Chapter 5
The Economic, Social, and Environmental Determinants for the Agricultural Output in Some European Union Countries

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1 Introduction

Nowadays, the reality in the agricultural sector among the several countries of the European Union is very different. Presently the European Union constitutes of 28 different countries ranging from Eastern to Western Europe, with significantly diverse histories and traditions.

For example, the ten countries which became members of the European Union in 2004, the frequently named countries of central and oriental Europe, had, in large part, a history marked by an economic and political strategy which differed greatly from those verified in other European countries.

Other countries in Western Europe, such as Portugal for example, until 1974, had a history influenced by other economic and political orientations that the society referred to many times as nondemocratic regimes.

The orientations followed in Eastern Europe, as well in the west, had several effects upon different economic sectors, namely in the agricultural sector. These strategies, frequently with policies, known as those of the "proud and alone," were conducive to situations of low technical development, low competition, and drastic consequences for farming factors of production, such as the exhaustion of soils.

The agricultural policies of the European Union, namely those from the Common Agricultural Policy (CAP), often do not take into account these diverse realities in European countries. Some countries when they adhered to the European Union had many problems, as referred to before, with the dynamics and development of the agricultural sectors, and needed a CAP that helped with the improvement of the performance of their farming contexts. In contrast, these countries adopted a CAP that in general since 1992 was aimed to reduce production and extending, partly due to some problems related with the excess of production,

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namely from the former countries of the European Economic Community (the first name for the European Union).

In this way, it seems important to develop this study, which to our knowledge is the first, by aiming to analyze with time series econometric techniques the determinants (economic, social, and environmental) of the agricultural output for some countries in the European Union. The countries selected are those which have the greatest dimension and those which suffered financial problems, such as Portugal, Ireland, and Greece. The intention is to analyze the influence of these determinants and the differences between the several countries of Europe using data from the World Bank (2014).

2 Background Literature

There are many factors in the European countries selected that influence the dynamics of agricultural economics. But, the preoccupation with, as referred to below, sustainability, the environment, renewable energies, the preservation of rural areas and growing populations is in the order of the day.

Agricultural production in Portugal is dependent upon many factors, such as the biological condition of several resources and, consequently, from pest and disease management. In these cases it is necessary to evaluate the costs and the benefits of such treatments (Gatto et al. 2009).

Some projects which were developed in Portuguese rural areas, such as hydroelectric power plants, need some amount of care, namely because of their impact upon the socioeconomic performance, agricultural sector, and resources in the environment (Almeida et al. 2005).

There is a tendency for certain regions of Spain, depending on several factors, such as, among others, the climate and the soil conditions, to become specialized in specific agricultural production. Southern Spain specializes, among other outputs, in olive production. Areal and Riesgo (2014) conducted a study, through a survey, to understand the future perspectives of these production practices in those regions and concluded that there are many factors that can determine this continuity, namely those related with social, economic, environmental, and spatial contexts. Spain has a good position, within the international context, in olive production, but, also, in the wine sector, in many indicators (Castillo and García 2013). The availability of water is one of the most important factors for the production in agriculture in some regions of Spain (Maestre-Valero et al. 2013). Multifunctionality and sustainability in the Spanish agricultural sector are fundamental areas, where forestry can play an important role (Hoyos et al. 2012). The use of pesticides and fertilizers needs some adjusted approaches in order to avoid problems with the pollution of water and soil (Peña-Haro et al. 2010).

Forestry is a crucial activity in France for the preservation of the environment, namely through carbon appropriation, but this contribution depends upon some factors, namely those related to public policies (Caurla et al. 2013). For French agricultural activities to be compatible with the environment, we must take into account the preservation of water and soil quality (Darradi et al. 2012).

Northern Italy has the largest area of apple production in Europe and fruit is the most important source of exports for the region. The triumph of this situation results, namely, from the education and the professional training in these issues (Via et al. 2013).

The search for agricultural practices that reduce the utilization of chemical products, such as fertilizers and herbicides, in German agriculture is a usual concern for farmers and, in general, for the population (Steinmann et al. 2012). Water contamination, namely with nitrogen, is a consequence of some agricultural production patterns (Hirt et al. 2012). The energy intensity in farming production is another concern, namely because of the decrease in the availability of resources (Kraatz 2012).

The nitrate concentration in the soil and water from agricultural activities are a problem in the UK that concerns namely public institutions (Wang et al. 2013). Today in the UK it is difficult to find a pattern of sustainability that conciliates several economic sectors, namely for agriculture with more developed industry (Krausmann et al. 2008).

The financial support afforded to Greece from the European Union for organic farming has had a dual effect upon the agro-biodiversity, because this agricultural practice preserves biodiversity, but can reduce it if farmers only perform these activities with subsidies (Nastis et al. 2013). Sheep farming is an important practice in Greece, namely, in the mountainous regions (Tzouramani et al. 2011). Rural tourism may be an important alternative source of revenue for farmers who depend on many factors such as the income from tourism, such as the information obtained before the trip and the origin of the information (Skuras et al. 2006).

Biomass crops appear in Ireland as an alternative to conventional agricultural production (Clancy et al. 2012).

3 Data Analysis

In the following figures the data described is relative to the variables considered as representative of the economic, social, and environmental determinants of the agricultural economics, namely that of agricultural output (represented by the value added).

Figure 5.1 is relative to the percentage of agricultural land (comparatively to the total area of each country) and shows that, from 1961 until 2011, Ireland, the UK, and Greece were the European countries with more relative land for farming. In contrast, Portugal has the lowest relative area for agriculture. Since the beginning of the 1990s there was some decrease in the percentage of agricultural land in Ireland and some years later there came some perturbations for Greece.

From 1990 to 2011, Fig. 5.2, Portugal had the largest area occupied with forest (about 35 %) and Ireland and the UK had the lowest areas (about 10 %).

