a methodical way solves the problems associated with the risk
COSO II	Process realised by the management board, management or other persons in the company, included in the strategy and in the whole enterprise, whose objectives are the identification of potential events that could affect the enterprise, maintaining the risk within the limits and ensuring realization of the enterprise objectives
AS/NZS 4360:2004	Culture, process and structures directly focused on the realisation of benefits while controlling threats
ISO 31000	Process that is an integral part of management, embedded in the culture and practice of a given organization and adapted to its business processes, the emphasis is placed not on the event itself but on the impact of this event on the intended objectives

Source: own study

potential losses to arise (Dalia 2011). First indications regarding shaping the risk management system in LGUs in Poland were based on the provisions of the COSO II standard (Jennison 2004, p. 35). However, the implementation process in Poland resulted in a significant wave of criticism from both theorists (Jastrzębska et al 2011, p. 40) and practitioners.

A combination of these definitions are the provisions of the Australian/New Zealand Standard (AS/NZS 4360:2004) (Cooper 2007, p. 3). On the basis of the culture existing in an organization risk is identified with the possibility of an occurring event impacting the business activity, which at the same time leads to profit or loss, measured in terms of probability and consequences.[4] In a similar spirit, the concept of risk is defined in ISO 31000 standard, that is focusing on the rules functioning in an organization and based on the combination of probability of the occurrence of an event and its consequences – in accordance with ISO/IEC Guide 73.

However, it is difficult to analyse the very concept of risk, even in terms of an organization's objectives, without a reference to the shape of the whole process of risk management (Table 1).

From the point of view of the risk as a construct, the key concept, which should be sought in the description of risk management process is the "risk owner". Its definition ("a person or unit responsible for risk management and entitled to such management") can be found in ISO 31000 (Polski Komitet Normalizacyjny 2012a, p. 12). Consequently, this standard allows the inclusion of the approach of a local government unit to the existing threats through the prism of the people to whom these threats relate. Not through the prism of the procedures applicable in an organization (FERMA) or through the prism of the knowledge of the management

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[4] In the context of the discussed subjective and subject-centered approach to threats, identifying risk with a profit may raise objections.

board (COSO II) but through the prism of the unit manager, secretary or individual officials. Their functioning in the scope of the control and responsibility allow for obtaining current information which may translate into a constantly updated risks register (Polski Komitet Normalizacyjny 2012b, p. 8). It should be emphasised that individuals – the risk owners – should get a clue what situations, events should be treated as risk assuming that functioning is based on risk as a construct.

4 Operationalization of the Concept of Risk as a Construct

The first step within the framework of the realised activity is to identify areas in which detailed discussions on the existing threats will be conducted. Additionally, the suggestions regarding the changes in the manner of managing risk will be also defined. Each of these areas has its own specificity with respect to occurring threats and the approach to the decision in the scope of risk management. In addition, in each of them there are usually other people responsible for certain actions taken during the daily operating activities in a local government unit. As a result, the procedure identifies team members responsible only for a certain area. In the first stage the recommendations are prepared separately by each team for a certain area. Not until the stage of the final report are the recommendations integrated to exclude repetitions or mutual exclusions. In this way, each of the organization employees, who will be getting acquainted with the document after the risk management audit,
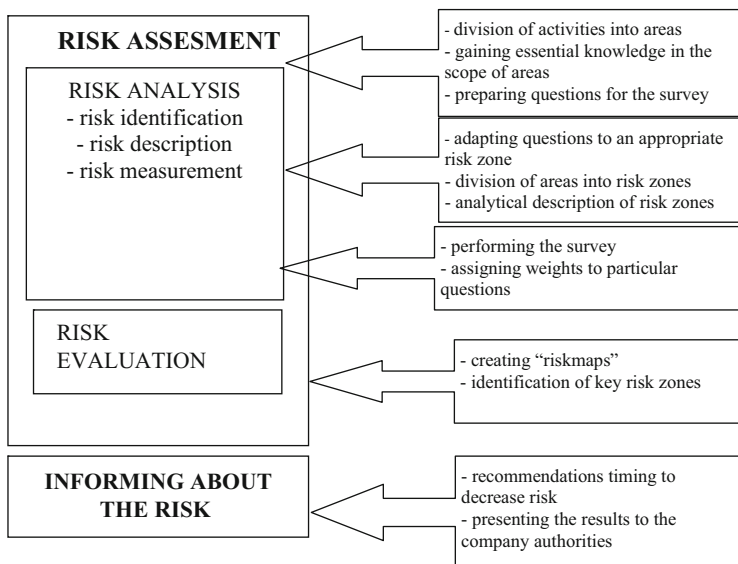

Fig. 4 Phases in the process of risk management in the projects of the Department of Insurance of the Poznan Economics University (Source: own study)

will be allowed to read the entire document or to confine to the point concerning their function within the organisation (Fig. 4).

If the area of the analysis is the infrastructure possessed by a local government unit, the zones identified within this area may refer to, for example: (a) bridges, (b) other road infrastructure, (c) key utility facilities, etc. In each of the zones there are most often different people responsible for certain actions undertaken during the daily operational activities of the community. As a result, those people are indicated and talked to which is to allow to indicate the key threats in a given zone from the point of view of the risk owner. The final result of these talks is the development of a survey in which a number of questions are assigned to each zone. Additionally, each of the questions in a given risk zone is assigned with weight of significance. The sum of the weights assigned within the framework of each of the zones amounts to 1. If it is higher, the impact of a given response on the total value of the index increases. The scale of threat is determined subjectively by people carrying out the survey. Its influence cannot be greater than the weight of a given question. An example in relation to key buildings can be found in the table below (Table 2).

For each area of the local government unit activities, based on the obtained values for each zone, appropriate diagram that shows the level of threat on the basis of the creation made by the employees is being developed. The system is based on the principle "from the particular to the general". Only after rating and assigning weighted values to all questions, the final weight is created for a given threat zone. With the assumed assumptions this means that the closer to the centre of the scheme the measurement is, the less possibility of the occurrence of losses in a given zone. Below there is the illustration regarding the key objects (Fig. 5).

Table 2 Possibility to respond to threats in relation to a key utility facility (eg. school, office building, etc.)

Question	Weight	Weight*risk
Are the buildings equipped with quick-exit system?	0.05	0.005
How far away from the building is the nearest fire department/energy emergency service?	0.1	0.015
What procedures are provided for in case of a rescue operation?	0.1	0.095
In the past, were there exercises carried out in cooperation with emergency services?	0.1	0.095
Are employees involved in the occupational health and safety trainings?	0.05	0.0075
Is the closest fire unit a State Fire Service [PSP] or Voluntary Fire Service [OSP]?	0.1	0.015
What is the estimated response time of the above mentioned services?	0.15	0.045
Does the area around the building allow for effective operation of the above mentioned services?	0.1	0.025
Are there any fixed firefighting systems in these premises?	0.15	0.0525
What is the access to the above mentioned devices?	0.1	0.015
Total	1	0.37

Source: own study
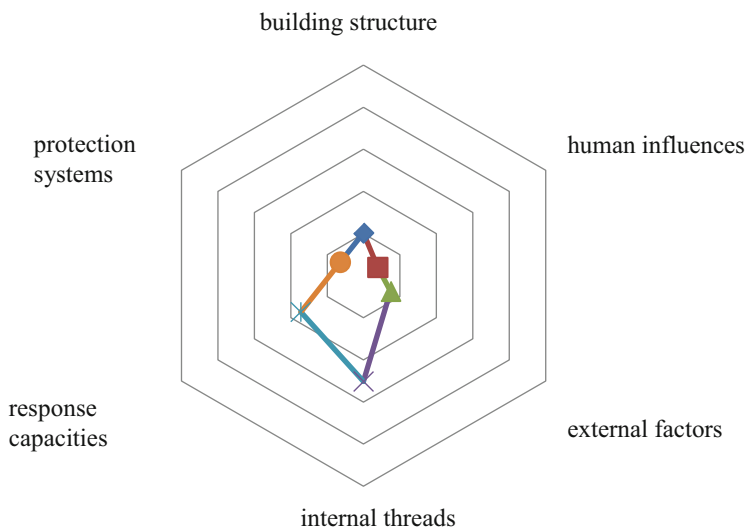*weight assigned by the team for risk management

Fig. 5 Operationalization of risk in relation to the key object (Source: own study)

These charts graphically show in which zones of particular areas there is the greatest risk. These zones require more attention from the management. The chart created for one's own needs is a good analytical tool and the basis for further decision-making.

Recommendations whose result is to be the improvement of the existing situation are a separate issue in this respect. Undoubtedly, the recommendations must be embedded in order to manage risk of a local government unit. If the goal is to improve the analyzed parameters by the insurer, it is certainly required to combine the necessary effort to fulfil the recommendations with the effects of the reduction of the insurance cost (e.g., within 3–5 years). If the aim is to protect the possessed resources or long-term building quality of the functioning in the community, the effectiveness analysis of the expenditure incurred has a much longer time horizon (Table 3).

5 Shaping the Optimal Formula of Financing the Consequences of Catastrophic Events: Study Results

In the performed study there was also made a list of identified threats within the units with the methods of financing catastrophic events. The following three questions were asked in order to define specific concerns of the employees of the local government units:

Table 3 Sources of financing losses in local government units under study by main events

| Type of damage	Insurance	Loan	Own funds	Help from the State budget	Activities and help from the citizens	Donations	Other	Not removed
Flood	2	0	5	1	0	0	0	0
Hurricane	5	0	6	0	1	0	0	0
Landslides	0	0	2	0	0	0	0	0
Fire	5	0	6	0	3	1	0	0
Strike of lightning	3	0	4	0	1	0	0	0
Act of vandalism	5	0	9	0	1	0	1	0
Claims of persons and entities wronged by an administrative decision	0	0	2	0	0	0	0	0
Severe frosts/heat	1	0	6	0	1	0	0	0
Chemical contamination	0	0	0	0	0	0	0	0
Theft	5	0	7	0	1	0	1	0
Other (what?)	1	0	2	1	0	0	0	0

Source: own study
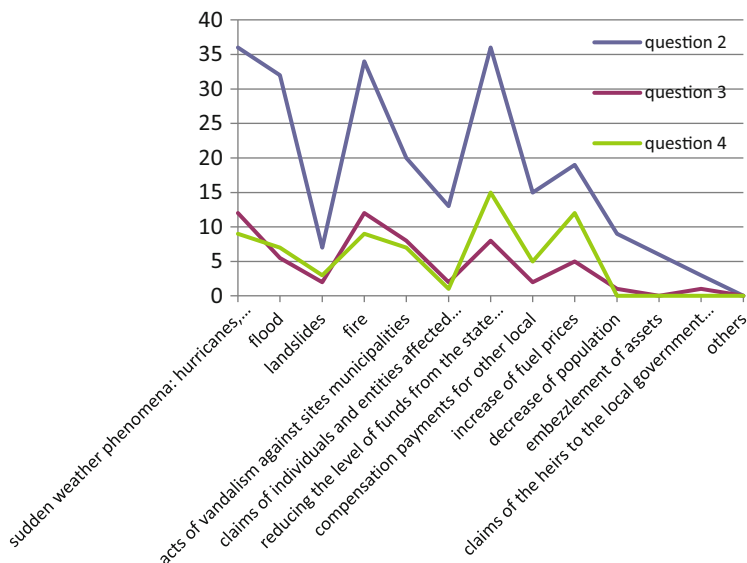
Fig. 6 Threat identification by the employees of local government units (study results) (Source: own work)

- (2) What threats do you consider most important in your environment in relation to the functioning of the commune? Please, use the rating scale from 0 to 5, where 0 means definitely not dangerous and 5 means definitely dangerous.
- (3) Which of the events listed in the table was realized in your commune over the past 5 years?
- (4) To what extent have the realized events affected the financial stability of the commune in the last 5 years? Very Much (3) Average (2) A Little (1) Not at all (0)

The obtained results, described graphically in the figure below, unambiguously indicate that employees fear most of all the events that have taken place in recent years in a given local governments unit. The R2 ratio for questions 2–3 was 0.90. The high level of threat identified in relation to natural phenomena is very important in this study (sudden weather events, flood, fire). It is needed to say that man-made phenomena (vandalism, introduction of compensatory payments or taking a part of the budget re-sources away from rich communities) cannot be omitted in this discussion . The R2 ratio for questions 2–4 was 0.84. It indicates that employees in particular identify as threats the events which disrupted financial stability of the local government (Fig. 6).

It should also be emphasised that the losses incurred as a result of natural phenomena. Weather that occurred to local government units under study were financed mainly from their own resources and from the concluded insurance contracts. This indicates that lack of appropriate insurance contracts or conclusion of inappropriate contracts forces the unit to cover the incurred loss from its own funds or from the central budget. As regards the events provoked by human activities (theft, vandalism), financing from own funds is definitely prevailing.

Conclusion

The actions taken within the scope of the definition of the word risk and the study carried out within the scope of GOM clearly show that the key task is to develop a method to define what individual employees of the unit are afraid of. Such actions allow us to define threats in the functioning of a local government unit. It becomes the basis for proper shaping of the risk management process.

Positions as that of an auditor or a person responsible for risk management or a risk management committee in a local government unit are to develop, implement or strengthen appropriate policies and procedures relating to risk management. However, it also allows for the coordination and monitoring of initiatives undertaken by individual employees within the scope of risk management. Such people may also work with individual risk owners (advice, the use of dedicated tools for risk identification and risk evaluation) which translates into shaping appropriate risk structures by the owners themselves as well as though different levels of the organization or within the scope of specific areas of functioning.

The latest risk management standard ISO 31000 states that a well-performed procedure for shaping the frameworks of such a process should provide:

- building a separate value for a given local government unit,
- inclusion of risk management in the organizational and decision-making processes within the unit,
- adequate information as a result of a risk management process should be shaped on the basis of the best information available and at the same time should be based on uncertainty, that is the perception of threats by individual employees,
- taking into account human and cultural factors of the functioning of the unit,
- provide the opportunity to respond to changes and to introduce mechanisms of automatic improvement.

It should be emphasised, however, that the introduction of risk management procedures in local government units has become a necessity in the face of increasing scale of threats. However, a large versatility of individual entities makes it impossible to approach this issue from the perspective of the traditional theory of risk. To define threats and manage the unit properly it is necessary to individualise the construction of the concept of risk. Thus, numerous studies, also those relating to the functioning of risk management in local government units, have pointed out the necessity to define the risk owner (Minister of Finance 2012, p. 13). And additionally, the person should have the ability (power) to enable them to effectively manage the risk.

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Infrastructure Public Private Partnership Investments: A Comparative Analysis of Western Balkan and Emerging Countries

Evis Gjebrea and Oltjana Zoto

Abstract The private sector participation is crucial to country development bringing more funds, technical knowledge and efficiency in several sectors (energy, telecommunication, transport, water and sewerage), particularly to developing countries. The demand for infrastructure projects has increased considerably in the recent years especially in emerging and developing countries, which can be attributed primarily to the rapid economic growth and the vast urbanization and industrialization of these economies.

The aim of this paper is to analyze the determinant factors of Public Private Partnerships in infrastructure development in Western Balkan and Emerging Countries. This will build on previous empirical analysis performed and the data of World Bank Database for Public Participation in Infrastructure for the period 2002–2013. The study focuses on the Western Balkan and Emerging countries because these countries need PPP arrangements in infrastructure. Additionally, the Western Balkan countries will need to integrate into the European Union in the near future, and therefore, the needed structural reforms and development strategies require much more investments.

For the purpose of this study a comparative analysis of countries of the Western Balkan and Emerging economies is undertaken by using data of the Public Participation in Infrastructure projects by type of sectors for the period 2002–2013. The result of the analysis confirms previous conclusions that countries with small size of the market have lower number of Public Private Partnerships as compared to those with big size of the market. Regarding macroeconomic stability the data strongly confirm that macroeconomic situation favor foreign investors to get involved in Public Private Partnership projects, but their small size of the market discourages these countries to have high Public Private Partnership projects.

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Abbreviations

GDP	Gross Domestic Product
ICRG	International Country Risk Guide
IMF	International Monetary Fund
PPPs	Public Private Partnerships
PPI	Public Participation in Infrastructure
FYROM	Former Yugoslav Republic of Macedonia

1 Introduction

Public Private Partnerships (PPPs) are widely spread and are considered beneficial instruments to the economic development of any country. Their aim is to deliver better quality services by bringing in new investment, which cannot be provided by the Government alone. This is because of the scarce sources to fully finance big infrastructure projects such as airports, roads, water supply, energy, sewerage etc. Investing in infrastructure projects has positive social impacts meeting public needs, as well as economic ones through contribution to GDP growth. PPPs have proven to be a successful instrument as much in developed countries as in developing countries. This is shown by the increased number of PPPs from the World Bank Public Participation in Infrastructure (PPI) database over the years in different sectors mainly energy, telecom, transport, water and sewerage.

The demand for infrastructure projects in emerging and developing countries can be attributed primarily to the rapid economic growth and the vast urbanization and industrialization of these economies. Moreover, much investment will be needed in these countries for achieving the Millennium Development Goals, specifically the goal of poverty reduction. PPPs in these countries are successful partnerships especially for large infrastructure projects due to advanced technology provided by the private sector.

By application of this scheme, governments benefit quality public services within an optimal time and at low cost. Sectors that most need investments are energy, telecommunication, water and sewerage and transport. In Eastern Europe PPPs took rise starting from 1990s. In countries such as Hungary, Baltic States, Bulgaria, Croatia, Czech Republic, Poland, Romania, Serbia, Slovakia, Albania etc., the degree and area of participation of PPPs is different.

This article aims to describe PPPs in developing countries by showing the factors determining their participation with a special focus on Western Balkan and emerging countries because these countries need PPP arrangements in infrastructure. The first part of this paper presents the theoretical background that justifies PPPs, empirical studies on main factors impacting PPPs in developing and emerging countries and main benefits and risks of PPPs. In the second part we run a comparative analysis of determinants of PPPs in infrastructure in Western Balkan and emerging countries. The last part gives conclusions and recommendations.

2 Literature Review

Before listing the theories that justify PPPs, our review starts with definition of PPP. There are many definitions but the most common is the following: "cooperation between public-private actors in which they jointly develop products and services and share risks, costs and resources, which are connected with these products and services" (Van Ham and Koppenjan 2001, quoted in Hodge and Greve 2005).

PPP are not new to the governments. The theoretical concept of PPPs can be traced to the theory of x-efficiency of Leibenstein (1966). According to this author, inefficiencies in public institutions result from both distortionary government interventions as well as states' organization structures, which are highly bureaucratic. Hence, PPPs are necessary to reduce the sources of x-efficiency in public organizations and to allow them to respond to market forces and become more competitive.

Milton Friedman in his book "Capitalism and Freedom" raises the issue of minimal state and bigger private sector participation. According to this theory, public institutions are inefficient to deliver efficient public services and therefore, private sector is necessary to produce more efficient and qualitative goods and services (Friedman 1982). Inefficiencies of public institutions led to a new era called New Public Management under Margaret Thatcher governance. This period was characterized by huge privatization of public enterprises and this policy was also followed by Ronald Reagan in the United States (Pollit and Bouchaert 2011). The whole idea of this new reform in the public sector was to introduce business principles into public institutions in order to become more efficient and competitive.

There are many empirical studies which have tested the impact of PPPs in economic development and the need of PPPs in developing countries. According to Dailami and Leipziger (1998), Fay and Yepes (2003) and Yang (2008), the vast urbanization and industrialization is putting pressure on existing infrastructure in developing countries. The governments of these countries are short of public funds due to budget constraints to meet the infrastructure demands. Recent data suggests that the governments in developing countries heavily rely on PPP model to plan, finance, build and operate infrastructure projects (World Bank PPI database 2012).

Previous data have shown that almost 70 % of infrastructure investment in developing countries is financed by governments, or from non-concessional borrowings, 3 % from aid and only a small part comes from the private sector (DFID 2002). Therefore, a question has been raised from researches in the field as to what the factors determining PPPs involvement in developing countries are. There are many empirical studies on this issue which will be discussed in Sect. 2.1.2 below.

Benefits and Risks of PPPs

This section presents the benefits and opportunities offered by PPPs, as well as critics made on them. Each government aims to deliver quality services to its citizens. Due to the constraint size of the Government on one hand and increasing demands by its population on the other, it becomes impossible for the Government to meet all needs (Harris 2003). Therefore, improving service delivery drives both the Government and private sector to do what they can do best.

As explained earlier infrastructure investments require huge capital for which the Government finances up to a certain amount. Therefore private sector participation smoothes the capital constraint taking into consideration that private sector has a more flexible access to resources. This is especially a necessity in those countries that lack capital market and as a result the flow of capital through private investment increases, which otherwise would be difficult to be obtained.

The private sector brings in an advanced technology know- how because of experiences it acquires in other countries. As a result, public services are delivered with a more cost-efficient than traditional approache. There are evidences on savings from cost efficiency that can be used to fund other needed services. In the case of PPP projects in infrastructure in the USA and UK the savings amount to 15–30 % and can be attributed to more efficient project management by the private investor, shorter construction time, as well as lower administrative expenses (Moszoro and Gasiorowski 2008). But there are critics based on empirical studies that question the efficiency aspect of PPPs toward public sector due to the difficulty of balancing the interest of the poor against the interest of the private sector, because the latter aims at profit maximization (Nkhoma-Mbawa 2006).