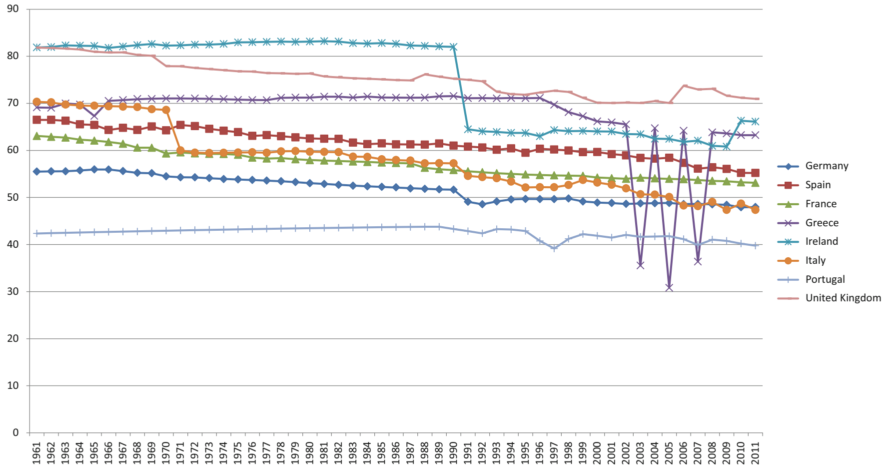

Fig. 5.1 Agricultural land (% of land area) between European countries

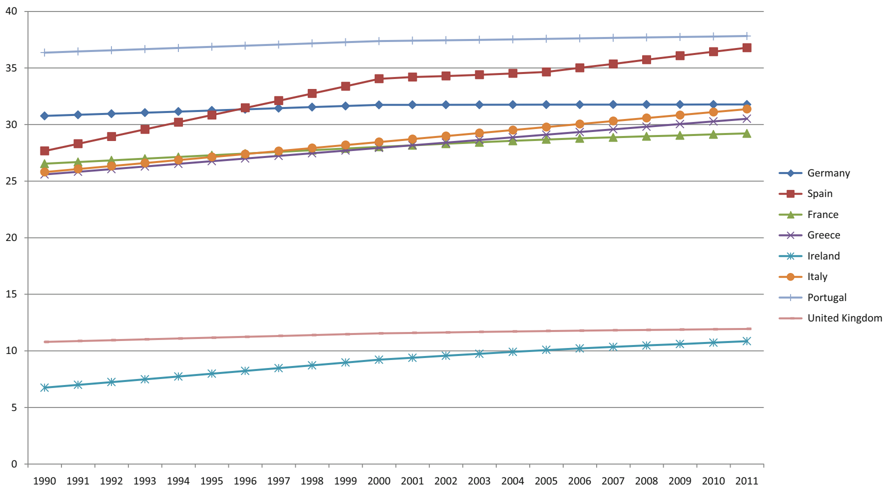

Fig. 5.2 Forest area (% of land area) between European countries

France presented the best productivity in agriculture, from 1980 until 2010, and Portugal showed the worst agricultural productivity level (Fig. 5.3). The database considered lacked information relative to this variable for Greece, Ireland, and the UK. This data for Portuguese farming productivity proved to be interesting information that requires more careful analysis in future studies.

In general the European countries consumed energy predominantly from fossil fuel sources, with percentages of more than 80 % (Fig. 5.4). On the other hand, France is a good example having decreased its fossil fuel energy consumption,

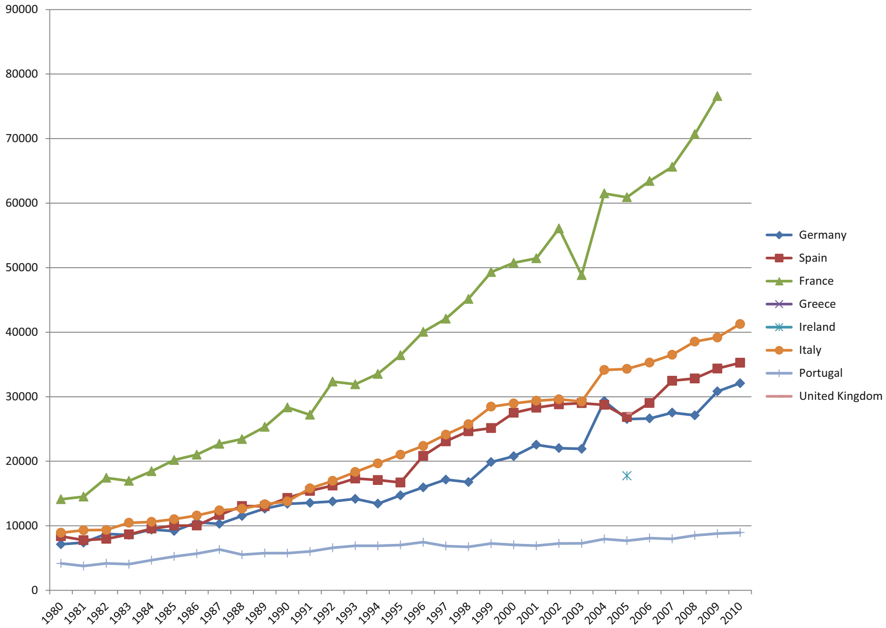

Fig. 5.3 Agriculture value added per worker (constant 2005 US$) between European countries

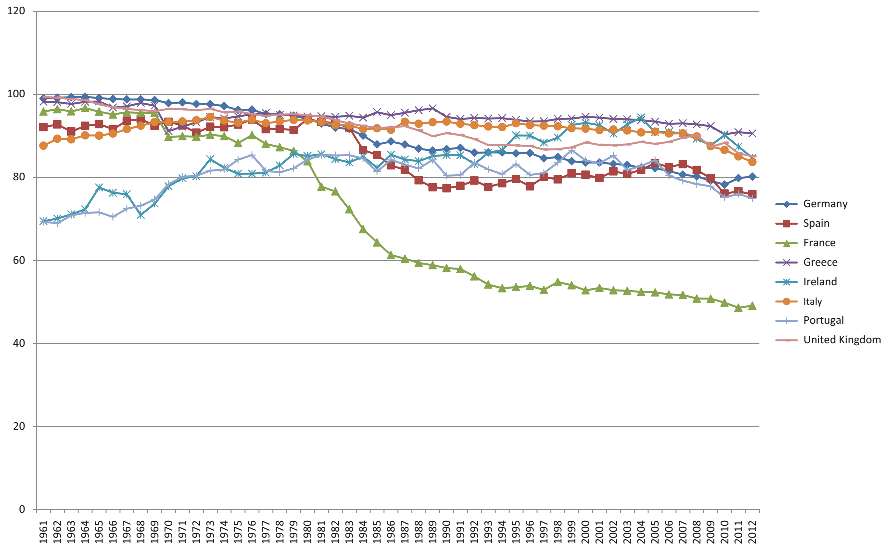

Fig. 5.4 Fossil fuel energy consumption (% of total) between European countries

since the beginning of the 1980s and by 2011 only 50 % of the energy consumed had been sourced from fossil fuel resources.

Portugal, from 1961 until 2009, had the lowest CO_2 emissions, comparatively to other European countries considered (Fig. 5.5). Indeed, France with the reduction of fossil fuel energy consumption, since the 1980s could have obtained the lowest levels of CO_2 emissions, which is a curious example.

The percentage of methane emission by agriculture in each country (Fig. 5.6), from 1990 to 2010, was superior in Ireland (about 80 %) and inferior in Portugal (more or less 30 % in the total of the economy).

Similar findings are possible to obtain from the Fig. 5.7 for the percentage of nitrous oxide emissions by agriculture in each country. These findings for Portugal are possibly in agreement with the lowest levels of productivity in farming for this country. However, as referred to before these observations need to be analyzed with other information and with some attention in future studies.

Portugal (about 40 %) and Greece (about 30 %) are the countries with more population in urban agglomerations (Fig. 5.8) and Germany (about 10 %), Italy (about 15 %), and France (about 20 %) are the countries with less population in large agglomerated urban areas.

Greece and Portugal are the countries that have more freshwater withdrawals for the agricultural sector (Fig. 5.9). On the other hand, the utilization of freshwater for farming is residual in Germany (less than 10 %).

The eight countries of the European Union considered followed a pattern more or less similar to that of inflation for consumer prices, from 1961 until 2012 (Fig. 5.10). The 1970s, the 1980s, and part of the 1990s were years with signs of strong inflation (maybe hyperinflation). Some countries such as France showed one of the lowest inflation rates for this period and Portugal and Greece had some problems with this economic variable, namely in the 1980s and part of the 1990s.

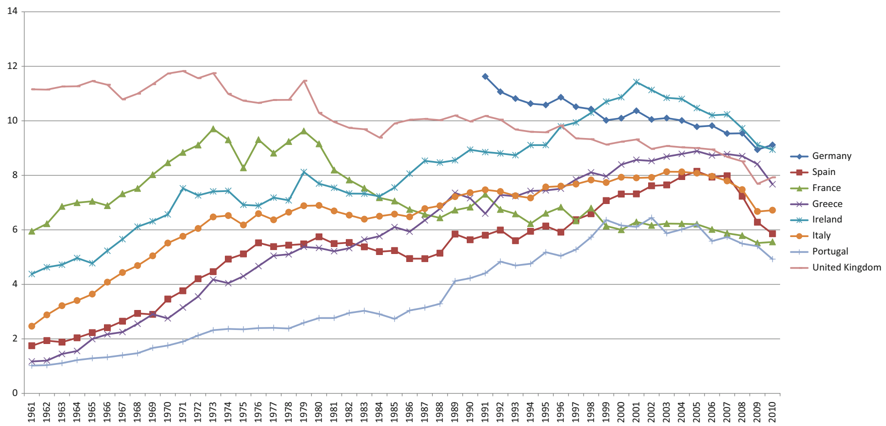

Fig. 5.5 CO_2 emissions (metric tons per capita) between European countries

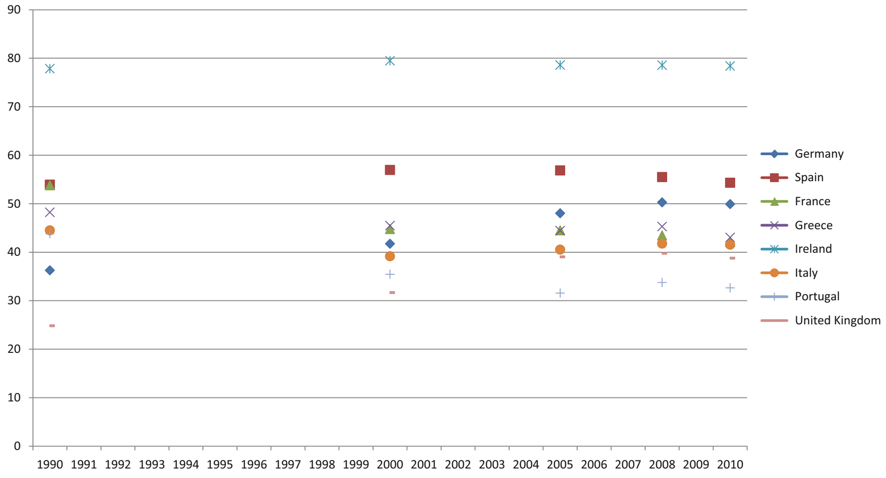

Fig. 5.6 Agricultural methane emissions (% of total) between European countries

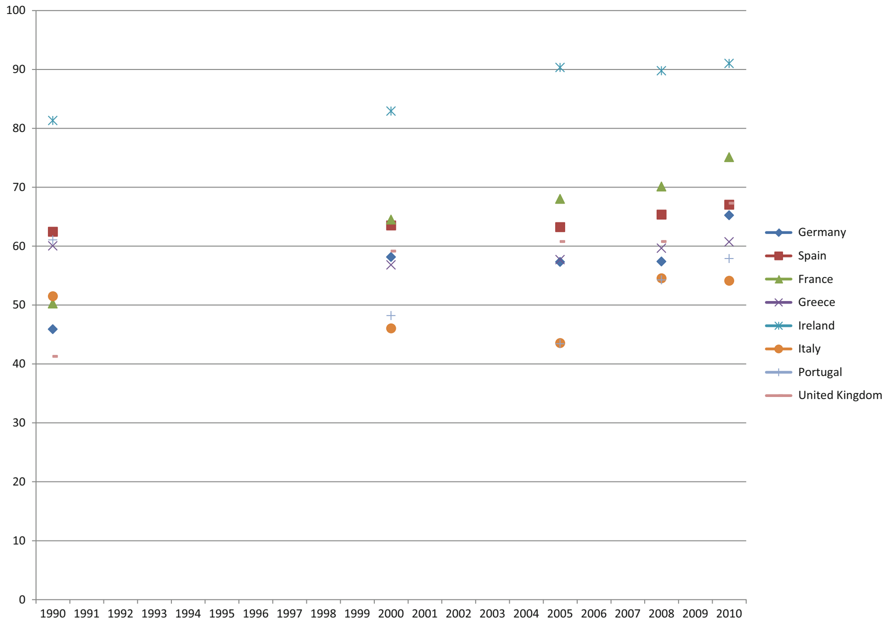

Fig. 5.7 Agricultural nitrous oxide emissions (% of total) between European countries

More or less the same can be said about the lending interest rate (Fig. 5.11). Indeed, between the 1970s and the 1990s these rates were high and Portugal and Greece were the European countries having the most problems with this variable.