Harris et al. (2003) have shown that PPPs increase access to services, efficiency, provide better quality services and have positive fiscal impacts. Andres et al. (2006) have shown that PPPs can generate significant improvements in labor productivity, efficiency and product/service quality of the electricity firms. Nickson and Franceys (2003) provide evidence which suggests that the general public perception about the affordability of privately managed utility is not correct, as there are clear evidences that the utilities can significantly improve access to basic services to poor at affordable price.

Joha and Janssen (2010) compared the strategic intents and motives for PPPs in three projects using the case study method. Their findings indicated that PPPs were focused on developing new and innovative services and the projects were able to accomplish most of their intents at the expense of higher risks.

Investments in hospitals, schools, highways, power plants, etc. bear risks and by including private sector in such investments public sector risk lowers as it is shared among different private operators. Also, public sector benefits from highly skilled risk management of the private sector, which is more efficient and innovative. Transferring risk to the private sector reduces the potential for government cost overruns from unforeseen circumstances during project implementation given the government budget certainty. According to a study made by Edwards and Shaoul

(2003) on effectiveness of PPPs, very often contractors fail to transfer risk and the public sector has to bear the major cost of the projects, which often leads to failure of PPP projects as in the case of UK.

Public services can be provided at a predictable cost as set out in contract agreements. Therefore, the government budget is improved through the fees collected from the private operators for the services rendered. Another positive aspect is a better public finances management, as the public funds previously planned for public investment can be used for other priorities.

Information is crucial to long term infrastructure projects, especially if information is confidential when the private sector has invested to create intangible assets e.g. pharmaceutical industry. Therefore, private sector participation becomes even more important due to the information it can offer. One of the last but not least benefits is the one related to asset management. The private operator which brings the technology and know-how uses assets provided by the public sector and as a result makes a better use in the long run.

Notwithstanding the advantages, PPPs poses risks for both the Government and the private sector. As a result of higher autonomy given to the private sector Government itself might lose its control from the service delivery which was previously under the monopoly of the Government. Also, the costs of PPPs could be higher during the implementation phase because of the autonomy the private sector has. In case the private sector fails to offer high quality services with low cost, this leads to potential risk for the Government in losing reputation and credibility. Another constraint for the Government relates to its weakened capacity in offering public services since the private sector increases its presence in the form of PPP participation.

Very often consultation process for investing through PPPs is poor and often carried out as a formality at the very late stages with no real intention of taking public opinions into account. This becomes a constraint for the public at wide as they are final beneficiaries of services delivered and also taxpayers. Overall, private investors are faced with the political, legal, economic and financial environment in the host country and as a result, their participation is determined by such factors.

Determinant Factors of PPPs in Developing Countries

There are many empirical studies made to explain and test the main determinants of PPPs. The last empirical studies by Basilio (2011) and Sharma (2012) take into consideration some variables to test and find out the most important factors with an impact on attracting more PPP projects. In this section are described the results of these empirical studies and other previous studies, which are used for the comparative analysis conducted for the purpose of this paper.

The first factor analyzed is Government's resource constraint. Governments with large deficits and a heavy debt burden are more likely to have PPPs and soft budget

constraints of government provide a little motivation for them to engage in private firms in PPP projects.

The second factor is stable macroeconomic condition. PPP projects and investments are more common in countries with credible and stable macroeconomic conditions. Previous studies for instance Ghura and Hadjimichael (1995), Allayannis and Weston (2000), De Soto (2000), Estache (2006) and Banerjee et al. (2006) found that macroeconomic stability is an important issue in private sector involvement. Cantor and Packer (1996), Altunbas and Gadanecz (2003), found that some variables such as real GPD per capita and economic growth, inflation rate and international reserves, fuel exports as a measure of a country's natural resources etc., are important explanatory variables of the capital surge to the countries.

The third factor is size of the market. According to Sharma (2012), a large market is likely to attract more private firms to engage in PPP projects mainly because of the future growth prospects. Size of the market is described by the number of population of a country.

The fourth factor is political environment. It is widely known that foreign investors before deciding to invest in a country consider the political environment of the country. This factor is measured by international rating agencies such as Moody's, Standard and Poor, International Country Risk Guide and investors get enough information to invest. Also Sharma (2012), in his study takes this factor into analysis and raises the hypothesis that better political environment leads to a large number of PPPs.

Another important factor is regulatory environment. According to Pistor et al. (2000) and Hammami et al. (2006) weak and inconsistent institutions and political risk lead to uncertainties about the regulations, which further enhance the country risk. Sharma (2012) has tested the hypothesis that better regulation attracts more private firms for PPP projects. Same tests have been performed by Basilio (2011) based on previous empirical studies which identified that creditor rights index and contract enforcement days are among legal risks which influence PPPs inflow.

In his study Sharma (2012) analyzes two other factors such as Government effectiveness and Country (currency) risk, but in our research we will not take into consideration these two factors due to lack of data.

The result of Sharma's study is that macroeconomic stability and size of markets are important determinants of PPPs in infrastructure in developing countries. The evidence also suggests that in developing countries regulatory environments are important consideration in determining PPP projects. Finally, the political environment, soft budget and country risk are not found to be significant factors in determining the number of PPP projects in developing countries. The result of Basilio (2011) for emerging countries is that market size and purchasing power are critical determinants of PPPs.

3 Methodology

The main aim of this analysis is to provide a more complete picture of the drivers of infrastructure flows to Western Balkan and Emerging countries. As a starting point the latest empirical studies on factors that impact PPPs in developing and emerging countries are used to identify main tested variables. Second, the data of factors determining PPPs based on identified variables are used to conduct a comparative analysis for the period 2002–2013 for two groups of countries namely: (i) Western Balkan countries including Albania, Former Yugoslav Republic of Macedonia (FYROM), Serbia, Montenegro, Bosnia and Herzegovina and Kosovo and, (ii) Emerging countries including Brazil, China, India, Russia, Turkey and Mexico. Parallel, data on PPPs by country and type of sectors are analyzed for both groups.

The data are analyzed based on their trend using a qualitative analysis. Main variables analyzed are: Government net debt/GDP, GDP per capita, inflation rate, political risk and contract enforcement days. These data are extracted from World Bank PPI Database and World Development Indicators of IMF.

Comparative Analysis

The comparative analysis of factors determining PPPs is undertaken for the period 2002–2013 for two groups of countries: (i) Western Balkan countries including Albania, FYROM, Serbia, Montenegro, Bosnia and Herzegovina and Kosovo and (ii) Emerging countries including Brazil, China, India, Russia, Turkey and Mexico. The six countries in Western Balkan have similar characteristics related to market structure, reforms undertaken, culture, and history.

The other six emerging countries are all economies characterized by fast economic growth with very high investments over the last years reaching near 52 % of all PPPs in the world (PPI Database 2013). The data show that PPPs flows have had different tendencies for both categories of groups. Therefore, it is worth analyzing the main factors influencing PPP flows as identified by empirical studies.

As Fig. 1 shows, the highest number of PPPs in Western Balkan countries is registered in Albania with 10 projects in total in four sectors. All other countries have few PPPs, except for FYROM which has four PPPs in total.

What is evident in almost all countries is that the telecom sector receives the highest number of PPPs compared to other PPP types followed by energy. This is due to technology development, especially after 1990s, when all countries had to invest to cope with innovative developments.

Likewise, all countries having as priority the modernization of their economies have invested in infrastructure with a special focus on energy, as a driver for economic growth. The third sector, where PPPs are evident, is water. Water sector is a natural monopoly, usually fragmented. Therefore, PPPs have been lower in this sector than others, due to low expected profit by investors where needed. Overall, it
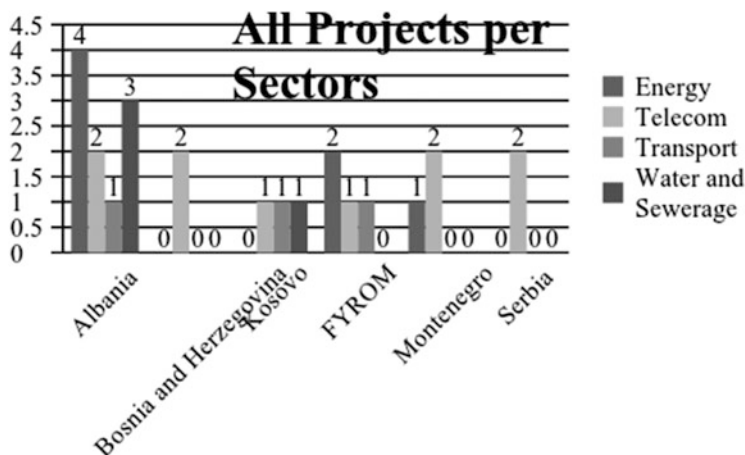
Fig. 1 Number of PPPs by country and sector 2002–2013 (Source: World Bank, PPI Database, own graph)

can be concluded that the total number of PPPs in the Western Balkan countries is low, and this can be explained by their small market size, which goes in line with the factors influencing PPPs in developing countries identified by empirical studies.

Besides small size of the market, another important determinant of PPPs identified is macroeconomic situation. In Figs. 2, 3 and 4, we observe that countries have had different tendencies in their macroeconomic indicators, some being positive and some negative. FYROM and Bosnia & Herzegovina have the best trend in the region regarding Government net debt/GDP, while Albania has the best trend in the region regarding inflation. All countries have had positive trends of their GDP/capita demonstrating the development of their economies. The high values of inflation for some countries such as Serbia and Montenegro are because of disturbances their economies have faced in the first years of our analysis mainly due to the war with Kosovo.

From the data of the above mentioned figures, it is expected that government with high debt burden and large deficits will be more interested in PPPs to solve infrastructure problems, because private investors contribute to leveraging high public debt. But at the same time these variables could point economic instability, as they imply a higher risk of default and larger deficits leading to increased foreign indebtedness, which may become unsustainable over time.

As we have explained earlier in this paper, the empirical analysis have tested that the political risk rating is positively related to the number of PPPs. What we observe is that countries have good political risk ratings, except for Serbia and Bosnia & Herzegovina. But as Sharma (2012) concludes, this factor proved to be not significant determinant in the number of PPPs (Table 1).

The second group of countries in our analysis is that of Emerging Countries. From the data, PPPs in these countries appear to be a key instrument to promote growth and enhance well-being. Figure 5 shows China having the highest number
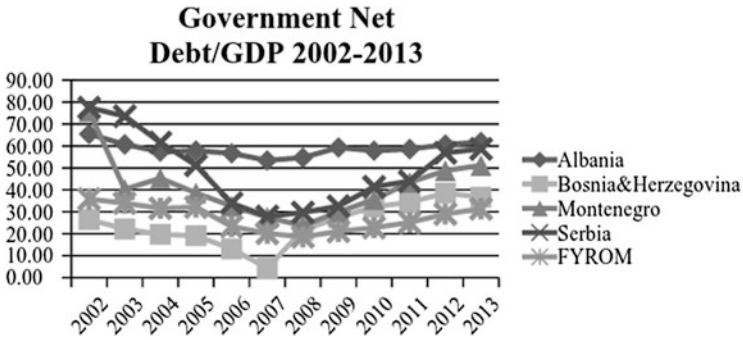
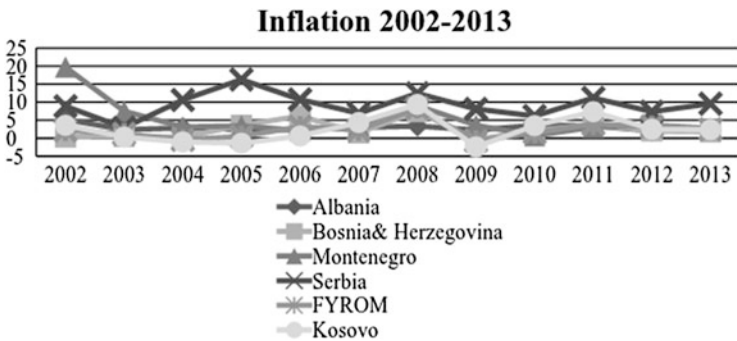**Fig. 2** Government net debt/GDP 2002–2013 (Source: World Economic Outlook 2014)

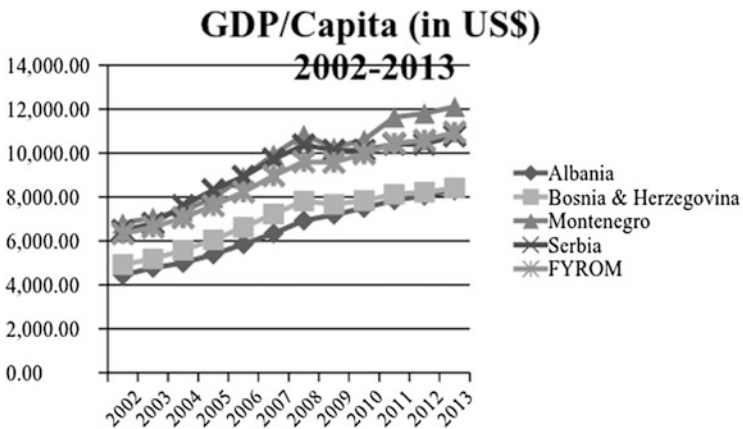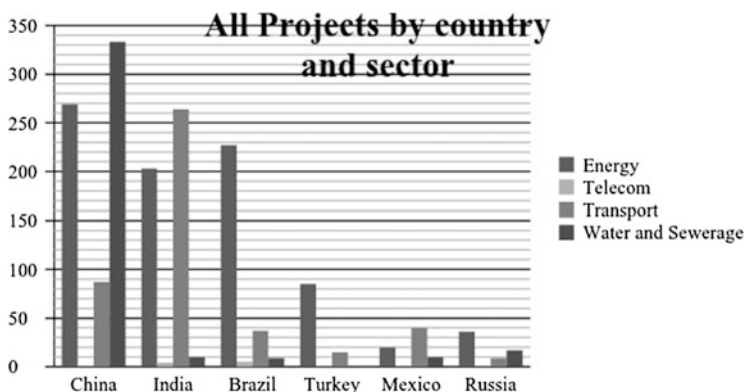**Fig. 3** Inflation 2002–2013 (Source: World Economic Outlook 2014)

Fig. 4 GDP/capita (Source: World Economic Outlook 2014)

Table 1 Political risk
rating, 2012

Western Balkan country	Political risk rating
Albania	Moderate
Bosnia and Herzegovina	High
FYROM	Moderate
Serbia	High
Montenegro	Low

Source: ICRG 2012

Fig. 5 PPPs in all sectors, 2002–2013 (Source: World Bank, PPI Database, own graph)

of PPPs (690) in total in four sectors, followed by India and Brazil and to a lesser
degree Turkey, Mexico and Russia.

In almost all emerging countries the energy and transport are the sectors that
receive high number of PPPs. Due to globalization and vast industrialization and
modernization, emerging economies have invested in infrastructure with a special
focus on energy, as a driver for economic growth and transport to allow faster
integration of their economies with the rest of the world. Overall, it is evident that
PPPs in emerging countries are high, which is favored by their big market size.

In the following section we present the trend of main macroeconomic indicators
for emerging countries for the period 2002–2013. We observe that emerging
countries have better tendencies of macroeconomic indicators as compared to
Western Balkan countries. Three countries from this group namely Brazil, Mexico
and Turkey have positive trends of Government net debt/GDP (Fig. 6), especially
starting from 2005, while China and Russia have good tendencies, especially in the
last years (Fig. 7). Exception is made for India, which has high levels of govern-
ment gross debt (Fig. 7). The data on Government debt for China, Russia and India
are calculated using the indicator government gross debt, which includes financial
assets corresponding to debt instruments. The reason is that for these three countries
the data are reported only for Government gross debt. All countries have rising
trends of GDP/capita (Fig. 9) showing the development of their economies.
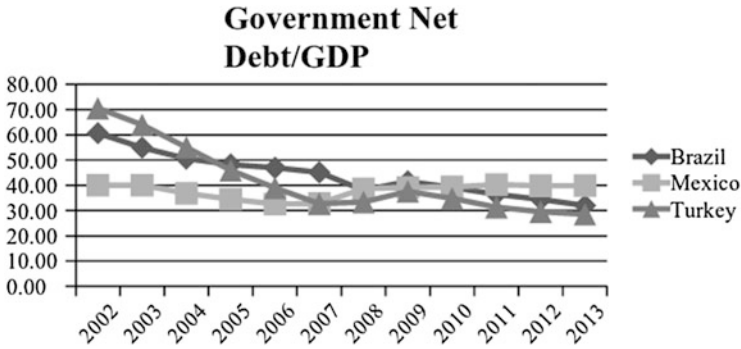
Government Net Debt/GDP

Fig. 6 Government net debt/GDP, 2002–2013 (Source: World Economic Outlook 2014)

Government Gross Debt/GDP

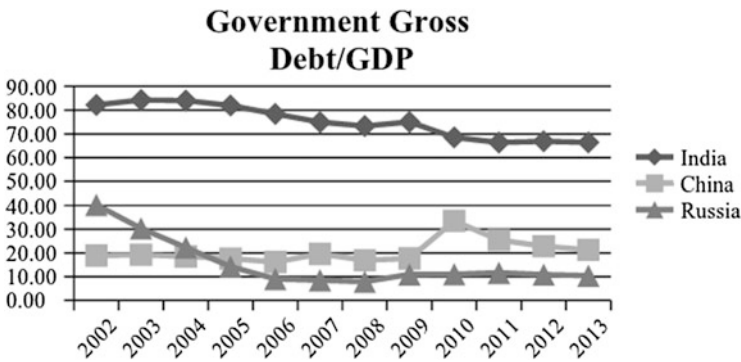**Fig. 7** Government gross debt/GDP, 2002–2013 (Source: World Economic Outlook 2014)
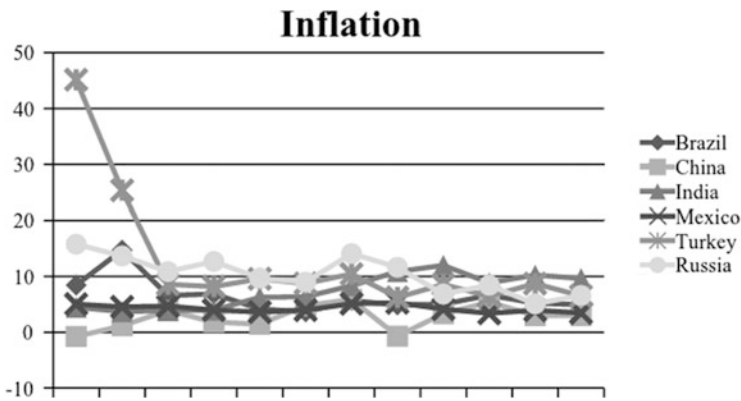
Inflation

Fig. 8 Inflation, 2002–2013 (Source: World Economic Outlook 2014
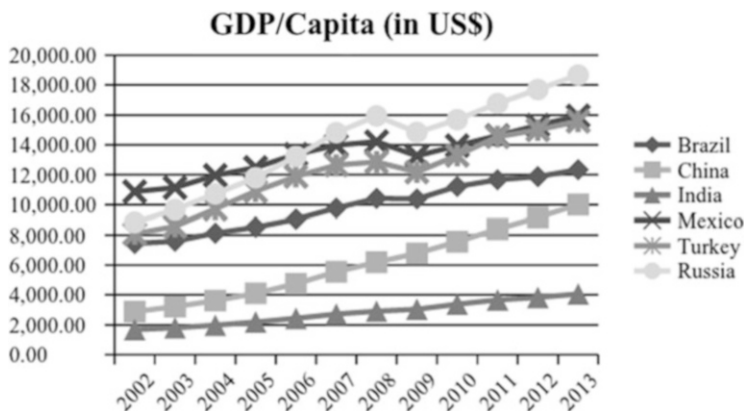
Fig. 9 GDP/capita, 2002–2013 (Source: World Economic Outlook 2014)

Also, inflation has followed a more stabilized trend, but for some countries it is still high (Fig. 8).

As Pessoa (2006) mentions, in emerging countries may arise problems related to relevant regulatory framework and underdeveloped capital markets. But what is characteristic for these economies is that Multilateral Development Banks do participate in infrastructure PPPs, therefore, private investors see this as a mechanism to lower potential risks, especially for countries such as Brazil, India and Mexico (IBRD 2011). Table 2 below summarizes data on contract enforcement days and political risk rating for emerging countries.

The above table shows that from almost all emerging economies China, Turkey, Russia and Mexico have positive figures regarding the number of days to resolve a payment dispute through court as compared to the average for the region. Brazil has a slightly difference of 5 days to reach the average, whereas India is yet far from the average standard pointing a potential possibility to impact the legal risk. Regarding political risk according to ICRG (2012) emerging countries have moderate to low political risk, showing that PPPs are favored in these countries.

In conclusion, the data presented above show that overall Western Balkan countries have low PPPs. This can be attributed to the political risk evident for some countries and their small size of the market. But, with the improved economic situation, especially in the last years, it is expected that the government will be more interested to get involved in PPPs projects considering also their ambition to become part of the European Union.

The data from emerging countries show a different trend regarding PPPs. These countries have received high number of PPPs reaching about half of private infrastructure flows globally. Overall, it is evident that PPPs in emerging countries are high, which is favored by their big market size, improved macroeconomic situation, low legal risk and low to moderate political risk. Exception is made for India, which is yet far from the average standard for the region regarding the contract enforcement days, showing a potential possibility to impact the legal risk.