Italy and Greece were the countries with more central government debts, from 1995 to 2011 (about 120 % of the GDP), but after 2008 many countries saw their

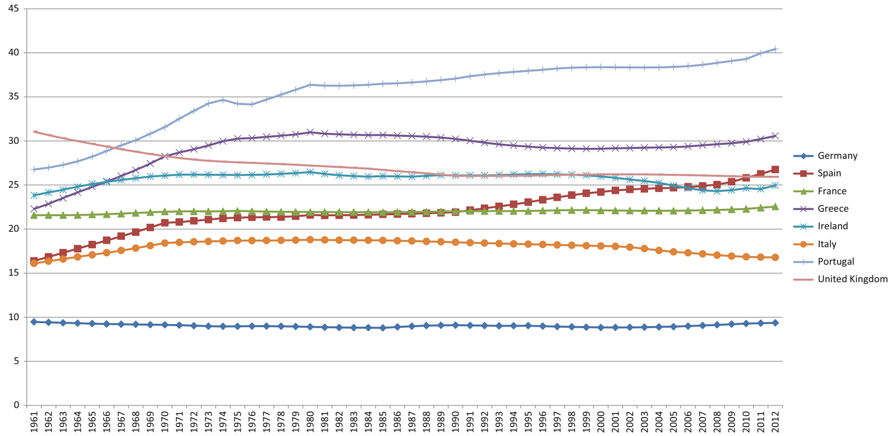

Fig. 5.8 Population in urban agglomerations of more than one million (% of total population) between European countries

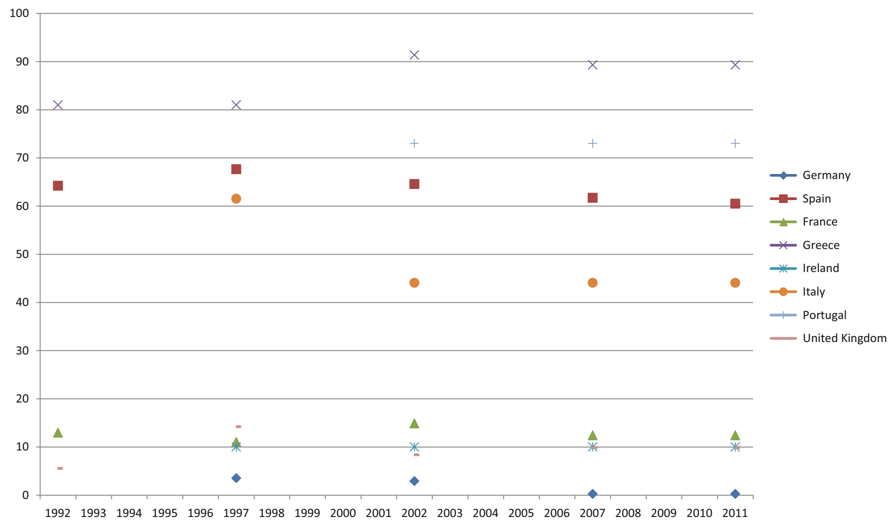

Fig. 5.9 Annual freshwater withdrawals, agriculture (% of total freshwater withdrawal) between European countries

central debts increase, namely Portugal, Ireland, the UK, and France (Fig. 5.12). The financial crisis of the USA in 2008 had negative effects upon European countries.

The number of motor vehicles per 1,000 persons is greater in Italy and recently in Greece and lower in Ireland and the UK (Fig. 5.13). This is interrelated with some social attitudes, such as the preference for use of other means of transport to travel.

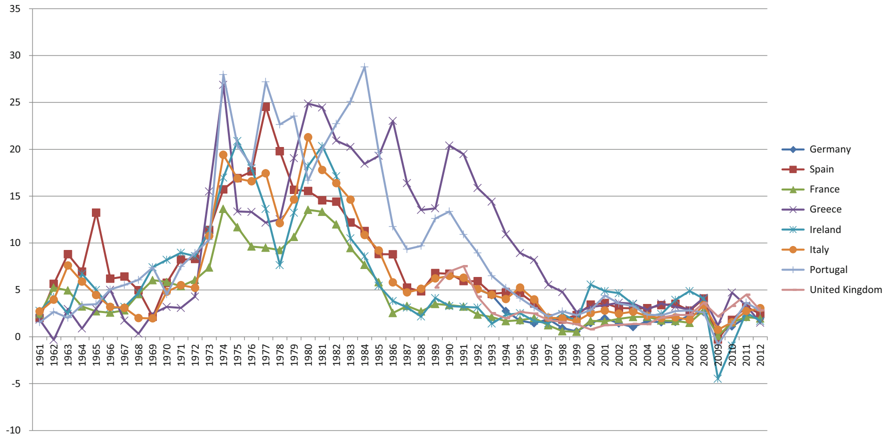

Fig. 5.10 Inflation, consumer prices (annual %) between European countries

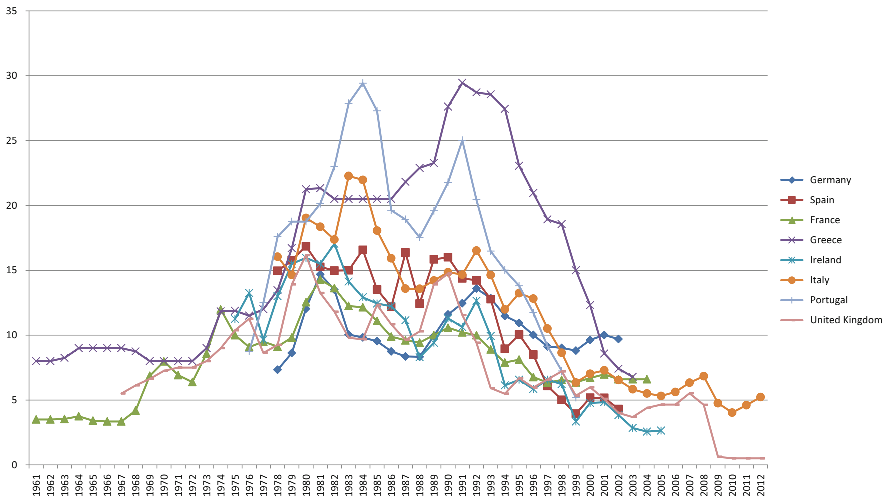

Fig. 5.11 Lending interest rate (%) between European countries

Ireland is the country with the best performance in the percentage of export goods and services relative to its GDP (Fig. 5.14). Germany recently had a good performance, also, in exports, but the dynamics in Ireland are greater.

The evolution of the gross capital formation in percentage of the GDP followed a pattern more or less similar in the several countries considered and was about 20 % at the beginning of the 1960s and decreased slightly in 2011 (Fig. 5.15).

Portugal (about 30 %) and Ireland (about 15 %) were the countries with more percentage of the value added from agriculture into the total GDP at the beginning

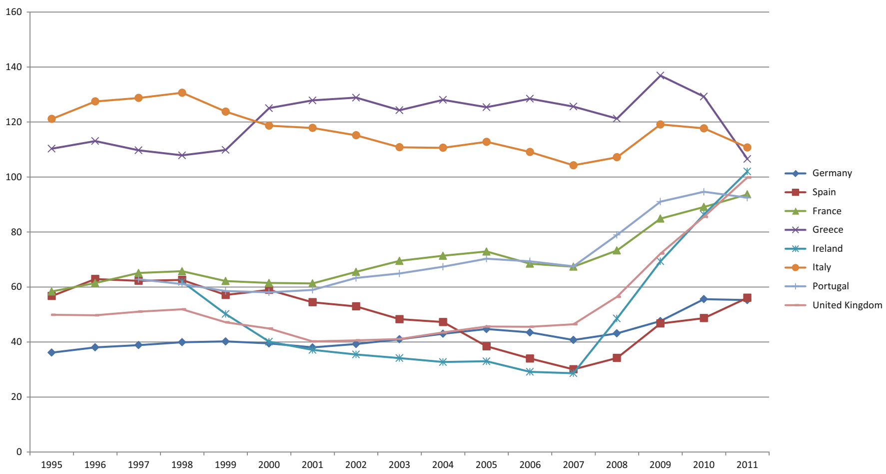

Fig. 5.12 Central government debt, total (% of GDP) between European countries

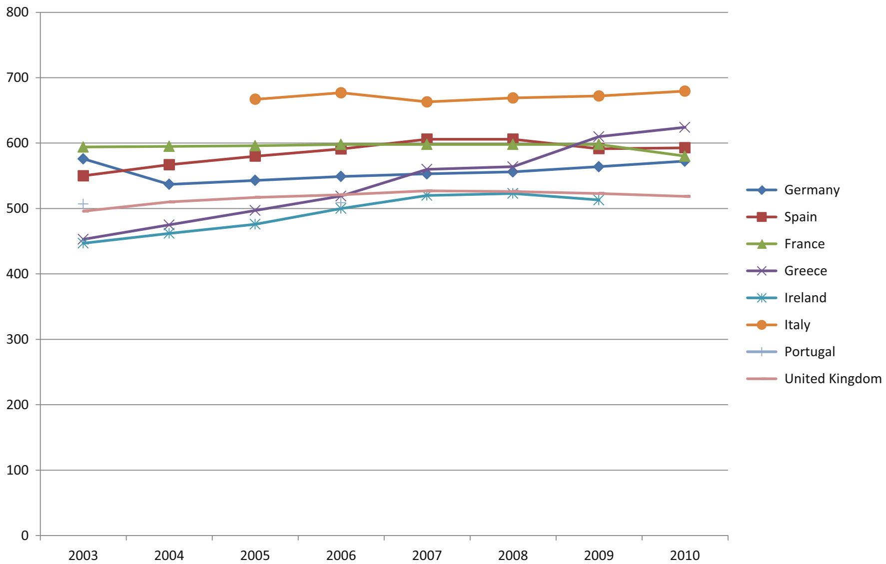

Fig. 5.13 Motor vehicles (per 1,000 people) between European countries

of the 1970s (Fig. 5.16), but this weight decreased significantly and in 2010 all countries considered had a similar weight of about 2.5 %.

The weight in GDP from the industry was greater in Germany at the beginning of the 1970s and in 2010 it was Ireland which presented the best performance