Table 2 Contract enforcement days/political risk rating

Emerging countries	Contract enforcement days	Average for the region contract enforcement	Emerging countries	Political risk rating
China	16	**85**	China	Low
India	182	**134**	India	Moderate
Brazil	118	**113**	Brazil	Low
Turkey	51	**60**	Turkey	Moderate
Russia	13	**85**	Russia	Low
Mexico	81	**113**	Mexico	Low

Source: World Bank Doing Business 2012; ICRG 2012

Conclusion

Public Private Partnerships are widely spread and are considered beneficial instruments to the infrastructure development of any country. Their aim is to deliver better quality services by bringing in new investment, which cannot be provided by the Government alone due to the scarce sources to fully finance big infrastructure projects such as airports, roads, water supply, energy, sewerage etc. The benefits of PPPs are many for the Government, private operators and public at wide. The Government benefits cost effective and quality services which are offered in shorter time, thus meeting public needs. Also, the private sector besides the business objective specializes in a certain area, and becomes more experienced and competitive giving opportunities for widening such experience in other countries.

The last empirical studies by Basilio (2011) and Sharma (2012) take into consideration some variables to test and find out the most important factors with an impact on attracting more PPP projects. The result is that macroeconomic stability and size of markets are important determinants of PPPs in infrastructure. The evidence also suggests that in developing countries regulatory environments are important consideration in determining PPP projects. Finally, the political environment, soft budget and country risk are not found to be significant factors in determining the number of PPP projects in developing countries. The result of Basilio (2011) for emerging countries is that the market size and purchasing power are critical determinants of PPPs.

A comparative analysis for the period 2002–2013 of factors determining PPPs was conducted for two groups of countries: (i) Western Balkan countries including Albania, Former Yugoslav Republic of Macedonia, Serbia, Montenegro, Bosnia and Herzegovina and Kosovo and (ii) Emerging Countries including Brazil, China, India, Russia, Turkey and Mexico. The data show that PPP flows have had different tendencies for both categories of groups.

Concretely, the data show that overall Western Balkan countries have low PPPs, except for Albania. This low number of PPPs can be attributed to political risk and small size of the market. Regarding macroeconomic stability, the trends show that macroeconomic situation could favor foreign investors to get involved in PPP projects, but their small size of the market may discourage high PPP projects. With the improved economic situation especially in the last years, it is expected that the government will be more interested to get involved in PPPs projects considering also their ambition to become part of the European Union. The challenge is to find ways of attracting foreign investors.

The data from emerging countries show a different trend regarding PPPs. These countries have received high number of PPPs reaching about half of private infrastructure flows globally. Overall, it is evident that PPPs in emerging countries are high, which is favored by their big market size and good macroeconomic indicators.

To conclude, in order for developing countries to increase, PPPs flows policy makers must maintain good macroeconomic indicators, and improve institutional quality and political risk to allow investors increase their financing. In the Western Balkan countries, which have small size of the market, policy makers should consider encouraging regional infrastructure projects through PPPs, in the framework of their ambition to become part of European Union.

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Agriculture's Role in Economic Growth: An Exploratory Study Among Southern and Northern EU Countries

Ioanna Apostolidou, Konstadinos Mattas, Efstratios Loizou, and Anastasios Michailidis

Abstract The role of agriculture in economic growth is an issue that still attracts the interest of scholars and particularly now when the whole growth approach is reexamined and reevaluated. The main objective of the current paper is to identify the causal relationship that exists between agricultural value added per worker and Gross Domestic Product (GDP) per capita in the European Union. The differences and similarities in relation to the role of agriculture in economic growth are examined among Southern and Northern EU countries. Recent methods of linear co-integration and the Granger causality test are used to examine short-run and long-run relationships and the role of agricultural value added in economic growth, as well as the direction of causality. The bi-directional relationship between agricultural value added and economic growth is of crucial importance since it can facilitate successful economic policies. The results provide evidence that agriculture can lead to growth in several EU countries, play stabilizer role and be an engine of growth in this period of economic crisis.

Keywords Agriculture • GDP growth • Granger causality • Co-integration

JEL Classification Codes O40 • Q17

1 Introduction

The role of agriculture in economic growth, since long, is an issue that attracts the global interest of economists that focused on how agriculture could best contribute to the overall economic growth and modernization. The agriculture's role in

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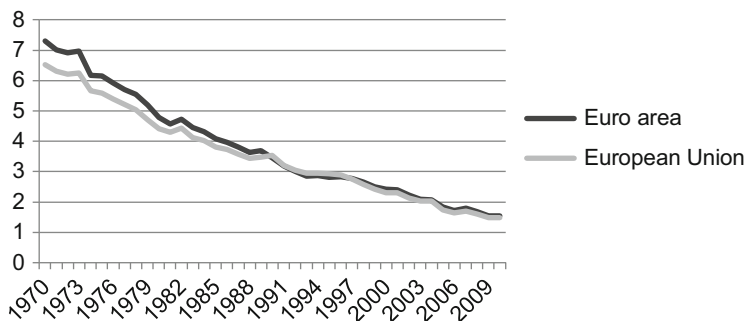
Fig. 1 Agricultural value added (% of GDP) in EU and Euro area

economic growth is a research topic of great interest and particularly, nowadays, when the overall growth approach is re-examined and re-evaluated. It is a common belief that the economic crisis affected all European member states in a different intensity, but mainly the countries of South Europe.

The economic contribution of agriculture varies significantly among the most developed Northern EU countries and the less developed Southern EU countries. This situation continues to exist despite the many important changes observed during the last years, mainly through the various reforms of the Common Agricultural Policy (CAP). Important changes such as the significant decrease in intervention prices, the introduction of decoupled payment and the shift for supporting rural development activities, second Pillar, (Dritsakis 2003; Cantore et al. 2011). As it can be seen in Fig. 1 a significant reduction in agricultural value added as share of GDP is observed during the period 1970–2010. Mainly, in the southern EU countries such as Portugal (from 29.8 % to 2.4 %), Spain (from 10.9 % to 2.7%) and Greece (from 11.4 % to 3.4%). A different view is observed from the northern EU countries.

Thus, an exploratory study among southern and northern EU countries may provide useful information for the role of agriculture. For this purpose, the main objective of the current paper is to identify the causal relationship that exists between agricultural value added per worker and GDP per capita in the Eurozone. A comparison among Southern and Northern EU countries is applied in order to examine possible differences and similarities as regards the role of agriculture in economic growth. The analysis employs an Autoregressive Distributed Lag (ARDL) approach for cointegration and the Granger causality test in order to examine the role of agriculture in economic growth by short-run and long-run relationships, as well as the direction of causality. The bi-directional relationship between agricultural value added and economic growth is of crucial importance since it can facilitate successful economic policies in EU countries.

The rest of the paper develops as follows: The next section briefly examines the literature, the third section describes the data and the methodological framework employed in the study, while the fourth section presents the empirical results and finally concluding remarks are offered in the last section.

2 Theory

Most of the studies appeared in the literature view agriculture as a vigorous and dynamic economic sector that plays an active role in economic growth through important production and consumption linkages (Johnston and Mellor 1961). Kuznets (1966) while stressing the role of agriculture notes that as countries develop its share in output and employment diminishes. Moreover, growth and higher productivity in the agricultural sector can contribute to aggregate economic growth by releasing labor as well as capital to other sectors in the economy. According to Hwa (1988), agriculture might benefit from non-farm growth, since agriculture's growth depends mostly on the provision of "modern" inputs and technology from the industrial sector. Estudillo and Otsuka (1999) prove that growth in the non-agriculture economy is the key driver of growth in agricultural wage rates. Furthermore, Gardner (2005) claimed that agriculture does not seem to be a primary force behind GDP per capita growth. However, World Development Report's 2008 (World Bank 2007) suggests that in agriculture-based economies agriculture could be the main engine of growth, while in transforming countries agriculture is already less important as an economic activity but is still a major instrument to reduce rural poverty.

Several researchers examined the relationship between the average rate of economic growth and the rate of agricultural growth and they showed that there exists a positive linkage (Stern 1996; Echevarria 1997). Timmer (2002) proved that a positive correlation exists between growth in agricultural GDP and non-agricultural GDP growth using a panel of 65 developing countries for the period 1960–1985. Self and Grabowski (2007) also investigated the same period for a cross-section of countries and showed that the relationship between average growth of real GDP per capita and different measures of agricultural productivity is positive. Some of the empirical studies establish a correlation between agriculture and GDP growth and they do not imply causation in either direction. But when both sectors have been growing independently or as a result of a common third factor, the correlation observed could be spurious. For this reason, several authors consider that there is a causal effect of agricultural sector to economic growth and finally, address the problem of endogeneity in empirical work.

Gemmel et al. (2000) examined the significance of inter-sectoral linkages for agricultural growth in Malaysia and dealt with the problem of endogeneity of the variables using a VAR approach to the estimation of the model, which permits to examine for Granger causality. The results showed that expansion of manufacturing output causes negative agricultural growth in the short-run, as sectors compete for fixed endowment of resources, while positive agricultural growth in the long-run, considering that manufacturing growth spills-over to the farm sector. On the contrary, expansion of the agricultural sector does not affect the other sectors of the economy. Consequently, manufacturing growth stimulates demand for agricultural commodities and provides the agricultural sector with new technology and inputs. Moreover, Bravo-Ortega and Lederman (2005) re-estimated the effect of

agricultural growth on the total economic growth using panel data tools such as GMM and Granger causality test for the period 1960–2000. They proved that in developing countries an increase in agricultural GDP raises non-agricultural GDP, but there is not a reverse relationship in developed countries. Similar findings revealed from the study of Tiffin and Irz (2006) which investigated the direction of causality between agricultural value added per worker and GDP per capita for 85 countries using Granger causality tests in the panel data. The results showed evidence that agricultural value added cause GDP in developing countries, while the causality in developed countries is not clear except from countries with highly competitive agriculture.

A drawback of cross-country studies is that differences in country conditions do not permit to a general relationship between agricultural and aggregate economic growth. Matsuyama (1992) argues that the relation between agricultural and total economic growth depends on the "openness" of a country to international trade. Several authors have tried to enlighten on the significance of linkages between the agricultural sector and the rest of economy in different developing countries, because these linkages differ across countries. The study of de Janvry and Sadoulet (2009) found that 1 % of agricultural growth have an effect of 0.45 % on aggregate growth in China for the period 1980–2001, while the indirect effect through the non-agriculture sector is half that amount. Therefore, a solution to the problem of cross-country studies is the analysis with time-series data. Chenery et al. (1975) combined cross-section and time-series data for the period 1950–1970. Samini and Khyareh (2012) examined the relationship between agriculture and economic growth of Iran using annual time-series data for the period 1970–2009. By multivariate Granger causality tests based on the ARDL-ECM estimates they proved that there is short-run and long-run relationship from agricultural value added to real GDP per capita. Moreover, they showed that real GDP per capita cause agricultural value added only in the short-run.

Thus, as it concerns the above empirical investigations that examine the causal relationship between agriculture and economic growth there is a substantial number that provides conflicting evidences. A number of them consider that the export of surplus resources from agriculture leads to an agricultural driving economic growth while others argue that increases in the non-agricultural productivity thereby implying that causality runs from general economic growth to agriculture.

3 Methodology

Data

The data used to examine the relationship between agriculture and economic growth are the real Agricultural value added (AVA) per worker and real Gross Domestic Product (GDP) per capita (in constant prices, 2000 US$). AVA per

Table 1 Period of examined EU countries

Southern EU countries		Northern EU countries		Northern EU countries	
Country	Period	Country	Period	Country	Period
Greece	1981–2011	Austria	1970–2011	Germany	1980–2011
Italy	1977–2011	Belgium	1970–2011	Ireland	1970–2011
Portugal	1980–2010	Finland	1980–2010	Netherlands	1970–2011
Spain	1970–2011	France	1970–2011		

worker is a measure of agricultural productivity and is considered a good indicator because the sector generates for each productively engaged person over and above the cost of inputs outside agriculture. According to Gardner (2005) investment and technological progress are the two main reasons of the sector's growth. GDP per capita represents the economy's growth.

Annual time series data were used in the analysis for 11 EU countries (Table 1). It is important to mention that a sample of the oldest EU member states which have adopted the euro as their official currency is used. Especially, a sample of four Southern EU countries is used where the contribution of agriculture is high along with a sample of seven Northern EU countries with a non-significant agricultural sector. The specific sample was selected in order to examine the existence of similarities and differences regarding the role of agriculture in economic growth.

The main source of data was the World Bank database; nominal agricultural gross value added and GDP per capita were taken from United Nations Statistics Division (UNSD), employment in agriculture from International Labor Organization (ILO) and consumer price index (CPI) from the International Monetary Fund (IMF). It is important to mention that all data are converted to natural logarithms. In time series analysis this transformation is often considered to stabilize the variance of a series (Brooks 2008).

ARDL Approach to Cointegration

Cointegration analysis is used to examine the study's objectives and specifically the Autoregressive Distributed Lag (ARDL) approach that was originally introduced by Pesaran and Shin (1999) and later extended by Pesaran et al. (2001). The ARDL approach presents numerous advantages in contrast to other cointegration methods. It is an efficient technique for determining cointegrating relationships even if the sample size is small. Additionally, the ARDL approach can be applied irrespectively of the regressors' order of integration. Thus, allowing for statistical inferences on long-run estimates that are not possible under alternative cointegration techniques. Moreover, the ARDL technique generally provides unbiased estimates of the long-run model and valid t-statistics even when some of the regressors are endogenous (Harris and Sollis 2003).

First, in order to find out the appropriate ARDL (p, q_i) model, it is estimated by the OLS method for all possible values of $p = 0, 1, 2, \ldots, m$, $q_i = 0, 1, 2, \ldots, m$, $i = 1, 2, \ldots, k$; namely a total of $(m + 1)^{k+1}$ different ARDL models. The maximum lag, m, is determined by the frequency of the data set and all the models are estimated on the same sample period, namely $t = m + 1, m + 2, \ldots, n$. We select one of the $(m + 1)^{k+1}$ estimated models using the Akaike information criterion (AIC) or the Schwartz Bayesian criterion (SBC). The ARDL model used in this study is represented as follows:

$$\Delta Y_t = \lambda' w_t + a_1 Y_{t-1} + a_2 A_{t-1} + \sum_{i=1}^{k} \gamma_{1i} \Delta_{t-i} + \sum_{i=0}^{k} \gamma_{2i} \Delta A_{t-i} + \varepsilon_{1t} \qquad (1)$$

where w_t is a $s \, x \, 1$ vector of deterministic variables such as the intercept term, time trends or seasonal dummies, or exogenous variables with fixed lags. Δ is the first difference operator and ε_{1t} is error term assumed to be white noise. Then, we investigate the existence of long-run relationship between the two variables. The bounds testing procedure is based on the joint F-statistic or Wald statistic that is testing the null hypothesis of non-cointegration, H_0: $\alpha_1 = \alpha_2 = 0$ against the alternative hypothesis, H_1: $\alpha_1 \neq 0$ and $\alpha_2 \neq 0$. In Pesaran et al. (2001) there are critical value bounds for all classifications of the regressors into purely I(0), purely I(1) or mutually cointegrated. If the calculated F-statistics is below the upper critical value, then we cannot reject the null of non-cointegration. If it lies between the bounds, the results would be inconclusive. The null hypothesis is rejected and there is cointegration whether the calculated F-statistics are above the upper level of the band.

The long-run equation is:

$$Y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} Y_{t-i} + \sum_{i=0}^{k} \beta_{2i} A_{t-i} + \varepsilon_{2t} \qquad (2)$$

where Y_t is the dependent variable (GDP per capita or agricultural value added per worker) and A_t is the independent variable (agricultural value added per worker or GDP per capita). If there is evidence of long-run relationship, cointegration between the variables, then there is a short-run equation which is:

$$\Delta Y_t = \delta_0 + \sum_{i=1}^{k} \delta_{1i} Y_{t-i} + \sum_{i=0}^{k} \delta_{2i} A_{t-i} + \psi ECM_{t-i} + \varepsilon_{3t} \qquad (3)$$

where ψ is the coefficient of the error correction term ECM, defined as:

$$ECM_t = Y_t - \beta_0 - \sum_{i=1}^{k} \beta_{1i} Y_{t-i} - \sum_{i=0}^{k} \beta_{2i} A_{t-i} \tag{4}$$

The error correction model is applied to investigate the short-run relationship between the variables. The value of the coefficient ψ in Eq. 3 must be negative and statistical significant that indicates how far we are from the long-run equilibrium which will show the short-run equilibrium between the variables.

Granger Causality Test

The next step in the analysis employs the Granger causality test to investigate the causal relationship between the variables under examination. The conventional Granger causality test involves the testing of the null hypothesis that a variable Y_t does not cause variable A_t and vice versa (Granger 1969). Unfortunately, this test does not examine the basic time series properties of the variables. If the variables are cointegrated, then this test incorporating different variables will be mis-specified unless the lagged error-correction term is included (Granger 1988). In addition, this test turns the series stationary mechanically by differencing the variables and consequently eliminates the long-run information embodied in the original form of the variables. As opposed to the conventional Granger causality method, the error-correction-based causality test allows for the inclusion of the lagged error-correction term derived from the cointegration equation. By including the lagged error-correction term, the long-run information lost through differencing is reintroduced in a statistically acceptable way. The Granger causality model used in the current study is based on the following model:

$$\Delta_t = \delta_0 + \sum_{i=1}^{k} \delta_{1it-i} + \sum_{i=0}^{k} \delta_{2i} A_{t-i} + \psi ECM_{t-1} + \mu_t \tag{5}$$

$$\Delta A_t = \delta_0' + \sum_{i=1}^{k} \delta_{1i}' A_{t-i} + \sum_{i=0}^{k} \delta_{2it-i}' + \psi' ECM_{t-1} + \mu_t \tag{6}$$

where ECM_{t-1} is the lagged error-correction term obtained from the long-run equilibrium relationship. However, the existence of a long-run relationship between Y_t and A_t suggests that there should be Granger causality in at least one direction. The direction of the causality in this case is only determined by the F-statistic or Wald statistic and the lagged error-correction term. As the t-statistic on the coefficient of the lagged error-correction term represents the long-run causal relationship, the F-statistic or Wald statistic on the explanatory variables represents the short-run causal effect. It should be noted that only equations where the null hypothesis of non-cointegration is rejected will be estimated with this process.

4   Results and Discussion

In order to examine the agriculture's role in economic growth among Southern and Northern EU countries and particularly, short-run and long-run relationships, as well as the direction of causality, an Autoregressive Distributed Lag (ARDL) approach for cointegration and the Granger causality test are applied. The order of integration is identified so as to investigate the existence of the Granger causality between AVA per worker and GDP per capita. Stationarity tests for each variable are conducted, prior to the testing of cointegration, using the Augmented Dickey-Fuller (ADF), Dickey-Fuller GLS, Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS).

The unit root tests provide evidence whether or not the ARDL approach should be applied even though the ARDL framework does not require pre-testing variables to be used. The results of the unit root tests are presented in Table 2 indicating that variables are a mix of I(0) and I(1) series. Unfortunately, the conventional stationarity tests which lead to the non-rejection of a unit root may be suspect when the sample under consideration incorporates economic events capable of causing shifts in regime. In this study breakpoint unit root tests are also conducted such as Zivot and Andrews (1992) and Perron (1997) that allows an endogenous structural break. The null hypothesis of these tests is that series has a unit root against the alternative of a trend stationarity process (TSP) with a structural break.

In Table 3 are presented the breakpoint unit root tests for the examined variables in each country. The results show that there are statistically significant breaks for the AVA per worker in Greece, Italy, Portugal and Spain while concerning to the GDP per capita, significance is found in Greece, Italy, Portugal, Spain, Belgium, Finland, France, Germany, Ireland and Netherlands. The results are inconclusive because there are differences between the Zivot-Andrews and Perron test as regards the existence of a structural break and the dates (the breakpoints found in the Perron test are usually lagging 1 year of those obtained by the Z-A test). However, in our analysis we take into account that variables have structural breaks and have to be adjusted prior to entering the ARDL model. For this reason dummies are used when it is required.

Therefore, the ARDL cointegration procedure is preferable to other conventional approaches such as Johansen multivariate test which require all the variables be of equal degree of integration. The results of the ARDL bounds test for cointegration are reported in Table 4 and prove that when the real AVA per worker is used as the dependent variable, the calculated F-statistic is higher than the critical value in Austria, France, Ireland, Greece and Portugal. Moreover, when the real GDP per capita is used as the dependent variable, the calculated F-statistic is higher than the upper-bound critical values in all examined EU countries except for Greece and Spain.

It should be mentioned that in a cointegrating relationship, the residuals from the long-run equation by the ARDL procedure, must necessarily be stationary, I(0). Otherwise, the results of the F-statistic for the existence of long-run equilibrium

Table 2 Results of the unit root tests

Country	Variable	Unit root tests				Country	Variable	Unit root tests			
		ADF	DF	PP	KPSS			ADF	DF	PP	KPSS
GR	LAVA	I(0)	I(1)	I(0)	I(1)	FIN	LAVA	I(1)	I(1)	I(1)	I(0)
	LGDP	I(1)	I(1)	I(0)	I(1)		LGDP	I(1)	I(1)	I(1)	I(0)
ITA	LAVA	I(1)	I(1)	I(1)	I(0)	FRA	LAVA	I(1)	I(0)	I(1)	I(0)
	LGDP	I(1)	I(0)	I(1)	I(0)		LGDP	I(1)	I(1)	I(1)	I(0)
PRT	LAVA	I(1)	I(1)	I(1)	I(1)	DEU	LAVA	I(1)	I(1)	I(1)	I(1)
	LGDP	I(1)	I(1)	I(0)	I(1)		LGDP	I(1)	I(1)	I(1)	I(0)
ESP	LAVA	I(1)	I(0)	I(1)	I(0)	IRL	LAVA	I(0)	I(0)	I(0)	I(0)
	LGDP	I(1)	I(0)	I(1)	I(0)		LGDP	I(1)	I(1)	I(1)	I(1)
AUT	LAVA	I(1)	I(1)	I(1)	I(1)	NLD	LAVA	I(1)	I(1)	I(1)	I(1)
	LGDP	I(0)	I(1)	I(1)	I(1)		LGDP	I(0)	I(1)	I(1)	I(0)
BEL	LAVA	I(0)	I(0)	I(0)	I(0)						
	LGDP	I(0)	I(1)	I(1)	I(0)						

Table 3 Results of breakpoint unit root tests

Country	Variable	Unit root tests		Country	Variable	Unit root tests	
		Zivot-Andrews	Perron			Zivot-Andrews	Perron
GR	LAVA	I(0) '03^C	I(1)	FIN	LAVA	I(1)	I(1)
	LGDP	I(0) '03^C, '00^B	I(0) '02$^{C,\,B}$		LGDP	I(0) '91^C	I(1)
ITA	LAVA	I(0) '99^C, '02^T, '00^B	I(0) '00^C, '99^B	FRA	LAVA	I(1)	I(1)
	LGDP	I(0) '98^C, '03^T, '99^B	I(0) '98^{C,B}		LGDP	I(0) '81^C	I(0) '80^B
PRT	LAVA	I(0) '87^T	I(1)	DEU	LAVA	I(1)	I(1)
	LGDP	I(0) '01^T	I(1)		LGDP	I(0) '99^C	I(0) '95^C
ESP	LAVA	I(0) '81^C, '84^T	I(0) '80$^{C,\,B}$	IRL	LAVA	I(1)	I(1)
	LGDP	I(0) '80^{C,B}, '84^T	I(0) '80$^{C,\,B}$		LGDP	I(0) '85^T, '80^B	I(0) '80^B
AUT	LAVA	I(1)	I(1)	NLD	LAVA	I(1)	I(1)
	LGDP	I(1)	I(1)		LGDP	I(0) '81^C, '85^T	I(0) '80^B
BEL	LAVA	I(1)	I(1)				
	LGDP	I(0) '81$^{C,\,B}$	I(0) '80^B				

C, T and B denote model with intercept (a change in the level), trend (a change in the slope of the trend function) and both (intercept and trend), respectively

Table 4 Results of bounds F-statistic for cointegration

Country	Dependent variable	F-statistic	Wald-statistic	Country	Dependent variable	F-statistic	Wald-statistic
Northern EU countries				*Northern EU countries*			
AUT	LAVA	9.3479**	18.6959**	DEU	LAVA	2.7889	5.5778
	LGDP	8.4785**	16.9570**		LGDP	4.6285**	9.2570**
BEL	LAVA	2.8546	5.7092	IRL	LAVA	5.2569***	10.5138***
	LGDP	10.2715*	20.5430*		LGDP	14.8450*	29.6901*
FIN	LAVA	2.3233	4.6466	NLD	LAVA	2.2508	4.5016
	LGDP	6.0262**	12.0524**		LGDP	8.4436**	16.8871**
FRA	LAVA	4.0422***	8.0844***				
	LGDP	17.2484*	34.4968*				
Southern EU countries				*Southern EU countries*			
GR	LAVA	7.9797**	15.9595**	PRT	LAVA	9.5934**	19.1868**
	LGDP	2.9415	5.8830		LGDP	7.9025*	15.8050*
ITA	LAVA	3.3480	6.6961	ESP	LAVA	1.4665	2.9330
	LGDP	6.5403***	13.0806***		LGDP	1.7136	3.4273

Critical value bounds of the F-statistic

1%		5%		10%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Case I: No intercept and no trend					
5.020	6.006	3.145	4.153	2.458	3.342
Case II: Intercept and no trend					
7.057	7.815	4.934	5.764	4.042	4.788
Case III: Intercept and trend					
9.063	9.786	6.606	7.423	5.649	6.335

Critical value bounds of the Wald-statistic

1%		5%		10%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Case I: No intercept and no trend					
10.040	12.011	6.291	8.307	4.916	6.684
Case II: Intercept and no trend					
14.114	15.630	9.867	11.528	8.085	9.576
Case III: Intercept and trend					
18.126	19.571	13.212	14.847	11.299	12.670

*, ** and *** denote statistical significance at the 1 %, 5 % and 10 % levels, respectively. Critical value bounds are obtained from Pesaran et al. (2001)

Table 5 Results of ADF unit root test in residuals

Country	Dependent variable	ADF test statistic	Country	Dependent variable	ADF test statistic
Northern EU countries			*Northern EU countries*		
AUT	LAVA	−3.971167 (0.0177)**	DEU	LGDP	−3.762670 (0.0078)*
	LGDP	1.838282 (0.9825)	IRL	LAVA	0.823025 (0.8855)
BEL	LGDP	−4.178951 (0.0105)**		LGDP	1.785970 (0.9805)
FIN	LGDP	1.086117 (0.9236)	NLD	LGDP	−5.097078 (0.0009)*
FRA	LAVA	−5.039799 (0.0010)*			
	LGDP	−3.751948 (0.0071)*			
Southern EU countries			*Southern EU countries*		
GR	LAVA	−2.194389 (0.0293)*	PRT	LAVA	2.165963 (0.9910)
ITA	LGDP	−3.650771 (0.0097)*		LGDP	−4.210757 (0.0148)**

*, ** and *** denote statistical significance at the 1 %, 5 % and 10 % levels, respectively, and probability reported in parenthesis

relationship between the examined variables are unreliable. Therefore, in order to confirm the claim that exist cointegration between the variables an ADF (Augmented Dickey-Fuller) unit root test is applied on the residuals. The results (Table 5) show that the residuals from the long-run equation when the AVA per worker is the dependent variable are a stationary series only for Austria, France and Greece. In addition, when the real GDP per capita is the dependent variable the residuals are stationary in Belgium, France, Germany, Netherlands, Italy and Portugal.

Then, tests for the causality between the variables used are applied by incorporating the lagged error correction term. The causality is examined through the statistical significance of the coefficient of the lagged error correction term and joint significance of the lagged differences of the explanatory variables using the Wald test. The results of these causality tests are presented in Table 6. It is important to mention that in order to test the reliability of the error correction models, a number of diagnostic tests were applied. No evidence of autocorrelation in the disturbance of the error term is found. The results indicate that there is heteroskedasticity only in France (model with dependent variable AVA), Germany and Netherlands (models with dependent variable GDP). However, since the time series constituting both the equations are of mixed order of integration, I(0) and I(1), it is natural to detect heteroskedasticity (Shrestha and Chowdhury 2005). Moreover, all models pass the Jarque-Bera normality test suggesting that the errors are normally distributed and the RESET tests indicate that all models are correctly specified. The high values of R^2 for all models prove that the overall goodness of fit of the model is satisfactory.

Table 6 Results of causality test

Country	Dependent variable	Model	Long-run relationship	Short-run relationship	ECM	Causal flow
			Wald statistic (χ^2)		t-statistic	
Northern EU countries						
AUT	LAVA	ARDL (1,1)	63.4771[*]	108.2242[*]	−0.61723 (−4.0817)[*]	GDP → AVA (long & short-run)
BEL	LGDP	ARDL (2,0)	15.8404[*]	13.4400[*]	−0.50494 (−6.3243)[*]	AVA → GDP (long & short-run)
DEU	LGDP	ARDL (1,1)	2089.8[*]	17.4650[*]	−0.18014 (−1.8800)[***]	AVA → GDP (long & short-run)
FRA	LAVA	ARDL (1,2)	66736.0[*]	74.5371[*]	−0.33973 (−2.8419)[*]	GDP → AVA (long & short-run)
	LGDP	ARDL (1,3)	2.8156[***]	117.3427[*]	−0.40747 (−4.8029)[*]	AVA → GDP (long & short-run)
NLD	LGDP	ARDL (2,1)	8.2070[*]	85.1407[*]	−0.31004 (−4.0266)[*]	AVA → GDP (long & short-run)
Southern EU countries						
GR	LAVA	ARDL (1,2)	40.3565[*]	32.0008[*]	−0.72358 (−3.9750)[*]	GDP → AVA (long & short-run)
ITA	LGDP	ARDL (3,1)	6.6675[*]	153.9298[*]	−0.27751 (−3.0638)[*]	AVA → GDP (long & short-run)
PRT	LGDP	ARDL (2,2)	17143.9[*]	1.7579	−0.14155 (−3.1338)[*]	AVA → GDP nnnnlong-run)

*, *** denote statistical significance at the 1 %, 10 % levels, respectively and t-statistics reported in parenthesis

The long-run causality from the real GDP per capita to AVA per worker is statistically significant in Greece, and as regards the northern EU countries is significant in Austria and France. The reverse long-run causality from AVA per worker to GDP per capita is statistically significant in Italy, Portugal (southern EU countries), Belgium, Germany, France and Netherlands (northern EU countries).

The coefficient of the lagged error correction term, ECM, is negative and statistically significant in all models and EU countries, as expected, making certain that the series is non-explosive and that long-run equilibrium is attainable. ECM measures the speed at which dependent variable (GDP per capita or AVA per worker) adjust to changes in the explanatory variable (AVA per worker or GDP per capita) before converging to its equilibrium level and depicts that adjustment in dependent variable (GDP per capita or AVA per worker) does not occur

instantaneously. Concerning to northern EU countries, in Belgium 51 %, France 41 %, Germany 18 % and Netherlands 31 % of the disequilibria of the previous year's shock to GDP per capita adjust back to the long-run equilibrium in the current year, while in Greece (southern EU country) the percentage is 72 %, which suggests a fast adjustment process. In Austria 62 % and France 34 % of the disequilibria of the previous year's shock to agriculture adjust back to the long-run equilibrium in the current year, and as regards the southern EU countries, Italy and Portugal, the percentages are 28 % and 14 % respectively, which implies a slow adjustment procedure.

The short-run causality from the real GDP per capita to agricultural value added per worker is statistical significant in Austria, France and Greece. Moreover, AVA per worker cause GDP per capita and there is statistically significant short-run relationship in Belgium, Germany, France, Netherlands (northern EU countries) and Italy (southern EU country). The short-run relationship from GDP per capita to agriculture is not significant in Portugal.

The empirical results show that in most of the examined and cointegrated EU countries there is a distinct unidirectional causal flow from GDP per capita to agricultural value added per worker and vice versa. However, there is a bi-directional relationship between the variables in the both long-run and short-run for France. The bi-directional causality indicates a feedback relationship and these findings suggest that AVA per worker and GDP per capita mutually influence each other.

Conclusions

In this paper, an attempt is made to identify the causal relationship between AVA per worker and GDP per capita in a sample of southern and northern EU countries, by employing cointegration analysis and Granger causality tests. The empirical results concerning the autoregressive distributed lag (ARDL) model show that there is a distinct unidirectional relationship from AVA per worker to GDP per capita both in the long-run and short-run for Belgium, Germany, Netherlands, (northern EU countries) and Italy, while only in the long-run for Portugal (southern EU countries). The reverse causality from GDP per capita to agricultural value added per worker both in the long-run and short-run exists for Austria and Greece. There are bi-directional long-run and short-run relationships between the examined variables only in France. The above findings prove that there are many southern and northern EU countries in which causality exists in one direction from AVA per worker to GDP per capita, or, in other words, that agriculture can lead to growth in Eurozone.

On the other hand, it is observed that there are some differences among the southern and northern EU countries. The speed is lower in the southern (Italy-28 %, Portugal-14 %) than in the northern EU countries at which GDP per

capita adjusts to changes in agricultural value added per worker before converging to its equilibrium level. In addition, Greece has faster adjustment process (72 %) than the northern EU countries when the causality runs from GDP per capita to agricultural value added per worker. The bi-directional relationship between agriculture and economic growth occurs in France and indicates that there are "strong" economies in this period of economic crisis, but only in northern Europe.

Finally, it is worth mentioning that although in EU is observed a significant reduction in AVA as a percentage of GDP, agriculture may lead to economic growth in several EU countries. Thus, policy makers have to take into account the fact that agriculture can become the engine of growth in EU and play the stabilizer role in this period of economic crisis.

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Part III
Marketing, Insurance, Real Estate

Commercial Real Property Investments Under Debt Crisis Economic Conditions

Konstantinos J. Liapis, Dimitrios D. Kantianis, and Christos L. Galanos

Abstract The main purpose of our paper is the incorporation of life-cycle costs (LCC) and whole-life costing (WLC) methodology into the investment appraisal procedure for commercial real property projects under the current debt crisis conditions that the Greek economic environment is facing. The paper initially presents the methodologies of LCC and WLC together with the NPV measure for the evaluation of real estate investments. These methods are incorporated into a decision-making model using mathematical approaches. The model is applied to a typical commercial property project (office building) in order to explore the significance of impacts from changes in structured variables and the taxation environment under today's debt crisis Greek economic conditions in the evaluation of commercial real estate projects. The application of our methodology to the current Greek economic environment revealed that the tax regime, the financial variables of funding and the applied monetary and fiscal policies affecting demand and inflation are critical variables of the Net Present Value (NPV) of a commercial property project investment. An integrated WLC mathematical model for the evaluation and valuation of commercial real property projects is introduced. The herein proposed methodology contributes to taxation policy and real estate theory in general and assists industry professionals in effective commercial property management and decision-making.

Keywords LCC • WLC • Property evaluation • Decision-making • Economic crisis • Taxation

JEL Classification Codes R30 • R33 • C60

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1 Introduction

Despite the fact that whole-life costing (WLC) is a field of continuous growing interest in the real property sector, there is no legislative framework that imposes WLC calculations in the evaluation of real estate projects. Hence, although the importance of WLC has long been recognised and substantial amounts of research into the field can be found in the literature, its application has not been implemented into standard practice. The lack of historical data and databases on building operation and maintenance and the complexity of calculating the factors involved in WLC have been determined as reasons for this (Kehily and Hore 2012). An obvious need therefore exists in the real property market for the development of a consistent and easy to implement WLC methodology/tool not only for initial investment appraisal purposes but also for effective property management through its entire life-cycle. The aim of this paper is to fulfil this need with the development of a real property mathematical model which is based on the integration of WLC/LCC concepts with the currently applied evaluation methods for real estate investments and the taxation environment. The main objectives of the study are: to explain the importance of WLC evaluation and management in the success of real property projects; to review WLC literature in order to identify the critical variables that a valid WLC tool should incorporate; to assess WLC application level in the industry, and to examine the influence of the taxation environment on WLC calculations. The proposed integrated WLC mathematical model for real property investments evaluation, decision-making and management is then analysed and its application to a typical commercial property project is carried out in order to explore the significance of impacts from changes in structured variables and the taxation environment under today's debt crisis Greek economic conditions in the evaluation of commercial real estate projects. Finally, conclusions are derived from the above analyses and recommendations for further research towards the potential improvement of the suggested WLC model are outlined.

2 The Need for Real Property Life-Cycle Evaluation

Real property industry is complex in its nature and building projects may be considered the most challenging undertaking in any industry. Building production process complexity affects project management triangular parameters of cost, time and quality (Baccarini 1996). Despite this complexity, real property is one of the largest markets worldwide contributing to about 10 % of Gross National Product (GNP) in industrialized countries, involving a vast spectrum of stake-holders and playing a significant role in the development and achievement of society's goals (Allmon et al. 2000). Moreover, real property market today is increasingly sophisticated with clients demanding 'best value for money' rather than lowest cost. Nonetheless, the cost performance of building projects has often been criticized

and this has been a major concern for the industry at large (Baloi and Price 2003). In general, according to Koushki et al. (2005), time delays and cost overruns are among the most common phenomena in the building industry – from simple to complex projects. The reputation of the building industry as a high-risk business is due to the high level of business failures which is far beyond those in many other industries. While these failures result from the combination of several factors, the financial-related causes account for a considerable proportion of them, manifesting themselves in low returns, losses and, in some cases, liquidations (Khosrowshahi and Kaka 2007). According to Mbachu and Nkado (2004), these cost overruns have obvious negative implications for the key stakeholders in particular, and the industry in general. To the client, high cost implies added costs over and above those initially agreed upon at the onset, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental/lease costs or prices. To the consultants, it means inability to deliver value for money and could tarnish their reputation and result in loss of confidence reposed in them by clients. To the contractor, it implies loss of profit through penalties for non-completion, and negative word of mouth that could jeopardize their chances of winning further jobs, if at fault.

As De Ridder and Vrijhoef (2004) explained, the predictability of the costs of buildings has proven to be difficult, particularly over the project whole-life cycle. The special characteristics of construction, such as fragmented demand and supply chains, the uniqueness and complexity of projects are basic causes, often leading to cost/time overruns, delivery of less value than agreed, and dissatisfied clients and users. In addition, it is difficult to assess uncertainty and risk beforehand. Besides, fixed prices and predefined contractual specifications make it difficult to respond to changing demands and circumstances. Kishk et al. (2003) argued that the traditional approach to costing building projects has been to focus primarily on initial capital costs and since the capital costs of construction is almost always separated from the running costs, it is normal practice in the building industry to accept the lowest initial cost and then hand-over the building to be maintained by others. Tietz (1987) believes that the initial building costs can be wholly misleading because capital savings can result in major life-time expenses caused by extra maintenance work or earlier obsolescence. Furthermore, with occupancy costs representing up to 70 % of the total cost of a building over its entire life-cycle (Flanagan and Norman 1987), this pre-occupation with capital expenditure has led to designs which do not meet clients' desire to set the right budget and to reduce their life-cycle costs, and it is important to understand the benefits of life-cycle costing (LCC) (Kirk and Dell'Isola 1995). In addition, energy prices have also risen and are subject to wide price fluctuations and, as a result, clients are more aware that running costs should be examined very closely from a sustainable development perspective. These rising concerns over the long-term environmental impact of a building have forced designers to adopt a more holistic attitude and to look more closely at the costs incurred over the project life-cycle, from conception to demolition (Al-Hajj and Horner 1998). It is not only original designs that matter for building productivity, but the nature of the materials used, and the manner in which

buildings are monitored, maintained, and re-evaluated over the whole life-cycle. Good design and construction does not, therefore, end at the erection of the building – it involves the provision of building services over the product life-time (*n*CRISP 2003).

A study conducted by the UK Royal Academy of Engineering on the long-term costs of owning and using buildings (Evans et al. 1998), revealed that for a typical commercial project (office building), over a 30-year period, the operational expenditure is 5 times the capital cost and the operating cost of businesses occupying the building is 200 times the initial costs (the 1:5:200 rule). A similar study in building design and management claimed the aforementioned ratio to be 1:10:100 (Kernohan et al. 1996). These approximate 'rule of thumb' ratios indicate that only a 1 % reduction of business operating cost in the life-time of a building would effectively payback its initial capital cost and that substantial levels of economic activity are affected by relatively small design, construction and maintenance inputs (*n*CRISP 2003). Herein is located the key impetus for implementing LCC, that is: *'to reduce costs during the operation and maintenance phases as these are greater proportion of the whole life cost of the asset, even if this means increased capital expenditure at the outset'* (Olubodun et al. 2010).

Accordingly, LCC has become more important to real property owners (private clients or public sector Authorities) with a long-term interest in the property concerned who demand evidence of what their costs of ownership will be, and to consortia formed to procure Private Finance Initiative (PFI), Public-Private Partnerships (PPP) or Build-Operate-Transfer (BOT) projects trying to assess the financial risks of taking long-term responsibility for building operation and maintenance (BRE 2004). The increased usage of LCC could well be due to the fact that in contractual partnerships of this nature the risk and the long-term financial implications of design decisions rest with the building contractors and, therefore, it is their interest to minimise the life-cycle cost of the asset (Kirkham et al. 2004). Furthermore, funding and insurance organisations are also interested in LCC as part of their due diligence enquiries into how robustly cost estimates have been prepared and how successfully the risks of designing and delivering property projects have been tackled (Constructing Excellence 2003). As Clift (2003) explained, until recently, lending institutions have considered that most financial risk occurs during the building production phase when project cost can be affected by unexpected ground conditions, inclement weather, labour/material shortages, time overruns, defects and/or poor budgeting. Now that financial institutions are funding long-term PFI projects (lasting over 25 years) they realize that lack of understanding of how buildings perform makes predicting future costs a long way ahead an unreliable exercise.

3   LCC/WLC Fundamentals

Key Definitions

Several definitions of LCC have developed over the years. The first International Standard for property life-cycle costing, BS ISO 15686–5:2008 'Buildings and constructed assets – Service life planning – Part 5: Life cycle costing' (BSI 2008) defines LCC as the: *'methodology for the systematic economic evaluation of life cycle costs over a period of analysis, as defined in the agreed scope'.* Life-cycle cost, in turn, is defined as the *'cost of an asset, or its parts throughout its life cycle, while fulfilling the performance requirements'.* Ferry and Flanagan (1991) in their report for the UK Construction Industry Research and Information Association (CIRIA) described the LCC method as: *'putting the estimated capital, maintenance, operating and replacement costs into a comparable form and bringing them into a single figure which allows for the fact that these items of expenditure will take place at different stages within the time-scale'.* Norman (1993) defined LCC as the process of economic analysis that assesses the total cost of investment in and ownership, operation and subsequent disposal of the system or product to which the LCC method is being applied. This process takes the functional requirements and operational constraints that apply to the system or product and translates these into a common cost measurement known as life-cycle cost. Another useful definition is included in Kishk et al. (2003) – at its most basic, LCC *'includes the systematic consideration of all costs and revenues associated with the acquisition, use and maintenance and disposal of an asset'.* The important point to be drawn from the above definitions and expressions is that LCC deals with present and future costs and attempts to relate the two as a basis for decision-making. LCC should also be distinguished from life-cycle assessment (LCA) since LCA only addresses ecological aspects with no connection to economy (Pelzeter 2007).