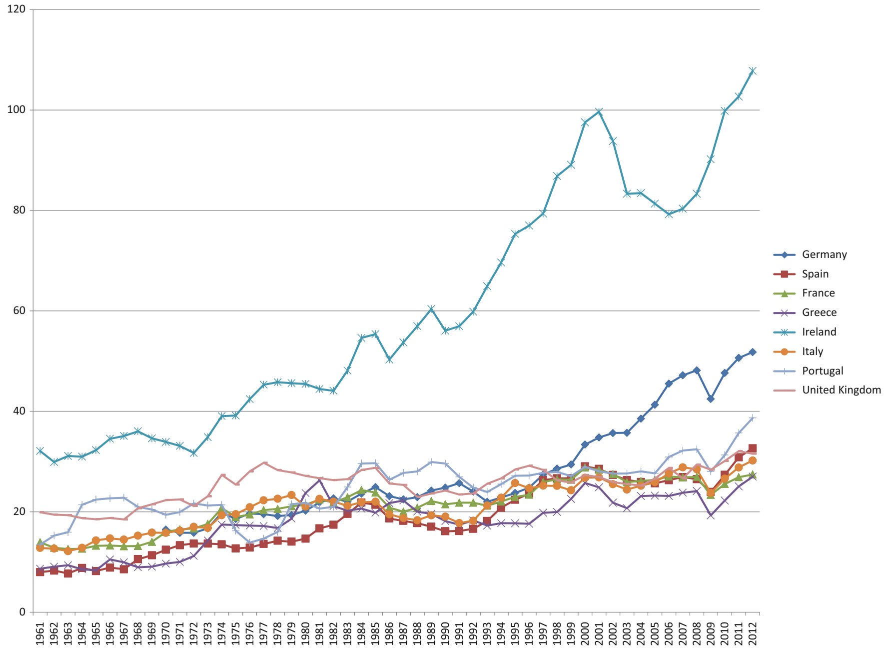

Fig. 5.14 Exports of goods and services (% of GDP) between European countries

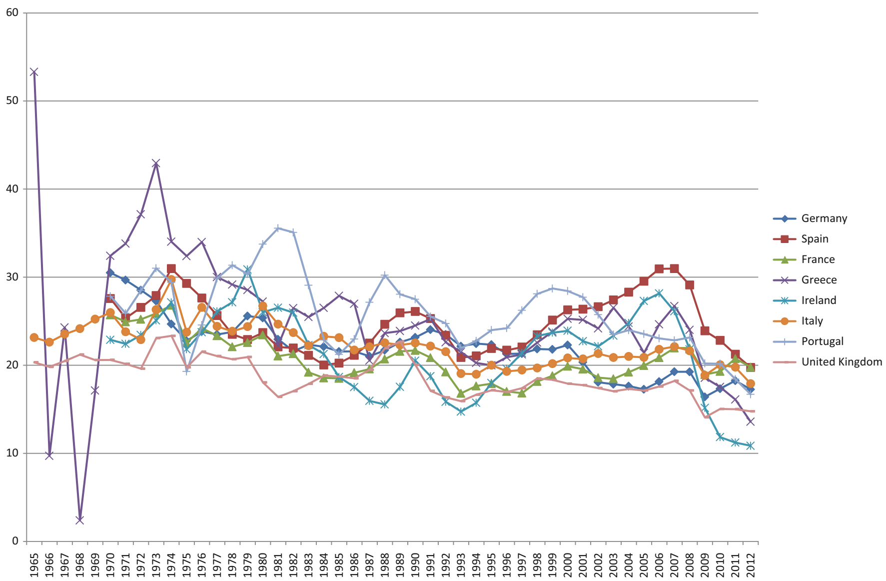

Fig. 5.15 Gross capital formation (% of GDP) between European countries

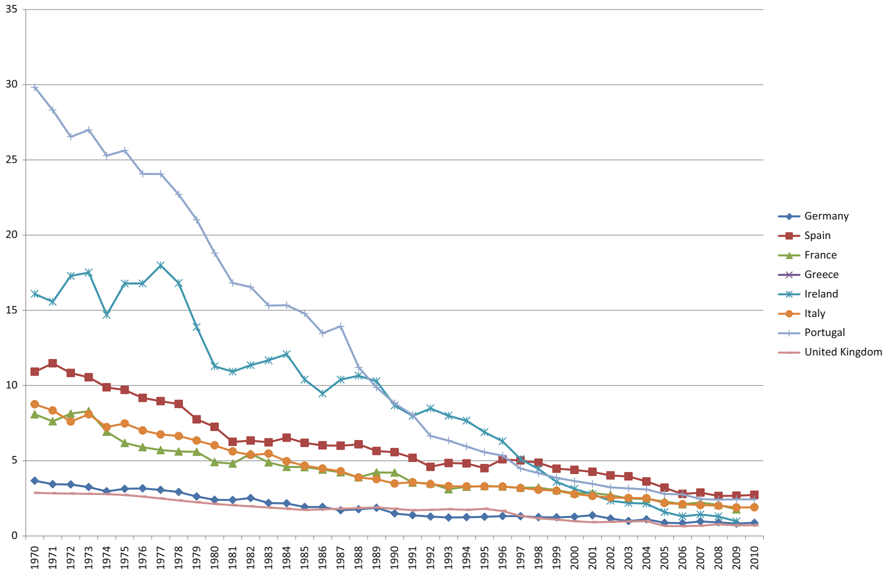

Fig. 5.16 Agriculture, value added (% of GDP) between European countries

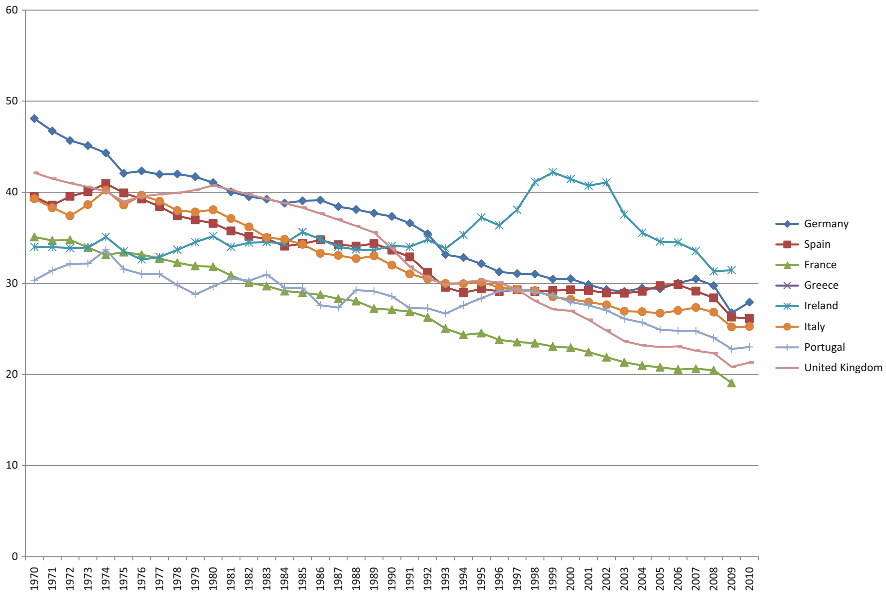

Fig. 5.17 Industry, value added (% of GDP) between European countries

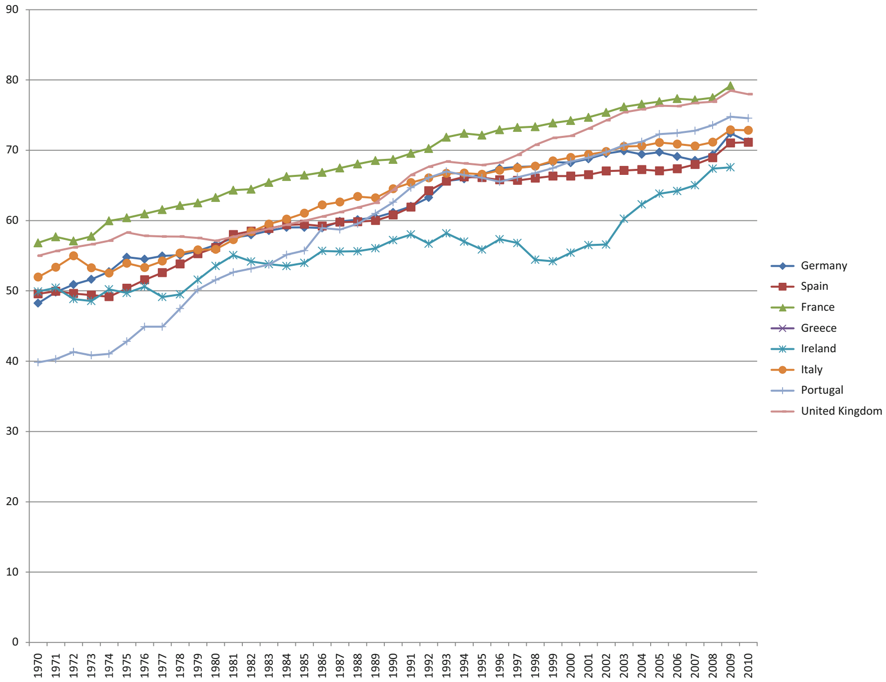

Fig. 5.18 Services, etc., value added (% of GDP) between European countries

(Fig. 5.17), but Germany has also maintained a good level of dynamics over recent years. France is the country with lowest weight of the industry in GDP.