The Norwegian Standard NS 3454 (2000) defines LCC as including both original costs and costs incurred throughout the whole functional property life-time. Mainly in the UK and Canada the expression whole-life costing (WLC) is preferred. WLC is defined in BS ISO 15686–5:2008 as the *'methodology for the systematic economic consideration of all whole life costs and benefits over a period of analysis, as defined in the agreed scope'.* Hence, WLC is considered to have a broader scope than LCC emphasising not only on economic life-span but on the entire span of real property existence including non-construction costs such as finance, business costs, incomes from sales/disposals etc. and also external social/environmental costs and benefits (Fig. 1). However, in the literature the two terms are still used interchangeably by the majority of those who are interested in the technique. To prevent confusion, in our paper both terms are used but according to their aforementioned definitions in BS ISO 15686–5:2008. Notwithstanding, since our subsequent proposed methodology is based on whole-life cost calculations, the term WLC is mainly used throughout the paper.
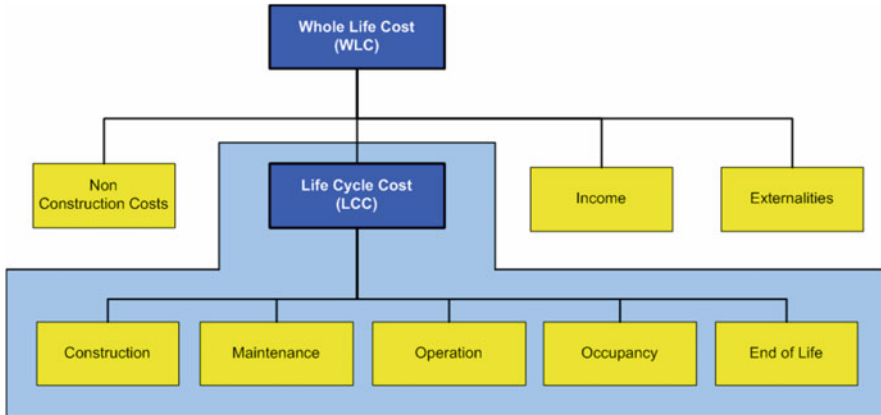
Fig. 1 Difference between WLC and LCC (From BS ISO 15686-5:2008)

WLC Benefits

WLC objectives as identified by the Royal Institute of Chartered Surveyors (RICS 1986) are to:

- enable investment options to be more effectively evaluated and facilitate choice between alternative scenarios;
- consider the impact of all costs rather than only initial capital costs;
- assist in the effective management of completed buildings and projects.

The use of WLC particularly assists in (Clift 2003):

- determining whether a higher initial cost is justified by reductions in future costs (for new build or when considering alternatives to 'like for like' replacement);
- identifying whether a proposed change is cost-effective against the 'do nothing' (or *status quo*) alternative, which has no initial investment cost but higher future costs.

The benefits for clients, as identified in the Client's Guide to Whole Life Costing (Client's Construction Forum 2000), include:

- encouraging analysis of business needs and communication of these to the project team;
- optimising the total cost of ownership/occupation by balancing initial capital and running costs;
- ensuring risk and cost analysis of loss of functional performance due to failure or inadequate maintenance occurs;
- promoting realistic budgeting for operation, maintenance and repair;
- encouraging discussion and recording of decisions about the durability of materials and components at the outset of the project;

- providing data on actual performance and operation compared with predicted performance for use in the future planning and benchmarking.

In general terms, all stages during the management of a typical real property project have a potential use of WLC (Ferry and Flanagan 1991). However, the potential for influencing the full life-cycle performance is higher in the early design stages and decreases dramatically through construction and use phases, and the earlier WLC can be considered in the procurement process, the more effective the outcome will be (Kohler and Moffatt 2003). It has been estimated that 80–90 % of the costs of running, maintaining and repairing a building is determined at the design stage (Mackay 1999 as cited in Kishk et al. (2003)).

WLC Key Variables and Basic Steps

In order to achieve WLC objectives, the following critical variables have been identified in numerous papers and textbooks on the subject (Flanagan and Norman 1987; Ferry and Flanagan 1991; Hoar 1993; Bull 1993; Norman 1993; Kirk and Dell'Isola 1995; Woodward 1997; Kishk et al. 2003, among others):

- project life-time (the analysis period);
- the discount rate (to address 'time value of money');
- inflation and taxation;
- construction cost;
- operating cost;
- repair and maintenance cost;
- occupancy cost;
- end of life/disposal cost;
- non-construction costs;
- incomes;
- externalities (social/environmental costs/benefits);
- uncertainty (risk assessment/sensitivity analysis).

WLC analysis is conducted through the following steps (Constructing Excellence 2003):

- identify/estimate all property costs and incomes in its entire life-cycle;
- employ an effective Cost Breakdown Structure (CBS) (see BCIS 2012);
- decide when these costs and incomes are likely to occur;
- use 'discounted cash-flow' techniques to bring costs and incomes back to a common basis – items should normally be entered into the analysis at the current cost and income and a discount rate applied;
- address uncertainty issues by undertaking risk assessment and/or sensitivity analysis of the variables such as the discount rate, the study period, the predicted design lives of various components, assumptions about running costs, etc.

Mathematical Expression of WLC

Almost all WLC mathematical models found in the literature employ the Net Present Value (NPV) approach. The NPV of an alternative investment is defined as the capital that needs to be invested today to meet all future financial requirements as they arise throughout the project whole life-cycle. Obviously, the best alternative is the one with minimum NPV. Because NPV focuses on costs rather than revenues, it is usual practice to treat cost as positive and income as negative. The following basic equation of NPV is found in Kishk et al. (2003):

$$NPV = C_0 + \sum_{t=1}^{T} O_t + \sum_{t=1}^{T} M_t - SAV \qquad (1)$$

C_0 : the initial construction costs (at time zero)
$\sum_{t=1}^{T} O_t$: the sum of discounted operation costs at time t
$\sum_{t=1}^{T} M_t$: the sum of discounted maintenance costs at time t
SAV : the discounted salvage value = $RV_T - DC_T$
RV_T : the discounted resale value (at the end of the analysis period)
DC_T : the discounted disposal costs (at the end of the analysis period)
T : the analysis period in years (project life-cycle)

The NPV method discounts the relevant cash flows of an investment at the opportunity cost of capital (or discount rate). If the present value of the cash inflows exceeds the present value of the cash outflows, we recommend that the project should be undertaken. The NPV method is always consistent with the firm's overall objective of shareholders' profit maximisation unlike the internal rate of return (IRR) approach, which is a measure of relative and not absolute wealth (Davis and Pointon, 1994).

Barriers to WLC Implementation

Despite its obvious long-term benefits, the application of WLC remains limited to large PPP projects and is mostly undertaken at the early stages of procurement (Davis Langdon 2007). The absence of sufficient and appropriate data was, and still is, the major barrier to the application of WLC in the real property market (Kishk et al. 2003). WLC application, in a way, is still trapped in a 'vicious circle' (Fig. 2), containing a series of causes and consequences. In order to move forward in WLC implementation the circle would have to be broken somewhere (Al-Hajj 1991).

National Audit Office Report on 'Improving Public Services through better construction' (NAO 2005), identified the following key barriers to WLC wider application:

- confusion over scoping and terminology (i.e. WLC, LCC and LCA);
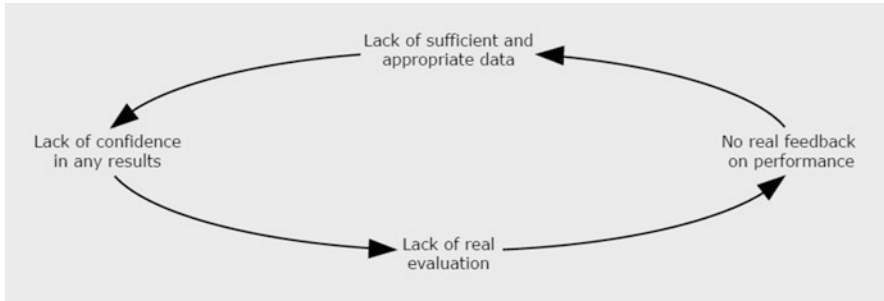- lack of a common methodology and standard cost data structure;

Fig. 2 The 'vicious circle' of WLC implementation (Al-Hajj 1991)

- lack of the ability to present information to enable project stakeholders to understand the interrelationship between cost (over the whole-life), time and design quality and also take account of wider environmental (notably energy performance and CO2 emissions) and also social aspects;
- lack of tangible evidence and 'know-how' skills.

4 Taxation Aspects

The tax regime within which the real property owner is operating may determine which future costs are allowable for tax (tax deductibles) – in the UK for example, capital allowances are currently available on new industrial buildings, hotels, industrial and commercial buildings in Enterprise Zones, agricultural buildings and on small workshops. Many items of plant, equipment, leased plant and, sometimes, associated builders' work are eligible for allowances. These allowances also vary depending on the financial situation of the property owner – whether or not taxable profits against which allowances can be claimed (BRE 2004).

There are two aspects in considering taxes in WLC calculations. The first deals with the probability that environmentally inefficient structures will attract future environmental taxes, and hence, WLC is an essential activity insuring elimination of this kind of risks. This can be addressed in the same way as any other risks. For each risk, the probability of occurrence and the likely impact can be established and a risk allowance is made. The second deals with general allowances for unspecified taxes in the calculations. There are several areas where costs might increase at a rate higher than inflation for a variety of reasons. Although capital costs for plant and equipment are usually a budgeted one-off attracting various tax allowances, the ongoing reliability, efficiency and maintainability will affect the bottom line for the life of equipment (Davis Langdon 2007). Ashworth (1999) believes that inclusion of taxes in WLC calculations is important in the assessment of projects for the

private sector; this tends to favour alternatives with lower initial cost because taxation relief is generally available only against repairs and maintenance.

The taxation environment is traditionally presented by tax rates and fees for indirect, direct and property taxes. According to the current Greek legislation, these tax bases are summarised in Appendix A.

5   The Proposed WLC Model for Real Estate Investments

The Time Value of Money: Net Present Value (NPV)

The (undiscounted) net value (NV) of a real property project can be expressed mathematically as follows:

$$NV = R - WLC \tag{2}$$

Where:
NV   *Net Value*
R   *Revenue* (i.e. income from sales/rents, tax allowances)
WLC *Whole-Life Cost*

Based on the BS ISO 15686–5:2008 (Fig. 1), the project whole-life cost breakdown structure (WLCBS) is analysed as follows:

$$WLC = LCC + NCC + EXT \tag{3}$$
$$LCC = C + O + M + OC - SAV \tag{4}$$
$$SAV = RV - DC \tag{5}$$

Where:
LCC   *Life-Cycle Cost*
NCC   *Non-Construction Costs* (initial capital costs, i.e. land acquisition, pre-construction design, engineering and consulting costs, costs of permits issuance, finance for land purchase and/or construction)
EXT   *Externalities* (positive like public health and safety improvement and/or other social benefits and negative like environmental pollution, traffic congestion and/or social costs) – the analysis and evaluation of these external costs and benefits is beyond the scope of this paper and will be addressed by the authors in latter research work
C   *Construction Cost* (i.e. preliminaries, site set-up, earthworks, substructures, super-structures, installations, finishing works, etc. including quality assurance costs)
O   *Operation Cost* (cleaning, utilities and administrative costs)

M   *Maintenance Cost* (for major replacements, minor scheduled and unscheduled works, adaptations, redecorations, grounds maintenance and gardening)

OC   *Occupancy Cost* (security, help-desks, telephones, IT services, car parks, etc.)

SAV   *Salvage Value*

RV   *Resale Value*

DC   *Disposal Cost* (materials disposal/recycling, demolitions/site clearance, reconstruction/restoration/refurbishment)

Therefore:

$$NV = (R + RV) - (C + O + M + OC + DC + NCC + EXT) \quad (6)$$

According to the theory of finance, the NPV of a real estate investment project can be calculated as follows:

$$NPV = \sum_{t=1}^{T} \frac{NCF_t}{(1 + WACC)^t} \quad (7)$$

Where:

NCF_t : Net cash-flow of the project at year t

t   : 1, ..., T and T = total years of property life-cycle (the analysis period)

WACC: The discount rate or the Weighted Average Cost of Capital

Operating Cash-Flow (OCF) and Net Cash-Flow (NCF)

The cash-flow of an investment project in real estate where we apply returns measures (like NPV, IRR) is the operating cash-flow (OCF). The OCF is calculated if, from the revenues of the investment project, we remove its fixed and variable costs. Thus:

$$OCF_t = R_t - TC_{ot} \quad (8)$$

Where:

OCF_t: Operating cash-flow at year t

R_t : Revenue (income) at year t:

$$R_t = (R_{ot} + RV_T) \quad (9)$$

ot   : Operating period

T   : End year of property life-cycle

R_{ot} : Revenue (income) at operating year t

RV_T : Resale value at the end year of property life-cycle

TC_{ot} : Fixed and variable (total) costs at operating year t:

$$TC_{ot} = (O_{ot} + M_{ot} + OC_{ot}) \tag{10}$$

O_{ot} : Operating costs at operating year t
M_{ot} : Maintenance costs at operating year t
OC_{ot} : Occupancy costs at operating year t
   Thus:

$$OCF_t = (R_{ot} + RV_T) - (O_{ot} + M_{ot} + OC_{ot}) \tag{11}$$

In order to calculate the project's net cash-flow (NCF), we deduct from the OCF the initial costs of the investment (construction, non-construction and disposal costs) and the taxes that correspond to the revenues minus the tax deductive amounts (i.e. the depreciation of the fixed asset):

$$NCF_t = OCF_t - \varphi_t^y.(OCF_t - D_t) - P_{ct,T} = OCF_t.(1 - \varphi_t^y) + \varphi_t^y.D_t - P_{ct,T} \tag{12}$$

Where:
t : 1, ..., T and T = total years of property life-cycle (the analysis period)
φ_t^y : Corporate tax rate (tax on income)
D_t : Annual depreciation
$P_{ct,T}$: Initial construction and non-construction costs plus disposal cost at the end year of property life-cycle:

$$P_{ct,T} = (C_{ct} + NCC_{pct} + DC_T) \tag{13}$$

ct   : Construction period
pct   : Pre-construction period
C_{ct} : Construction cost at construction period
NCC_{pct} : Non-construction cost at pre-construction period
DC_T : Disposal cost at the end year of property life-cycle
   Thus:

$$NCF_t = [(R_{ot} + RV_T) - (O_{ot} + M_{ot} + OC_{ot})].(1 - \varphi_t^y) + \varphi_t^y.D_t \\ - (C_{ct} + NCC_{pct} + DC_T) \tag{14}$$

Assuming that we follow the constant depreciation method per year and that there is a Salvage Value (SAV) of the investment at the end of the construction period:

$$D_t = a.(C_{ct} + NCC_{pct} - SAV_{T,ct}) \\ = a.(C_{ct} + NCC_{pct} - (RV_{T,ct} - DC_{T,ct})) \tag{15}$$

Where:
a: Rate of constant depreciation of fixed asset (1/useful life)

$SAV_{T,ct}$: Salvage Value of fixed asset at the end of construction period:

$$SAV_{T,ct} = (RV_{T,ct} - DC_{T,ct}) \tag{16}$$

Thus:

$$D_t = a.\left(C_{ct} + NCC_{pct} + DC_{T,ct} - RV_{T,ct}\right) \tag{17}$$

Therefore:

$$
\begin{aligned}
NCF_t = & \left[(R_{ot} + RV_T) - (O_{ot} + M_{ot} + OC_{ot})\right].(1 - \varphi_t^y) \\
& + \varphi_t^y.a.\left(C_{ct} + NCC_{pct} + DC_{T,ct} - RV_{T,ct}\right) \\
& - \left(C_{ct} + NCC_{pct} + DC_T\right)
\end{aligned} \tag{18}
$$

In addition, if we suppose that a property tax exists:
  φ_t^p: Property tax rate
  Usually, property tax is not a tax deductible amount increasing the project whole-life cost:

$$
\begin{aligned}
NCF_t = & \left[(R_{ot} + RV_T) - (O_{ot} + M_{ot} + OC_{ot})\right].(1 - \varphi_t^y) \\
& + \varphi_t^y.a.\left(C_{ct} + NCC_{pct} + DC_{T,ct} - RV_{T,ct}\right) - \varphi_t^p.\left(C_{ct} + NCC_{pct}\right) \\
& - \left(C_{ct} + NCC_{pct} + DC_T\right)
\end{aligned} \tag{19}
$$

But, Value Added Tax (VAT) and other indirect taxes also exist in construction and operational periods, thus:

$$
\begin{aligned}
NCF_t = & \left[(R_{ot} + RV_T) - (O_{ot} + M_{ot} + OC_{ot}).\left(1 + \varphi_t^{ind}\right)\right].(1 - \varphi_t^y) \\
& + \varphi_t^y.a.\left(C_{ct} + NCC_{pct} + DC_{T,ct} - RV_{T,ct}\right) - \varphi_t^p.\left(C_{ct} + NCC_{pct}\right) \\
& - \left(C_{ct} + NCC_{pct} + DC_T\right).\left(1 + \varphi_t^{ind}\right)
\end{aligned} \tag{20}
$$

If indirect taxes like VAT also exist on revenues and resale value, then:

$$
\begin{aligned}
NCF_t = & \left[(R_{ot} + RV_T).\left(1 + \varphi_t^{ind}\right)\right. \\
& - (O_{ot} + M_{ot} + OC_{ot}).\left(1 + \varphi_t^{ind}\right)\left.\right].(1 - \varphi_t^y) \\
& + \varphi_t^y.a.\left(C_{ct} + NCC_{pct} + DC_{T,ct} - RV_{T,ct}\right) - \varphi_t^p.\left(C_{ct} + NCC_{pct}\right) \\
& - \left(C_{ct} + NCC_{pct} + DC_T\right).\left(1 + \varphi_t^{ind}\right)
\end{aligned} \tag{21}
$$

Hence:

$$NCF_t = \left[(R_{ot} + RV_T) - (O_{ot} + M_{ot} + OC_{ot})\right].\left(1 + \varphi_t^{ind}\right).\left(1 - \varphi_t^y\right)$$
$$+ \varphi_t^y.a.\left(C_{ct} + NCC_{pct} + DC_{T,ct} - RV_{T,ct}\right) - \varphi_t^p.\left(C_{ct} + NCC_{pct}\right)$$
$$- \left(C_{ct} + NCC_{pct} + DC_T\right).\left(1 + \varphi_t^{ind}\right) \tag{22}$$

Where:

φ_t^{ind} : Indirect tax rate.

Relationship Between Price and Revenue

According to the theory of finance and existing literature (Liapis et al. 2011), the relationship between price and revenue (income) is described by the following formula:

$$R_t = P_t.[(i_{FR} - \varphi_t^p).(1 - \varphi_t^y) + \delta_t + \Lambda_t - EG_{t+1}] \tag{23}$$

And if depreciation of the price of property asset is tax deductible we have:

$$R_t = P_t.[(i_{FR} - \varphi_t^p).(1 - \varphi_t^y + a.\varphi_t^y) + \delta_t + \Lambda_t - EG_{t+1}] \tag{24}$$

Where:

i_{FR} : Risk-free rate of interest
φ_t^p : Property tax
φ_t^y : Income tax (corporate tax) on property yield (annual rent)
a   : Depreciation rate on tax deductible amount of price of property
δ_t : Rate of operating, maintenance and occupancy cost
Λ_t : Risk premium, for commercial properties investments
EG_{t+1} : Expected capital gains (profits) at year t+1, but in terms of WLC is closely to 0

But:

$$R_t = (R_{ot} + RV_T) \tag{25}$$
$$P_t = \left(C_{ct} + NCC_{pct} + DC_T - RV_T\right).\left(1 + \varphi_t^{ind}\right) \tag{26}$$

Thus:

$$R_{ot} + RV_T = \left(C_{ct} + NCC_{pct} + DC_T - RV_T\right).\left(1 + \varphi_t^{ind}\right).$$
$$[(i_{FR} - \varphi_t^p).(1 - \varphi_t^y + a.\varphi_t^y) + \delta_t + \Lambda_t - EG_{t+1}] \tag{27}$$

According to the above equation, price should be high relative to rents and from this we take a similar formula for property assets like Price per Earnings (P/E) formula in capital markets, thus:

$$\frac{P_t}{R_t} = \frac{\left(C_{ct} + NCC_{pct} + DC_T - RV_T\right).\left(1 + \varphi_t^{ind}\right)}{R_{ot} + RV_T}$$

$$= \frac{1}{\left[(i_{FR} - \varphi_t^P).(1 - \varphi_t^y + a.\varphi_t^y) + \delta_t + \Lambda_t - EG_{t+1}\right]} \quad (28)$$

If indirect tax (like VAT) exists also on revenues and resale value, then:

$$\frac{P_t}{R_t} = \frac{\left(C_{ct} + NCC_{pct} + DC_T - RV_T\right)}{R_{ot} + RV_T}$$

$$= \frac{1}{\left[(i_{FR} - \varphi_t^P).(1 - \varphi_t^y + a.\varphi_t^y) + \delta_t + \Lambda_t - EG_{t+1}\right]} \quad (29)$$

If AC denotes the direct cost of property asset which is equal to cost ratio exempt risk premium and capital gains, we have:

$$AC_t = [(i_{FR} - \varphi_t^P)(1 - \varphi_t^y + a.\varphi_t^y) + \delta_t] \quad (30)$$

Where:

$$\delta_t = \frac{(O_{ot} + M_{ot} + OC_{ot})}{(C_{ct} + NCC_{pct})} \quad (31)$$

Also, according to finance theory:

$$i_{FR} = i_* + i_{inf} \quad (32)$$

Where:
i_* : Risk-free rate of interest in an economy without inflation
i_{inf} : Inflation rate

Discount Factor or Weighted Average Cost of Capital (WACC)

As discount factor in evaluation measures, a rate from funding cost of investment is commonly used. An investor could be using his own capital or debt financing or a mix of them. The investor's total cost of capital is an important benchmark in many popular forms of performance analysis in real estate projects. The total cost of capital or the Weighted Average Cost of Capital (WACC) is:

$$WACC = i_D.(1 - \varphi_t^y).\left(\frac{D}{D+S}\right) + i_S.\left(\frac{S}{D+S}\right) \quad (33)$$

Where:

$$i_D = i_{FR} + \text{Credit Spread} \tag{34}$$

i_D : Average interest rate of debt
Credit Spread: Risk premium for the banking sector for long-term investments like commercial property projects
i_S : Average interest rate of investor's capital
D   : Debt
S   : Investor's equity capital
φ_t^y : Income tax rate
The average interest rate of investor's capital, according to the work of Liapis et al. (2011), is calculated by the following equation:

$$i_S = \exp\left(\frac{\ln 2 * \ln(1+g)}{\ln\left(1 + \frac{g}{AC_t + \Lambda_t - g}\right)}\right) - 1 \tag{35}$$

Where:
   g: Growth rate

6   Case Study

We apply our WLC model on a 1,000,00 sq. m of gross floor-area real typical commercial property project (i.e. an office building) with a 2-year pre-construction period (for land purchase, design and engineering and issuing of construction permits) and a 3-year construction period starting from the second year of the pre-construction period. The project, after its completion, is assumed to be operated, repaired and maintained by the developer for rental purposes for a time horizon of 45 years. Finally, the disposal (end of life) period is 1 year and, hence, the total analysis period (property whole-life cycle) is 50 years.

Depending on the assumptions made concerning the required input rates and values, the model calculates the shaded output rates and values as described in Table 1. In order to approximate the current Greek economic environment as close as possible, the rates and values used in Table 1 are taken from the authors' database of actual recently completed Greek commercial property projects in the centre of Athens and from professional real estate agencies and developers.

From the results of our WLC analysis, the Net Present Value (NPV) of the investment at any time of property life-cycle is calculated as follows:

Any change in any of the selected model inputs has its own impact on the evaluation of property. For example, nowadays in Greece, a debate exists whether to increase property tax ratio from 1 % to 2 % or more; on the other hand, the leverage of funds is limited as a result of liquidity problems of the economy. Thus, if we assume: a) an increase in property tax from 1 % to 2 %; b) that the whole

Table 1 Input – output figures of the WLC model for a typical commercial project

WLC	sq.m	(%)	Rates/sq.m or (%)	Values	Tax on Income	33,00%	Property Life-cycle	50 yrs	
	1.000,00				Indirect Tax (VAT)	23,00%			
R (Rent)	1.000,00	16,07%	180,00	180.000	% cost NCC (Land etc.)	20,00%	120.000,00		
C	1.000,00		1.000,00	1.000.000	Property Tax	1,00%	Source of Finance		
NCC (Land)	1.000,00		650,00	650.000	WACC	5,86%	D	S	
O	1.000,00	0,89%	10,00	10.000	Credit Spread	3,00%	60%	40%	
M	1.000,00	1,12%	15,00	12.500	Inflation Rate	2,00%	Cost Distribution	C	NCC
OC	1.000,00	1,61%	20,00	18.000	Depreciation (a)	2,00%	Year 1		70%
RV	1.000,00		10%	100.000	Free-risk rate	4,00%	Year 2	25%	30%
DC	1.000,00		50,00	50.000	Risk Premium (›)	5,00%	Year 3	50%	
					Growth Rate (g)	0,10%	Year 4	25%	
					Free-risk rate (i*)	2,00%			

project is funded only from the developer's equity capital (D=0); and c) the decision of the Greek Government to adopt fiscal policies in their effort to enhance productivity to overcome the current crisis situation which has decreased inflation rate close to 0 % (and, thus, moving towards *deflation*) and, as a result, influencing future revenues as well as the cost of capital, the NPV graph of Fig. 3 changes accordingly, as shown in Fig. 4:

It can be seen that the payback period of the investment project increase from 23 years to 45 years, indicating that the current Greek economic environment restrains any investment in the real property market.
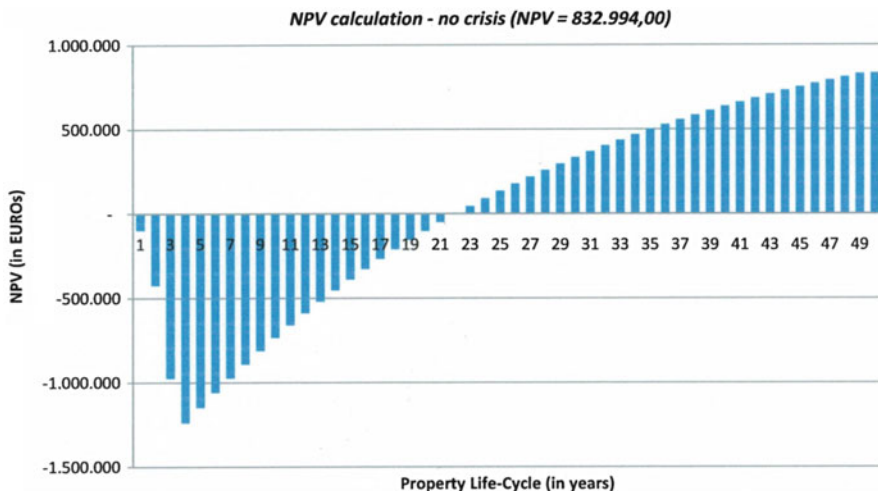
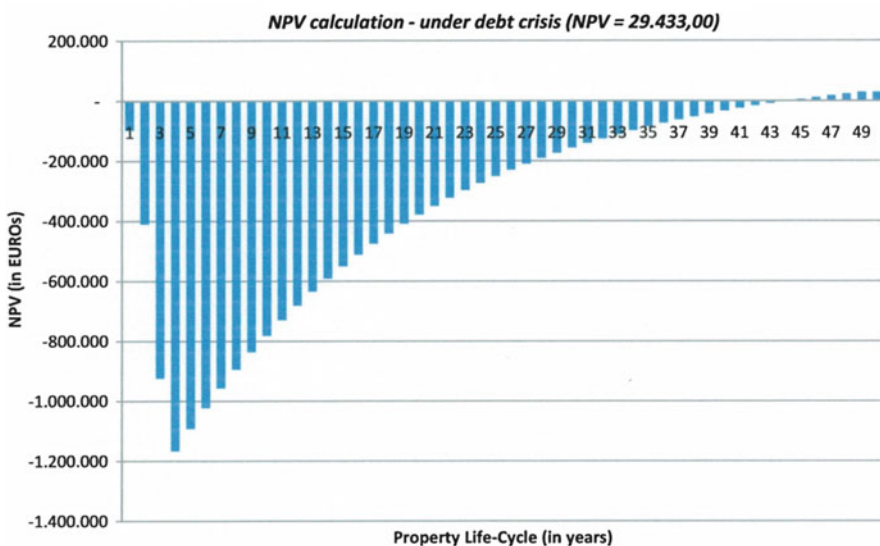**Fig. 3** NPV calculation at any time of property life-cycle under normal economic conditions

Fig. 4 NPV calculation under debt crisis conditions: property tax 2 %; no external funding (D = 0); and no inflation

Conclusion

In our paper, building upon the assertion that WLC is fundamental for securing 'best value for money' on real estate development projects, a consistent prototype WLC mathematical model has been introduced as a practical and easy to implement management tool to assist professionals in the evaluation, decision-making and financial control of commercial property investment projects throughout the project whole-life cycle. The uniqueness of the model is founded on the dynamic integration of WLC/LCC fundamental concepts with the widely used investment appraisal measures for real estate projects and the critical variables imposed by the economic and taxation environments. Through the analysis of the capital requirements of the project, the owners (developers) can assess the net contribution of the investment to their equity and the effects of potential changes in the cost and value of main decision parameters and financing schemes.

Given today's uncertain economic conditions real property industry is operating in, some of the effects of changes in tax rates and/or funding sources on project profitability were assessed through a case study on a real typical commercial (office building) project constructed in the centre of Athens. The case study revealed that the current tough Greek economic environment restrains any investment in real estate.

The development of our suggested WLC model is a continuous process and our ongoing work is focusing on its further dynamic integration with the following methodologies/techniques, in order to develop and validate an innovative real property management holistic methodology covering all the phases over property life-cycle: the risk assessment/sensitivity ('what-if') analysis of the variables (tax and inflation rates, etc.) with the use of statistical software packages; the incorporation of the Activity-Based Costing (ABC) method in the WLCBS as a means to enhance the WLC estimating capability of the model; the use of advanced project management techniques (CPM; PERT) for effective monitoring of project time and cost over its entire life-cycle; the use of suitable Operational Research (OR) tools for NPV/WLC optimisation (by imposing restrictions on the critical variables through WLC envelopes); the adoption of Artificial Intelligence (AI) theories for the automation of our instrument in decision-making.

Appendix A

According to the current Greek legislation, tax bases are summarised as follows:

A.1 Indirect Taxes

The most popular tax category in real property is indirect taxation. The following tax rates and fees are levied:

A.1.1 Taxes and Fees on Land Purchase

- Property transfer tax levies in the contract value; the tax rate is 8 % on property with a value up to €20.000,00 and the percentage increases to 10 % for property values greater than €20.000,00;
- City tax 3 % levies on the total payment on property transfer tax when the property is transferred;
- Fee 0.65 % for legal fund on contract authorship;
- Fee 0.45–0.75 % for legal fund on contract registry;
- Additional fee 0.45–0.75 % on contract registry;
- Notary fee 1 % on purchase value.

A.1.2 Taxes on Property Construction

- Value added tax (VAT) 23 % on construction materials;
- VAT 23 % on net value of contracting work;
- Social Security Contribution or Social Security Charges (SSC): employer's social security contribution 65 % on wages calculated on net value of contracting work.

A.1.3 Taxes on property maintenance cost

- VAT 23 % on maintenance materials;
- VAT 23 % on net value of work required for property maintenance;
- SSC: employer's social security contribution 19,95 % on wages calculated on net value of maintenance work.

A.1.4 Taxes on Property Operating Cost

- VAT 23 % on net value of work required for property operation;
- SSC: employer's social security contribution 28,56 % on wages calculated on net value of operating work.

A.1.5 Taxes on Property Completion Cost

SSC: employer's social security contribution 28,56 % on wages calculated on net value of labor rates.

A.1.6 Taxes on Property End-of-Life Cost

VAT 23 % on net value of work required for property end-of-life.

A.2 Direct Taxes (Taxes on Income)

- 26 % corporate tax on income; plus tax on dividends 9 %; total average tax rate on income 33 %;
- Additional tax on rental income 3 %.

A.3 Property Taxes

- Annual property taxation: the tax rate ranges from 0,25 % to 0,35 % and is imposed on the objective value of the property;
- Special end properties: a special estate fee of €3,00 to €16,00 per square meter with an average property tax of €4,00 per square meter;
- Municipal lighting and cleaning fees in accordance with the decisions of the municipal council of the city-owned property;
- Fees for drainage properties according to the decisions of the municipal council of the city-owned property;
- Primary end occupation of sidewalks according to the decisions of the municipal council of the city-owned property;
- Nowadays in Greece, a debate exists whether to increase property tax ratio from 1 % to 2 % or more.

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Would Consumers Be Willing to Buy Woody Biomass Energy Products of Transgenic Origin?

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Abstract Forest wood biomass can address multiple energy needs in the form of firewood, chips, charcoal, briquettes and pellets, as well as feedstock needs for the biofuels industry in renewable ways. Short rotation coppiced hardwoods mainly of poplars, willows and sycamores have been recognized as the most promising for energy production, but for industrial applications they need to have their productivity rates increased. Transgenic trees improved in terms of growth rates, site adaptability and stress tolerance can be used in this direction to achieve faster results than other available approaches, such as silvicultural methods or traditional breeding techniques. However, transgenic trees need to undergo through a very strict regulatory process, which involves biosafety and risk assessment controls prior to commercialization. The very strict regulatory framework of transgenic plants reflects mainly the public concerns regarding their impacts on public health and the environment.

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This paper discusses the main market considerations in terms of the regulation processes and public acceptance for woody biomass energy products of transgenic origin. Also, it presents results of a study from Greece, initiated in the frame of the EU COST Action FP0905 with the aim to explore consumers' attitudes towards the woody biomass energy products of transgenic origin. Field interviews based on a structured questionnaire were conducted on a random sample of 418 consumers all over the country. Multivariate statistical analysis was performed then on 220 consumers, the ones who stated that they would buy such woody biomass energy products. Principal Components Analysis indicated that the main factors affecting consumers' purchasing behaviour towards those products were marketing issues, product quality features and health safety issues. Through cluster techniques, three groups of consumers with similar consumption behaviour were identified: (a) opportunists, (b) consumers interested in health protection issues and (c) consumers influenced by marketing issues. Discriminant Analysis was performed to predict cluster membership and a nonparametric test to profile each consumer group according to personal characteristics and attitude towards the establishment of transgenic forest plantations.

1   Introduction

Forest wood biomass is considered an important renewable energy resource addressing multiple energy needs in the form of firewood, chips, charcoal, briquettes and pellets. Even more, it can address feedstock needs for the biofuels industry (Hinchee et al. 2009; Sedjo 2010; Harfouche et al. 2011). Long-term economic feasibility of utilizing forest wood biomass for energy production depends to a great extent on its productivity rate. This should reach 8–10 dry tons/acre/year for industrial energy applications (Hinchee et al. 2009). However, forest trees are in general slow growing, with low growth rates. Even the tree species that are fast growing are not widely adapted. Short rotation coppiced hardwoods mainly of poplars, willows, sycamores and pines, which are the most promising crops for energy production, provide yields in the USA that range between 1 and 7 dry tons/acre/year (Davis and Trettin 2006; Hinchee et al. 2009). Transgenic trees with improved growth rates, more site adaptable and stress tolerant, can be used to reach the desired tree crops productivity rates. Transgenic forest trees are Genetically Modified (GM) or Genetically Engineered (GE) organisms. That is, they are biotechnology products, which through the

insertion of DNA from other species manifest specific traits of interest (www. forestguild.org). Such traits in terms of industrial energy applications concern mainly higher growth rates, lignin modifications and increased resistance to stress. Much discussion has been geared by academics and the industry towards the potential of GM forest trees to help meet projected demand increases for woody biomass energy products worldwide. This can be done through increased growth and productivity and increased stress tolerance (Gartland et al. 2003; van Frankenhuyzen and Beardmore 2004; Carman et al. 2006; Sedjo 2006, 2010; FAO 2008, 2010; Zhu and Pan 2010; Harfouche et al. 2011, www.cost-action-fp0905.eu). However, with the exception of China, no market for GM forest trees currently exists in Europe, the USA or other parts of the world, despite the fact that over the past 20 years, through confined transgenic forest tree field trials and millions of hectares of commercial transgenic crop fields, much scientific experience has been gained (Häggman et al. 2012).

The main reasons for the absence of such markets are the very strict regulatory frameworks regarding license granting for the establishment of GM plantations, particularly due to a number of potential public concerns. These include mainly the potential adverse effects on the environment and particularly biodiversity from the transgenic forest plantations and any unexpected effects (El-lakany 2004; Gartland et al. 2003; Sedjo 2006; Brunner et al. 2007; Halpin et al. 2007; FAO 2008).

Although woody biomass energy products from transgenic plantations are unlikely to be in the market for another 10–15 years, scientifically based information on the anticipated attitudes of consumers is extremely important both for developers and policy makers. For the first, because without the expectation of viable markets the developments and investments are unlikely to be made, and for the latter in order to respond adequately through regulation tools and programs. This paper discusses the main market considerations regarding the regulatory processes and public acceptance for biomass energy products of transgenic origin. It also presents results of a study from Greece, the first of its kind in Europe to the authors' knowledge, initiated in the frame of the EU COST Action FP0905 (www. cost-action-fp0905.eu). The study explores Greek consumers' attitudes towards woody biomass energy products that could be derived from transgenic forest plantations, and profiles them according to personal characteristics and their attitude towards the establishment of such plantations.

2 Market Considerations for Biomass Energy Products of Transgenic Origin

As of today, transgenic forest trees have not been grown commercially for bioenergy or other products anywhere in the world, except China, in contrast to agricultural crops, which have been grown commercially for many years throughout the world. However, there seems to be a growing interest in GM forest trees

even from the private sector due to the increasing global trend for timber production from plantations and bioenergy applications (Hinchee et al. 2009; Verwer et al. 2010). To our opinion, three elements are the most important ones towards commercialization of GM forest trees for bioenergy applications: (i) technical issues, (ii) the regulatory framework and (iii) public acceptance. Technical issues concern the required biotechnology research to improve growth, site adaptability and stress tolerance, so as to make GM forest plantations economically feasible for bioenergy applications. A considerable progress has been achieved already in this direction, particularly with a limited number of the forest species taxa (poplars, eucalyptus and pines) that could be grown in short-rotation crops for bioenergy applications in different parts of the world, where plantation forestry is economically important. Deliberate releases of GM forest trees have mainly occurred in the USA and in some countries of Northern and Central Europe, as it is depicted in Table 1. It is also worth noting that there is growing interest of the private sector in funding GM forest trees research for bioenergy applications. ArborGen for example has developed three varieties of GM forest trees: fast growing pines (*Pinus taeda*) for the southern US pine plantations, low lignin *Eucaluptus species* for use in South America and freeze-tolerant *Eucalyptus species* for the southern US (Farnum et al. 2007; Hinchee et al. 2009). However, much remains still to be done in terms of technical issues to improve economic feasibility of GM forest crops for bioenergy applications.

The regulatory framework concerns the biosafety and risk assessment analyses required prior to commercialization. The regulation framework of transgenic forest trees in use differs between countries. In the European Union, the GMO's regulations apply to GM forest trees too. The main Directive 2001/18/EC that regulates the GM forest trees concerns two types of deliberate releases: (i) those for placing the product in the EU markets and (ii) those for experimental purposes (that is field trials). In the first case, application must include an Environmental Risk Assessment,

Table 1 Deliberate release of GM forest trees in Europe and the USA

Country	Deliberate release of GM forest trees			
	Poplars	Eucalyptus	Pines	Forest trees (birch, spruce, pine)
France	11			
Sweden	6			
Germany	4			
Spain	4	1		
UK	2	1		
Norway	1			
Poland	1			
Belgium	1			
Finland				10
USA	203	82	154	

Source: Federal Office of Consumer Protection and Food Safety (BVL), ISB Information Systems for biotechnology (April 2012)

whose structure is outlined in the Directive (Aguilera et al. 2013). Different legal documents regulate all aspects of GMO's, such as safety assessments, labeling, marketing, transport, sampling and detection of post-marketing environmental monitoring. Applications for field trials require assessments only at a national level. All the GMO's applications in the EU for marketing and/or cultivation are assessed by the European Food Safety Authority (EFSA).

All in all, regulations in the EU aim at providing high levels of protection for human health and the environment while ensuring consumer interests, and the promotion of competitive market. This is why they are so strict and require very long processing times for both types of deliverable releases described above.

Public acceptance reflects the concerns of the public about the use of GM forest trees. Many of these concerns, although not all, are the same rose for genetic modification of annual crop plants. They involve the potential for long-distance pollen spread from long-lived trees over many years, the spread of antibiotic or herbicide resistance genes from GM trees to other non-target species, adverse effects on biodiversity from the transgenic forest plantations and any unexpected effects (Gartland et al. 2003; Sedjo 2006; FAO 2008). Also, GM forest plantations might generate profit for certain actors in the private sector, while poorer communities become further marginalized (Thomas 2001). Although numerous studies have been carried out on the public attitudes towards GMO's, such studies towards the products from transgenic forest plantations in Europe are completely lacking. Evidence from other countries, such as the USA, indicated that the industrial consumers of wood products, who use wood as an input to production, are generally enthusiastic about transgenic forest trees, contrary to the attitude of consumers towards final wood products, who appear more concerned (Sedjo 2004).

In the following section a case study from Greece that explores the attitudes of consumers, who would be willing to buy woody biomass energy products of transgenic origin, initiated in the frame of the EU COST Action FP0905 (www.cost-action-fp0905.eu) is presented. The study also profiles them according to their personal characteristics and attitude towards the establishment of such plantations.

3 A Consumers' Attitude Case Study from Greece

The Conceptual Model

A conceptual model was developed to place key concepts into an identifiable framework (Fig. 1), in order to investigate the relationships between factors affecting consumers' attitude in Greece towards purchasing woody biomass energy products originating from transgenic plantations, and consumer groups who exhibit a specific buying behaviour. The model also explored the linkage between consumers, who exhibit a specific buying behaviour and their opinion towards the establishment of transgenic forest plantations.