In terms of the importance of services in the total GDP, Ireland is the country with the lowest relevance and France the country with more weight (Fig. 5.18). The weight of services in the GDP of each European country increased from 1970 until 2010 in all countries considered, particularly in Portugal where the importance of services increased from about 40 % to about 75 % in the period referred to.

In general (Fig. 5.19), the GDP had negative growth, for the countries considered, in 1975, in 1993, and strongly in 2009. In 1975 and 2008 there were countries with growth rates of −5 %. In 2011, Greece had growth rates for GDP inferior to −5 %. In 2010 and 2011, Germany was the country with the highest growth rates of almost 5 % in 2010.

In recent years (Fig. 5.20) Ireland, Germany, and France were the countries with a greater GPD per capita. On the other hand, the lowest income per capita was verified in Portugal and Greece. This statistical information helps to understand some social and economic contexts verified by some European countries in the south.

Portugal had some literacy problems in the beginning of the 1980s (Fig. 5.21); this variable has improved significantly in recent years, from about 80 % in 1981 to about 95 % in 2011.

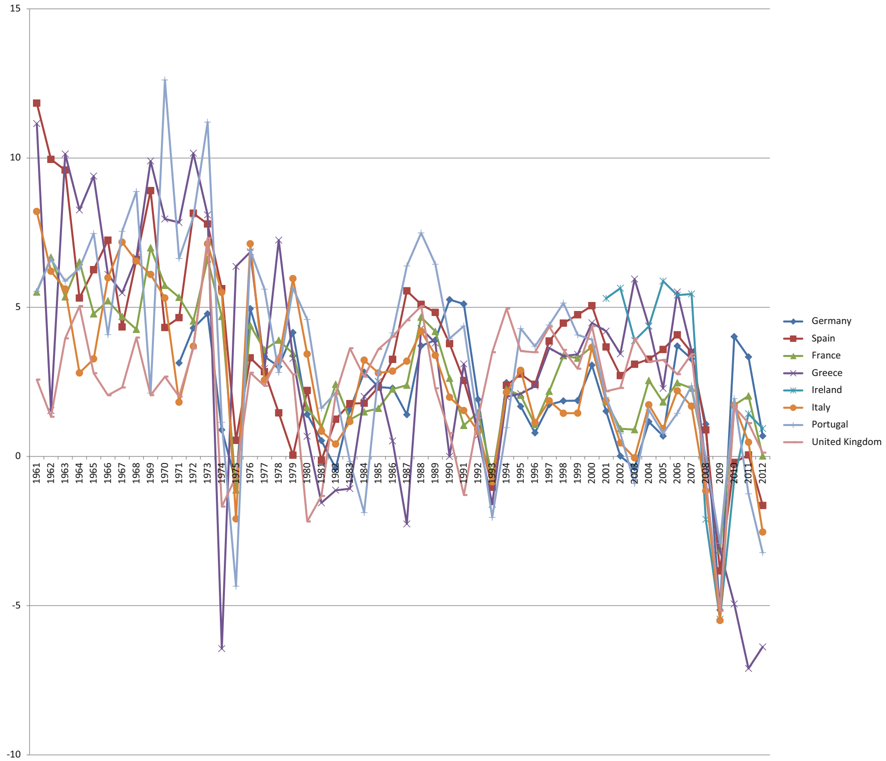

Fig. 5.19 GDP growth (annual %) between European countries

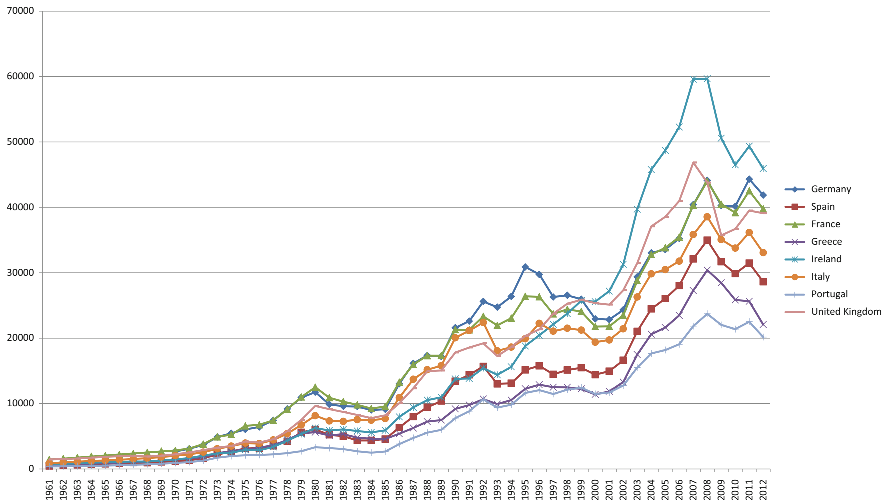

Fig. 5.20 GDP per capita (current US$) between European countries

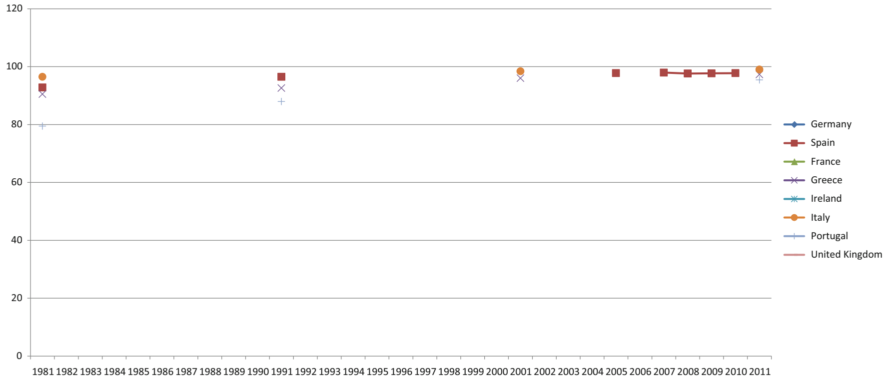

Fig. 5.21 Literacy rate, adult total (% of people ages 15 and above) between European countries