Fig. 1 A conceptual model for classifying consumers' buying behaviour towards woody biomass energy products of transgenic origin

The null research hypotheses this study aimed to reject were:

- **H_o1:** Consumers can not be classified into groups according to their potential purchasing behaviour towards woody biomass energy products that could be derived from transgenic forest plantations.
- **H_o2:** Consumers' opinions towards the establishment of transgenic forest plantations are not significant in relation to a particular potential buying behaviour *(group of consumers with potential similar buying behaviour)*.

Methodology

A survey with face-to face interviews throughout the country was undertaken to gather the necessary information. Cluster sampling was used to form the sample. The general population was stratified into two levels: regions and prefectures. The researchers based on the methodology presented by Oppenheim (2000), selected at random 9 regions of the 13, in total, regions of Greece, in order to form a more representative sample from the geographical point of view. Then, one prefecture from each region was selected at random. Random systematic sampling was used to form a sample of 50 consumers in the capital of each selected prefecture by taking every sixth person that came on site, mainly shopping malls, supermarkets and open markets (McCluskey et al. 2003). A total productive sample of 418 consumers was finally derived through the adopted survey methodology. Statistical analysis, however, was performed on 220 consumers (52.63 % of the sample), those who stated that they would be willing to buy woody biomass energy products originating from genetically modified forest trees. The sample comprised 0.025 % of the total population and it was considered reasonably representative of it, as all the sample characteristics did not differ from those of the total population, based on the Census data of 2001 (Table 2) (Chen 2007; Tsourgiannis et al. 2008; ELSTAT 2011). The questionnaire designed to meet the research objectives was piloted in October 2011 to 30 consumers. Consumers were asked to answer questions regarding the factors that would affect their potential purchasing behaviour towards woody biomass energy products derived from transgenic forest trees and their opinion about the establishment of transgenic forest plantations on the Likert scale from 1 to 5. The

Table 2 Characteristics of the sample

Characteristics of the total population						
Age groups	Total population[a]	Proportion of each age group to total population	Not married[a]	Proportion of each age group of not married to total population	Married[a]	Proportion of each age group of married to total population
20–29	49,387	18 %	32,665	12 %	16,722	6 %
30–44	74,708	28 %	15,592	6 %	59,116	22 %
45–64	82,870	31 %	12,689	5 %	70,181	26 %
65+	61,535	23 %	21,583	8 %	39,952	15 %
Total	268,500	100 %	82,529	31 %	185,971	69 %
Characteristics of sample population						
Age groups	Sample population	Proportion of each age group to total population	Not married	Proportion of each age group of not married to total sample population	Married	Proportion of each age group of married to total sample population
20–29	79	19 %	54	13 %	21	5 %
30–44	113	27 %	21	5 %	84	20 %
45–64	121	29 %	30	7 %	113	27 %
65+	105	25 %	25	6 %	70	17 %
Total	418	100 %	130	31 %	288	69 %

[a]Compiled data from ELSTAT (2011)

pilot survey indicated that it needed no modification, and therefore, the main survey was conducted in November and December 2011 using enumerators from each selected prefecture.

Multivariate analysis techniques were applied in three stages to the responses of the 220 consumers to reveal the key information these contained. Principal Component Analysis (PCA) was used to identify the variables that accounted for the maximum amount of variance within the data in terms of the smallest number of uncorrelated variables (components). The anti-image correlation matrix, as well as the Bartlett's test of sphericity and the Measure of Sampling Adequacy (MSA) were used, in order to check the appropriateness of the data for subsequent factor analysis. The variables with a high proportion of large absolute values of anti – image correlations and MSA less than 0.5 were removed before analysis. An orthogonal rotation (varimax method) was conducted and the standard criteria of eigenvalue = 1, scree test and percentage of variance were used in order to determine the factors in the first rotation (Hair et al. 1998). Different trial rotations followed, where factor interpretability was used to compare the reduced through PCA 7 variables related to consumers' potential purchase behaviour towards woody biomass energy products of transgenic origin to a smaller set of underlying factors.

These PCA scores were then subjected to cluster analysis to group consumers with similar patterns of scores into similar clusters of buying behaviour. Both hierarchical and non-hierarchical methods were used (Hair et al. 1998), in order to develop a typology of the consumers' buying behaviour. Quadratic Discriminant Analysis was performed to assess how accurately the key factors identified through factor analysis could predict and discriminate cluster membership. Furthermore, the Friedman one way test was performed to identify the relationship between the consumers' opinion towards the establishment of transgenic forest plantations and their particular buying behaviour.

Results-Discussion

The variables and the three main key factors affecting Greek consumers' potential purchasing behaviour towards the transgenic woody biomass energy products along with their eigenvalues, the scree plot test and the percentage of variance results from PCA and Factor Analysis are portrayed in Tables 3 and 4 (Fig. 2).

Hierarchical and non-hierarchical clustering methods (Hair et al. 1998) were used to develop a typology of the Greek consumers' potential buying behaviour towards the transgenic woody biomass energy products. Cluster analysis was conducted on all 220 observations, as there were no outliers.

Consumers appeared to fall in three groups according to their potential buying behaviour towards the woody biomass energy products originating from transgenic plantations (Table 5): (a) Opportunists, (b) Consumers who are influenced by products' health safety issues (c) Consumers who are interested in marketing issues.

Table 3 Variables affecting Greek consumers' potential purchasing behaviour towards the transgenic woody biomass energy products

Component	Eigenvalues	% of variance	Cumulative % of variance	Variables	Communalities
1	2.090	29.858	29.858	Quality	0.642
2	1.801	25.733	55.591	Special characteristics	0.739
3	1.069	15.271	70.862	Certification of origin	0.681
4	0.646	9.236	80.097	Labelled as woody biomass energy products derived from GM plantations	0.763
5	0.546	7.803	87.900	Health safety	0.668
6	0.497	7.106	95.006	Attractiveness of packing	0.779
7	0.350	4.994	100.00	Advertisement	0.688

Table 4 Key factors affecting Greek consumers' potential purchasing behaviour towards transgenic woody biomass energy products

Key attitude dimensions	Factor loading
Marketing issues	
Attractiveness of packing	0.868
Advertisement	0.826
Product quality features	
Special characteristics of the product	0.859
Quality of the product	0.663
Certification of the product's origin	0.609
Health safety issues	
Labelling as product derived by GM plantations	0.863
Health safety issues	0.748

KMO MSA = 0.614, Bartlett test of sphericity = 301.725, P < 0.001

Fig. 2 Scree plot test
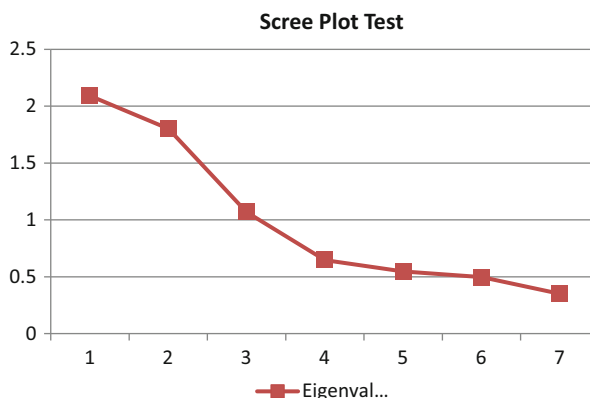
The **opportunist** potential buyers of transgenic woody biomass energy products comprised 32 % of the sample and their buying choice would not be influenced by any particular factor. **The potential buyers** of transgenic woody biomass energy products**, who were influenced by health safety issues,** comprised 40 % of the sample. These consumers would like the products to be labeled as products derived from GM plantations, so as to have adequate information before they make their purchasing choice. They would also be influenced to a smaller extent by products' quality features and marketing issues. **The potential buyers** of transgenic woody biomass energy products**, who were interested in marketing issues,** comprised 28 % of the sample. These consumers would be influenced in their purchasing decision by products' quality, special characteristics and brand name. They would also be attracted by products' packing and advertisement, but not by products' health safety issues.

Table 5 Classification of consumers according to their buying behaviour towards transgenic woody biomass energy products

Factors	Groups of consumers			P
	Opportunists	Consumers who are influenced by products' health safety issues	Consumers who are interested in marketing issues	
Marketing issues	−0.82390	0.34919	0.45351	0.001
Product quality features	−0.74820	0.29285	0.44586	0.001
Products' health safety issues	−0.03854	0.80178	−1.08095	0.001
Number of consumers (N = 220)	**71**	**87**	**62**	

Table 6 Summary of classification with cross – validation

Actual classification	Predicted classification		
	Opportunists	Consumers influenced by products' health safety issues	Consumers interested in marketing issues
Opportunists	66	2	0
Consumers influenced by products' health safety issues	5	82	0
Consumers interested in marketing issues	0	3	62
Total N	71	87	62
N correct	66	82	62
Proportion of correct classification	93.0 %	94.3 %	100.0 %

Discriminant Analysis was performed to evaluate the prediction performance of group membership with the predictors derived from the factor analysis. Initially, the normality of the key strategic dimensions was checked. A summary of the cross validation classification derived through quadratic Discriminant Analysis is presented in Table 6.

It is evident that the three attitude dimensions could accurately predict and discriminate consumers' group membership.

Therefore, the hypothesis H_o1: *Consumers can not be classified into groups according to their potential purchasing behaviour towards the woody biomass energy products that could be derived from transgenic forest plantations* could be rejected.

Table 7 Consumers' opinions towards the establishment of transgenic forest plantations

Impacts of the transgenic forest plantations establishment	Opportunists ($x^2 = 60.580$, df $= 10$, P $< 0,001$)	Consumers influenced by products' health safety issues ($x^2 = 56.158$, df $= 10$, P < 0.001)	Consumers interested in marketing issues ($x^2 = 31.452$, df $= 10$, P < 0.001)
Transgenic forest plantations will increase job flexibility	7.11	6.97	6.93
Transgenic forest plantations will reduce cost production	7.11	6.01	6.70
Transgenic forest plantations will increase income	6.67	6.39	6.55
Transgenic forest plantations will reduce production losses	6.66	6.25	5.54
Transgenic forest plantations will have negative environmental impacts	5.69	5.71	6.22
Transgenic forest plantations will have a negative impact on biodiversity	5.91	5.68	4.96
Transgenic forest plantations will have negative impacts on non GMO products	5.89	5.01	6.06
Transgenic forest plantations may harm human health	4.99	7.36	6.61
Transgenic forest plantations are not important	4.60	5.36	5.90
Transgenic forest plantations will have a negative impact on climate change	4.89	4.84	5.70
Transgenic forest plantations will be important for biomass energy production	6.49	6.39	4.83

The Friedman non parametric test was employed to explore consumers' opinion towards the establishment of transgenic plantations (Table 7).

Table 7 indicates that most of the consumers have a similar opinion towards the establishment of transgenic forest plantations. In particular, most of the opportunists stated that the establishment of transgenic forest plantations will mainly increase job flexibility, reduce cost, increase farmers' income, reduce production

losses and will improve production of biomass. Furthermore, most of the consumers, who were influenced by health safety issues, although concerned that the establishment of transgenic forest plantations may harm human health and reduce the production cost, stated also that it may increase job flexibility, improve farmers' income, improve the production of biomass and contribute to the reduction of production losses. Finally, the consumers, who were interested in marketing issues, stated that the establishment of transgenic forest crops will increase job flexibility, improve farmers' incomes and reduce cost, but it will constitute a danger for human health and will have negative environmental impacts.

Hence the hypothesis, **Ho2:** *Consumers' opinions towards the establishment of transgenic forest plantations are not significant in relation to a particular potential buying behaviour (group of consumers with potential similar buying behaviour)* could be rejected.

Conclusions

There are three conditions for establishing viable markets for woody biomass energy products of transgenic origin. The first concerns technical issues related to biotechnology research, particularly to efforts for increasing growth rates and improve site adaptability and stress tolerance of GM forest trees. The second concerns the strict and long time regulatory process prior to commercialization currently in force. The third condition, closely related to the second one, is connected to public acceptance issues. Some empirical studies have been initiated in Europe through EU Cost Action FP0905 and the results of the first study on consumer attitudes towards the woody biomass energy products carried out in Greece are presented in this publication.

From the results of this study, it appears that there might be potential buyers of woody biomass energy products originating from transgenic plantations in Greece. Indeed, most of these potential consumers willing to purchase transgenic woody biomass energy products base their buying decisions on economic issues. Taking into consideration that most of these products are not directly linked with human health impacts, there is a potential for development of a market for such products, particularly in current times of economic depression. Hence, the potential market developers should structure their marketing and promotion mix and focus on quality of product and efficiency of production methods, as well as on effective advertisement, attractive packing and labelling issues.

On the other hand, the empirical results of this study should trigger further studies both in Greece and other parts of Europe, so as to gradually build the required scientific knowledge base that in combination with environmental risk assessments and biosafety standards will help policy makers at national and EU level to more adequately shape regulatory policies for commercialization of transgenic forest plantations.

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Analysis of Insurance Market Development in Eastern European Countries Based on S-Curve

Jerzy Handschke and Paweł Rozumek

Abstract S-Curve is a versatile model for analyzing the relations between income and insurance penetration. The main assumption of the model is changing income elasticity. The S-Curve for insurance markets was firstly introduced in 2000. Further research contributed to theories enabling to determine the stage of insurance market development. Using the S-Curve world average penetration level as a reference we can assess the Benchmark Ratio of Insurance Penetration (BRIP) and trichotomy of insurance growth theorem which can be used to harness the advantages of S-Curve model.

In the first part of the empirical research, the authors are comparing the Eastern Europe economies' level of penetration with the world and regional references deriving from S-Curves. The world S-Curve parameters were assessed by W. Zheng, Y. Liu and Y. Deng, while the regional S-Curve parameters were estimated by the authors on the base of penetration and income levels of analyzed countries. The analysis shows the differences between Eastern Europe and the world and among the analyzed countries. This enables the authors to determine the stage of insurance development in life and non-life insurance markets, which in most of the cases is a sustained growth stage.

In the second part of empirical research, BRIP was used by the authors to measure the pace and fluctuations of the analyzed insurance markets' convergence. In the time series model of penetration level the author showed the seasonal variation caused by business and insurance cycle.

The research conducted by the authors proves that countries in Eastern Europe have different pace of insurance convergence. Besides, the analysis shows that the countries can bring into play institutional growth in both life and non-life insurance market. Thus, in the time of the global financial crisis, the countries can increase the penetration level without any economic growth.

Keywords Eastern Europe insurance markets • Insurance market development • S-Curve

JEL Classification Codes G22 • O40

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1 Introduction

Insurance plays a very important, sometimes underestimated, role in economy. Empirical evidence and theory proved that countries with well-developed financial systems experience more sustainable and faster long-term growth (Haiss et al., p. 406). Insurance industry affects the economy mostly by transferring the risk from individuals and companies, and by doing so, it smoothes out the economic cycles and provides a vast amount of capital to the market (Haiss et al., p. 409). Empirical analysis based on Granger causality tests provided the evidence that insurance has a significant supply-leading impact on economic growth (Kugler et al., pp. 17–19), (Adams et al., p. 22) and (Arena, p. 15). Besides, the relation of written premium/income is closely related to the income. This relation can be described with the S-Curve, which is presented in this paper.

   The S-Curve is used to determine theoretical minimal and maximal penetration rate and the current stage of insurance market development. There are four stages of an insurance market development: dormant, early growth, sustained growth and mature stage. Besides, we can distinguish two kinds of growth (economic and institutional) that drive the insurance development (Zheng et al. 2008, p. 12). The aim of this paper is to answer the questions: "What is the level of insurance markets development in the analyzed countries comparing to the world average?" and "What is the process of developing the world average level in analyzed countries?".

   S-Curve, apart from the properties that allow us to forecast the future path of insurance growth, it also gives a tool to compare countries at different levels of economic development. In this paper, a ratio based on S-Curve was presented and calculated for a number of countries from eastern and south-eastern Europe.

2 Properties and Application of S-Curve

The curve describing the relation between real gross domestic product per capita and insurance penetration[1] was firstly introduced by Enz (2000, p. 396). The main idea behind this function is that the income elasticity[2] is changing according to the level of income. R. Enz argued that if we assumed constant income elasticity, which in most of the economies is greater than one, the penetration level would have no upper limit, which can be observed in the following example (Table 1):

   Assuming that income elasticity was 2, after several dozen years, premiums would exceed gross domestic product, which is not truly possible. There are two main reasons that make the income elasticity variable, and by so, limit the

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[1] Insurance penetration (also called penetration) is a relation between gross written premium and gross domestic product in a given year.

[2] Income elasticity is a relation of gross written premium growth caused by income growth to the income.

Table 1 Case of constant income elasticity

Income elasticity = 2	Annual growth	t	t+25	t+50	t+75
Premium	10 %	7	76	822	8,903
GDP	5 %	200	677	2,293	7,767
Penetration	–	3, 5 %	11 %	36 %	115 %

Source: Authorial computation

penetration level. Demand for insurance is limited because of alternative active methods of managing the risk, such as self-insurance, captive or investment. The alternative methods appear and work effectively only in developed countries, that is why the income elasticity is decreasing in accordance with higher income (Haiss and Sümegi, p. 4). On the other hand, insurers limit the supply and prefer the policyholders to bear some risk in order to discourage moral hazard. Every economy has its own lower and upper limit of insurance penetration level.

The S-Curve proposed by R. Enz is a three-parameter logistic function of real gross domestic product per capita. The equation is:

$$Penetration = \frac{1}{C_1 + C_2 \times C_3^{GDP}} \tag{1}$$

Where C_1, C_2, C_3–estimated parameters,

GDP–real gross domestic product per capita.

Theory and empirical observations suggest that the penetration grows as GDP per capita grows. To get a continuous increasing three-parameter logistic function, parameters C_1 and C_2 must be both plus and C_3 must be less than one and greater than zero. Otherwise, the function is decreasing (if $C_3 > 1$) or constant (if $C_3 = 1$). Negative relation or no relation between income and penetration are not consistent with neither the model's assumptions nor reality (Fig. 1).

The figure shows examples of the function with different parameters. The solid line is the closest one to the S-Curve describing the real relation between income and insurance penetration. The other two curves do not meet the assumptions of the model, both are decreasing and the dashed one is in the minus values which is not coherent with the reality.

The S-Curve has two horizontal asymptotes, which allow us to predict theoretical minimal and maximal penetration level:

$$\lim_{GDPpc \to \infty} \frac{1}{C_1 + C_2 \times C_3^{GDP}} = \frac{1}{C_1} = Maximum\,penetration \tag{2}$$

$$\lim_{GDPpc \to -\infty} \frac{1}{C_1 + C_2 \times C_3^{GDP}} = 0 \tag{3}$$
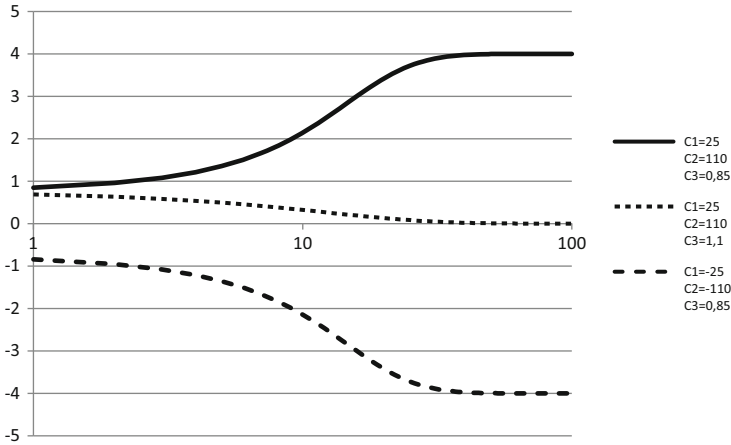
Fig. 1 Examples of logistic function (Source: Authorial computation)

As the gross domestic product per capita cannot be minus, more practical minimal level of penetration is[3]:

$$GDPpc = 0 \rightarrow \frac{1}{C_1 + C_2 \times C_3^{GDP}} = \frac{1}{C_1 + C_2} = Minimum\,penetration \quad (4)$$

Steepness of the S-Curve changes depending on the income. Firstly it increases, and after the inflection point it decreases. The income at the inflection point can be determined by comparing the second derivative of the S-Curve equation with zero and then transforming to:

$$Income\,at\,inflection\,point = \frac{lnC_1 - lnC_2}{lnC_3} \quad (5)$$

Analyzing the characteristics of the S-Curve, such as maximum and minimum penetration and inflection point, we have to remember that these are average values for the whole world and they only roughly describe the insurance markets growth.

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[3] No income ($GDP_{pc} = 0$) is not possible as well, but penetration value at this point is very close to low income levels (eg. $GDP_{pc} = 1, 000\$$) because of very low steepness in this part of the curve.

3 Benchmark Ratio of Insurance Penetration and Its Seasonal Variation

A relative ratio BRIP (Benchmar Ratio of Insurance Penetration) is a useful tool in analyzing and comparing insurance markets development. The value of the ratio is based on the country's current insurance penetration rate and the reference value from the S-Curve (respectively for the country's current gross domestic product per capita). The formula of the ratio is:

$$BRIP = \frac{penetration\,in\,given\,country}{S - Curve\,reference\,penetration} \times 100\,\% \tag{6}$$

Thus the ratio expresses the country's proportional insurance development in comparison to the world average. Beside the advantage to compare countries at different levels of economic development it also allows us to compare life and non-life insurance businesses as the parameters of the curves are calculated for the businesses separately. The advantage of BRIP is determining its value on the basis of current income – the higher the income the higher the reference penetration.

In contrary to income and penetration relation described by S-Curve model, the course of the BRIP values can be described by linear regression with seasonal variation. The variation is caused by insurance cycle and business cycle.

Insurance business works in economic environment and it is influenced by the environment. Besides the fluctuations caused directly by economy,[4] insurance has its own specificity which is expressed in insurance cycle. Insurance cycle (or underwriting cycle) is a tendency of insurance premiums, income and availability of coverage to increase or decrease in time with some regularity (Lisowski and Zimowski 2008, p. 90). Insurance cycle is generally explained by market competition and inflows and outflows of capital on the insurance market.

As BRIP is based on written premium, fluctuations of the written premium cause fluctuations of the ratio which can be classified as seasonal variation.

4 Stages of Insurance Market Development and Insurance Development Gap

Depending on the S-Curve we can distinguish four stages of insurance market development: dormant, early growth, sustainable growth and mature market (USAID 2006, p. 8). The stages are characterized by different economic, legal, political and industry-specific factors (Bednarczyk, p. 93).

In the dormant stage, the penetration is close to the theoretical minimum with a very low increase rate. Countries in this stage generally fall into a fragile state

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[4] Changes in aggregated demand for goods and services.

category. The preconditions required for insurance development in this stage include political stability, property rights, freedom of enterprise, legal framework and contract enforcement. Besides, there must exist insurance law, basic data collection initial regulatory and risk management at the government level.

The penetration rate in early stage insurance development is slightly higher and starts to grow faster. To fall into this category an insurance market needs economy of scale, economic stability and market restriction. The industry-specific preconditions encompass consumer awareness of risk, actuarial capacity and data collection. Countries in this stage are stable but with low income.

The most dynamic stage of insurance development is the sustained growth stage. At this stage, transparency and efficiency of institutions and development of financial sector are required. There must exist consumer protection, professional education and ethical behavior of the market's participants. Approximately in the middle of this stage (at the inflection point) the growth rate begins to decrease but still remains much higher than in the previous stages. Countries undergoing the sustained growth stage are stable with lower middle income.

In the last stage of insurance development the penetration rate starts to decrease. It is so because the consumers are educated and risk aware and look for alternative ways of risk management. The required preconditions for this stage are tax incentives and financial risk securitization. Countries with a mature insurance market are stable with upper income.

Perhaps the emerging economies cannot by qualified to the stages of development on the basis of one model universal for whole world. Especially, former Eastern Bloc satellite countries are different in terms of the age of their free market economies.

A country's position in relation to the S-Curve allows to analyze the market's possibilities of insurance development. W. Zheng, Y. Liu and Y. Deng proposed a decomposition of the insurance development into three types, called a "trichotomy of insurance growth" (Zheng et al. 2008, p. 12) which is presented in the following Fig. 2:
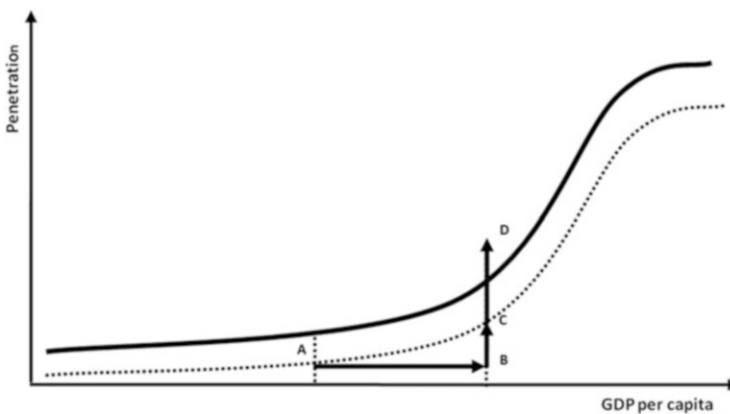

Fig. 2 Trichotomy of insurance development (Source: Zheng et al. (2008), p. 13)

The dashed line represents a country's own S-Curve, while the solid line is the world average S-Curve. According to the trichotomy theorem, insurance growth can be driven by economic or institutional factors. When a country's position on the world S-Curve plot is under the curve, the growth is induced by economic factors (line segments |AB| and |BC|). The first kind of economic growth is called a "regular growth". In this case GDP per capita is growing while the penetration level remains the same, so the premium is increasing at the same pace as the income (line segment |AB|). The second economic kind of growth is a "deepening growth" when the penetration level is increasing (line segment |BC|). The |CD| line segment stands for "institutional growth". This kind of growth is noneconomic and causes additional penetration increase.

When a country's combination of income and penetration lies under the average S-Curve, there is an insurance development gap, which according to the current market's stage, can be filled mostly by improving relevant institutional factors. Institutional intervention is more beneficial in the markets with greater gap (USAID 2006, p. 18).

5   Empirical Results for Some Eastern Europe Countries

In this paper, we present empirical results for Czech Republic, Estonia, Greece, Hungary, Poland, Slovakia, Slovenia and Turkey.[5] The countries have been compared to the world average S-Curve. In the analysis we determine the countries' level of insurance market development and past and forecasted BRIP values in both life and non-life business.

Although the original S-Curve was proposed by R. Enz, in the empirical research we use parameters estimated by W. Zheng, Y. Liu and Y. Deng because the data covers more countries and longer period and is more up-to-date (Zheng et al. 2008, p. 6). The data used by the researches covers 95 countries and regions over 27 years (1980–2006). Figure 3 presents the researcher estimations for the best fitted models for life, non-life and total insurance market:

As can be seen in the figure, changes of gross domestic product per capita cause changes in the penetration level growth rate. When the GDP per capita is low, the penetration is barely changing and is very close to the minimum. With the rise of income penetration rate is growing faster and then in the ultimate stage slows back again. The curve estimated for life insurance is steeper, which suggests that the income elasticity can reach greater values comparing to non-life insurance.

Besides the world average S-Curve parameters calculated by W. Zheng, Y. Liu and Y. Deng, we also present S-Curve estimated by us for analyzed countries. The regional curve is presented only to show the differences between the whole world

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[5] Designations of the countries used in tables and figures: Czech Republic – CZ, Estonia – EE, Greece – GR, Hungary – HU, Poland – PL, Slovakia – SK, Slovenia – SL, Turkey – TR.

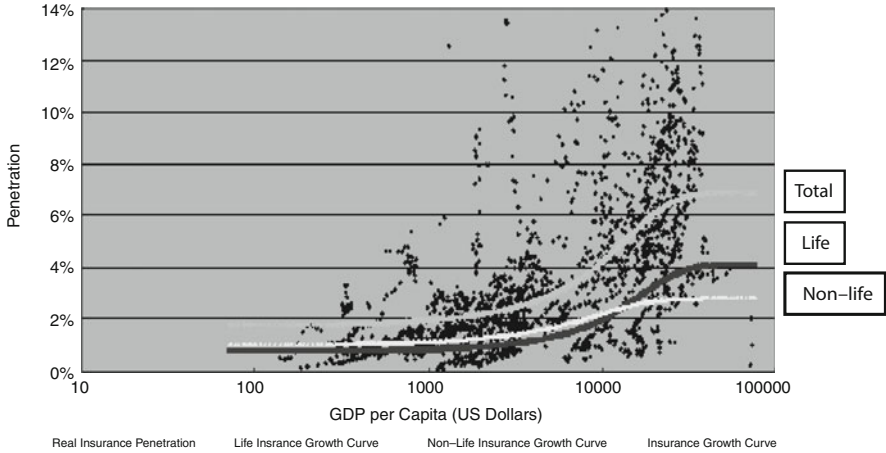**Fig. 3** The S-curve and penetration levels in analyzed countries in life insurance (Source: Zheng et al. (2008), p. 6)
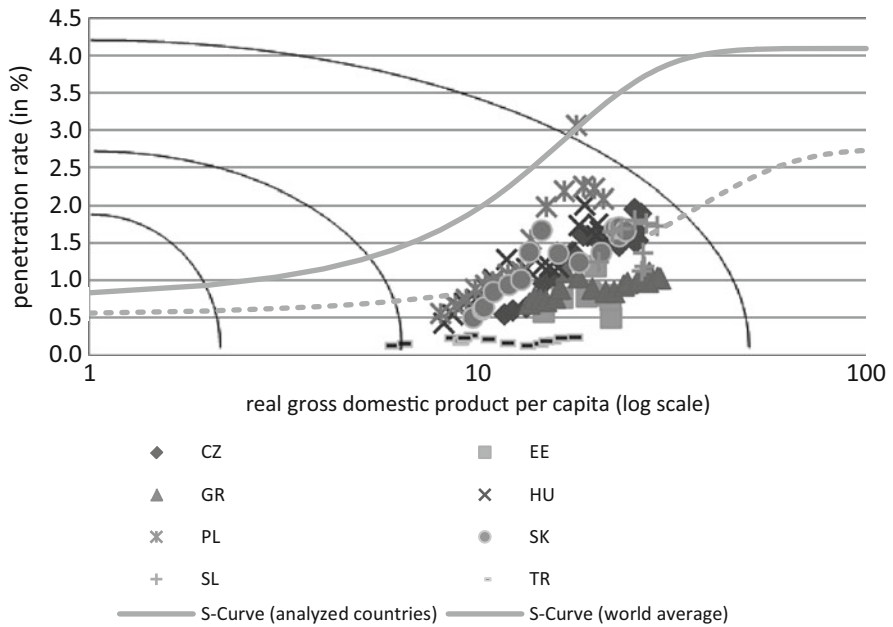

Fig. 4 The S-curves and penetration levels in analyzed countries in life insurance (Source: Authorial computation based on OECD and World Bank data. *Curved lines* roughly demarcate dormant, early growth, sustainable growth and mature stages determined by the world average S-Curve, respectively)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
CZ	25%	26%	26%	25%	27%	29%	36%	38%	41%	46%	51%	48%	45%	42%	42%	42%	45%	53%	51%
EE											22%	27%	25%	24%	15%	26%	37%	22%
GR	28%	30%	29%	27%	28%	31%	38%	34%	28%	25%	24%	26%	27%	29%	29%	27%	27%	26%	27%
HU	25%	31%	35%	37%	38%	43%	48%	57%	47%	45%	44%	42%	47%	56%	64%	53%	49%	50%	46%
PL			33%	37%	40%	45%	46%	47%	44%	48%	47%	62%	74%	76%	101	72%	68%	62%
SK			26%	30%	31%	40%	42%	42%	56%	64%	48%	40%	41%	45%	49%	49%	46%
SL							38%	48%	48%	49%	47%	45%	37%	30%	32%
TR		9%	11%	10%	13%	14%	11%	11%	13%	11%	7%	5%	6%	7%	7%	8%	8%

Fig. 5 BRIP values in analyzed countries in life insurance markets (Source: Authorial computation)

average and analyzed (developing) countries. Computations of BRIP were made in accordance with the original S-Curve.

The data used for analyzing the insurance markets comes from OECD, Sigma and World Bank statistics and covers the years 1993–2011.[6] The plot for life insurance market is shown in Fig. 4:

As shown in Fig. 4, the S-Curves estimated for the world and those for Eastern Europe countries are different. Based on the world average, all countries transitioned to sustainable growth stage several years ago, while the regional curve suggest that the countries are still in early growth stage. Both of the curves show that the countries should experience further growth of penetration rate with quite high income elasticity if they maintain the current economic growth rate. Otherwise, based on the trichotomy theorem, the countries could increase penetration only with institutional growth.

The maximum and minimum penetration for the world S-Curve are 4, 1 % and 0, 5 %, respectively. Based on the curve estimated for analyzed countries, the minimal penetration stays the same, while the maximal one is 2, 8 %.

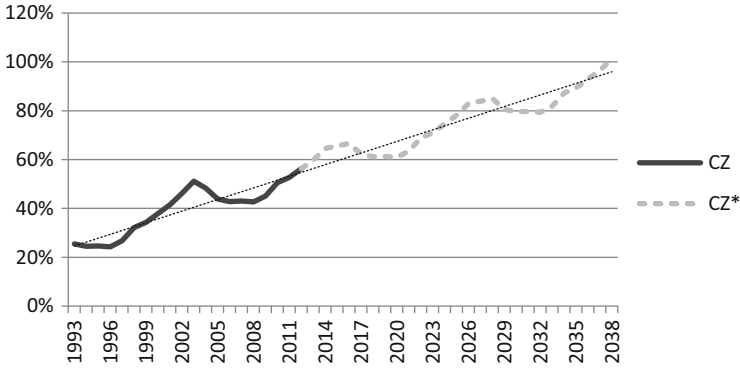[6] Years with a country's missing data were skipped only for this country.

Fig. 6 Past and forecast values of BRIP in Czech life insurance market (Source: Authorial computation)

Benchmark Ratio of Insurance Penetration values for life insurance markets are presented in Fig. 5:

In most of the examples, the BRIP values are constant or slowly increasing in time, which means that the countries' positions are changing parallel to the S-Curve. On the basis of BRIP values we calculated convergence pace (in percentage points per year) which expresses the pace of the countries catching up the world average. Starting with the highest values, the results are: Poland 3,1 pp, Slovenia 1,7 pp, Czech Republic 1,5 pp, Slovakia 1,23 pp, Hungary 1,19 pp, Estonia 0,5 pp, Greece −0,2 pp and Turkey −0,3 pp. With the current pace of convergence, Czech Republic, for example, will reach the world average penetration level in around 25 years. The lowest BRIP values of Turkish life insurance market can be explained with either low insurance awareness of the society or different culture in which family support plays a very important role.

As mentioned before the values of BRIP are fluctuating in time because of the insurance cycle, which can be seen on the example of Czech life insurance market (Fig. 6):

Due to the products specificity, non-life insurance market development is different than life insurance market, which can be observed in the Fig. 7:

Non-life insurance penetration is more diversified on account of Czech and Slovenian outstanding situation. Both non-life insurance markets have already developed to the mature stage and are close to the world average level of penetration (Slovenian is much higher than the average), while the other countries remain in the sustained growth stage. The gross domestic product per capita at the inflection point is 3 015US\$, so the income elasticity has been theoretically decreasing in all the analyzed markets for years. The minimal and maximal levels of penetration designated by the curve's asymptotes are 1, 02 % and 2, 82 %, respectively.
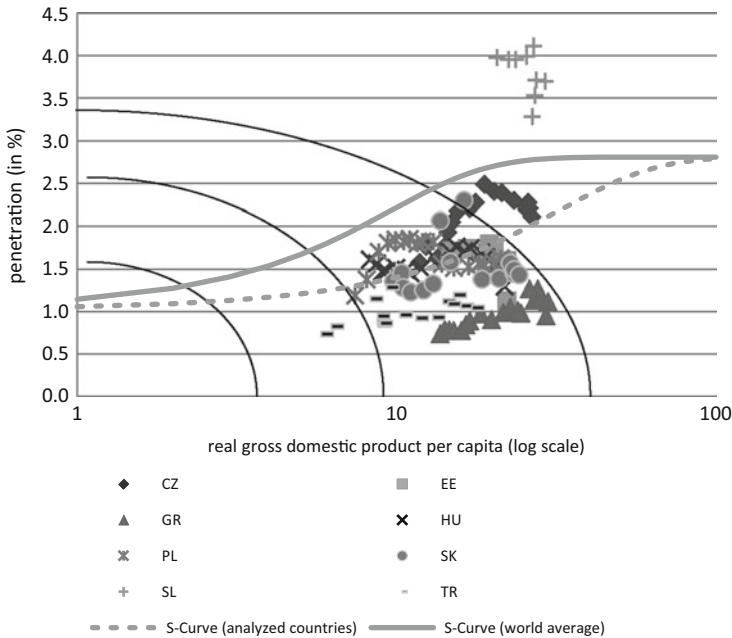
Fig. 7 The S-curve and penetration levels in analyzed countries in non-life insurance (Source: Authorial computation based on OECD and World Bank data). *Curved lines* roughly demarcate dormant, early growth, sustainable growth and mature stages determined by the world average S-Curve, respectively

The values for world and regional countries are the same, because only the C_3 parameter is significantly different (Fig. 8).

Czech Republic, Estonia, Greece, Poland, Slovakia and Slovenia are in the sustainable growth market in terms of non-life insurance market. It means that the income elasticity is already decreasing in these markets. All the other countries are still in early growth stage but will transit to the next stage soon. All countries, except of Slovenia are beneath the curve. The insurance gap can be filled with institutional growth, especially in Turkey, Greece and Slovakia, where the gap is relatively big (Fig. 9).

Similarly to life insurance business, the BRIP values are constant or slowly increasing in time, which means that the countries' position on the S-Curve plot is parallel to the curve. On the basis of BRIP values, we calculated convergence pace (in percentage points per year), which means the pace of the countries catching up the world average. Starting with the highest, the values are: Greece 0,75 pp, Czech 0,6 pp, Turkey 0,43 pp, Slovakia −0,49 pp, Hungary −1,1 pp, Poland −1,32 pp, Estonia −2,2 pp and Slovenia −2,66 pp. Slovenia is the only country that has exceeded the world average, and in fact with very high values; in 2011 BRIP was 127 %.
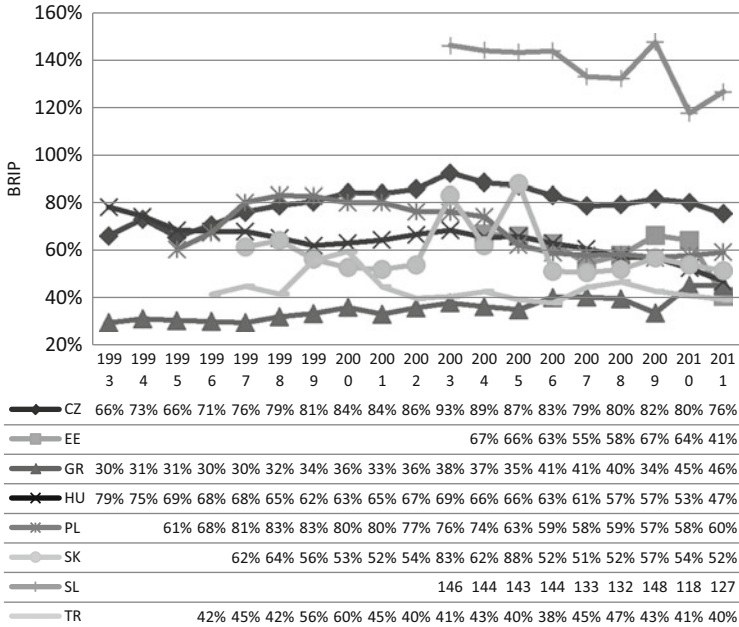
Fig. 8 BRIP values in analyzed countries in non-life insurance markets (Source: Authorial computation based on OECD and World Bank data)
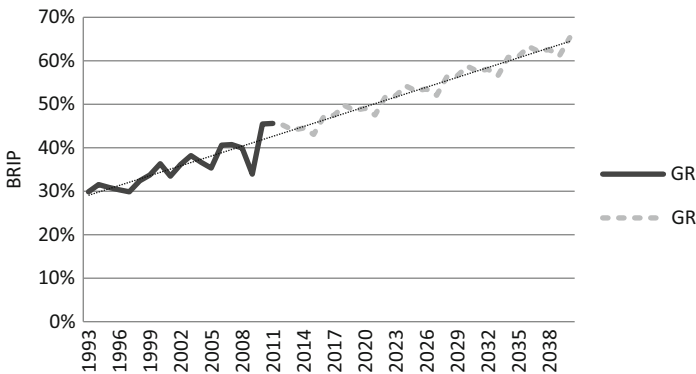

Fig. 9 Past and forecast values of BRIP in Czech life insurance market (Source: Authorial computation)

By analogy to the life-insurance analysis, we conclude that the countries need to improve the institutional growth in order to harness their potential and equal with the world average.

Comparison of life and non-life markets showed that although in all countries the markets are in the same stage of development respectively, BRIP values are significantly different. In terms of world average, life insurance market is less

developed than non-life insurance market. In 2011 the average BRIP value in life insurance markets was 37 %, while in the same year the value in non-life was 61 %. The most interesting example is Slovenia where BRIP value in life insurance market is 32 % and non-life one is 127 %.

Conclusion

The insurance sector allows countries to experience sustainable and fast economic growth. The convergence pace, measured in average annual Benchmark Ratio of Insurance Penetration should be higher in order to catch up the developed countries in terms of insurance markets. As discussed in the paper, a country can increase the penetration rate without economic growth, but only with institutional growth i.e. increasing insurance awareness of the society, applying more liberal insurance law or supporting the insurance market with governmental institutions. Countries with bigger insurance gap, e.g. Turkey or Greece have better chance to improve the penetration rate with sole institutional growth.

The empirical results showed that most of the countries are in early growth or sustainable growth stage. Despite decreasing income, elasticity for insurance penetration rate can still grow. Specific insurance products might be a subject for further penetration analysis in order to find more detailed similarities and differences between the countries.

Some of the countries (Poland, Slovenia, Czech Republic, Slovakia, Hungary and Estonia) have quite high pace of catching up the life insurance market development. On the other hand, Turkey's and Greece's pace is negative, which means that recently their insurance markets slowed down or that their economy is growing relatively faster than their insurance industry. In non-life insurance markets' development there is no such high pace of catching up the world average. Only Greek, Czech and Turkish insurance markets are growing fast enough to have the pace ratio positive.

However, as mentioned before, insurance market development is subject to insurance cycles and the recent falls of BRIP might be just a phase of it. Besides, accurate forecasts of BRIP values should be elaborated in a few years for two reasons. First of all, for some countries the data concerning insurance markets is available for only few years. Secondly, there is a great chance that the financial crisis has vastly influenced the insurance markets.

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