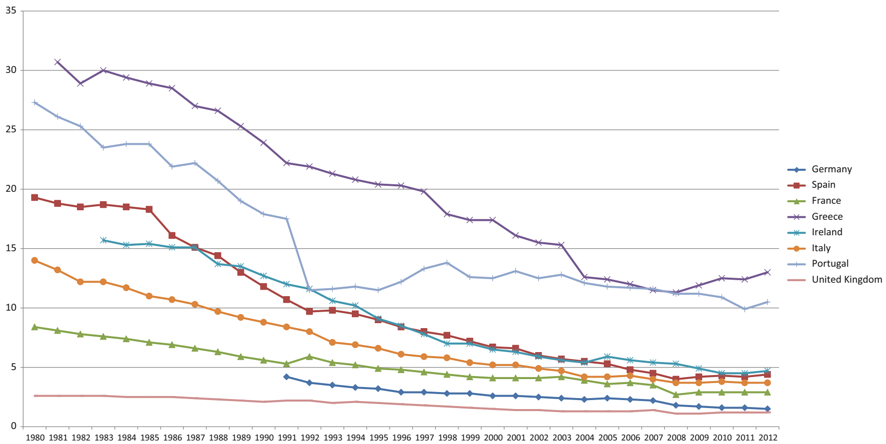

Fig. 5.22 Employment in agriculture (% of total employment) between European countries

Employment in agriculture decreased in almost every country (Fig. 5.22) from 1980 to 2012, but Portugal and Greece are the two countries with more relative employment in farming (about 15–20 % in 2012) whereas Germany and the UK were those with less people employed by the agricultural sector (about 1–2 % in 2012).

Over the last 30 years the unemployment rate has always been high in Spain, with rates of about 25 % in 1994. These rates improved significantly after 2000, but the international financial crisis in 2008 increased the level of unemployment in Spain and in other European countries (Fig. 5.23).

Between 1961 and 2012 Portugal was the country with a higher percentage of population in rural areas, from about 65 % to about 40 % (Fig. 5.24). The UK (about 20 % during this period) and France are those with less rural population.

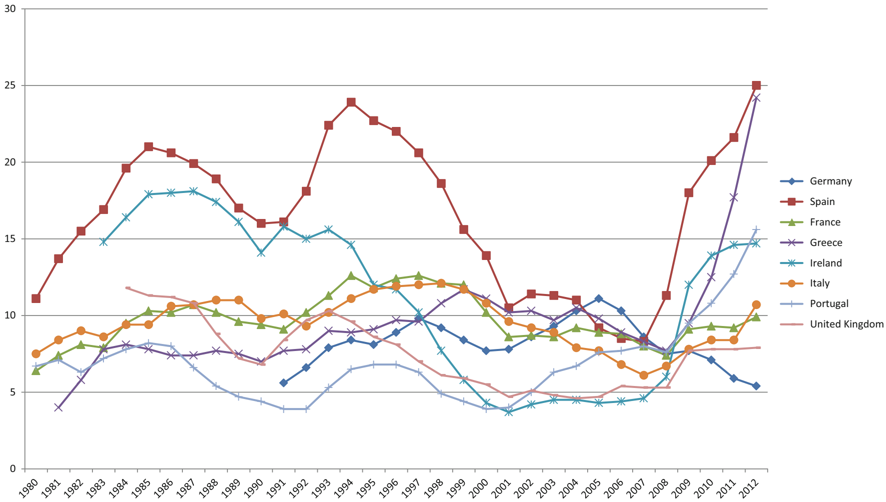

Fig. 5.23 Unemployment, total (% of total labor force) between European countries

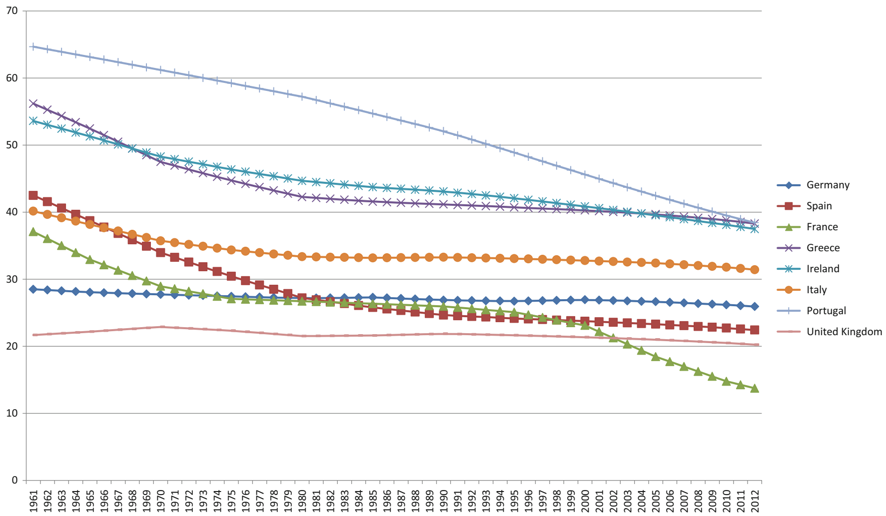

Fig. 5.24 Rural population (% of total population) between European countries

4 Results

In the tables presented in this section results were obtained using time series econometric techniques for each one of the European countries considered, considering the Cobb and Douglas (1928) function of production. Table 5.1 shows the results found with the original Cobb–Douglas model, where the output is a function of productivity, employment, and capital (in our models capital is represented by

Table 5.1 Results obtained with time series econometric techniques, based on the original Cobb–Douglas (1928) model (linear model obtained with logarithms), for the agricultural output in the period 1990–2011 (there are not results for Greece, due to a lack of data)

	Germany	Spain	France	Ireland	Italy	Portugal	UK
Model	Prais–Winsten	Prais–Winsten	Prais–Winsten	Prais–Winsten	Prais–Winsten	Prais–Winsten	ARCH family regression (Robust)
Constant		−8.804* (−6.010) [0.000]	4.235** (1.910) [0.073]	−2.535* (−3.660) [0.002]		12.837** (2.070) [0.053]	−0.575* (−10.320) [0.000]
Agriculture value added per worker (constant 2005 US$)		0.758* (6.050) [0.000]	−0.360** (−2.060) [0.055]			−1.360* (−2.180) [0.042]	
Employment in agriculture (% of total employment)	0.559* (2.140) [0.047]	1.325* (12.050) [0.000]	0.461** (1.800) [0.090]	1.842* (5.490) [0.000]	0.673** (1.890) [0.074]		1.513* (15.930) [0.000]
Augmented Dickey–Fuller test for unit root	−4.969* [0.000]	−2.984* [0.0364]	−2.890* [0.046]	−4.310* [0.000]	−3.247* [0.017]	−3.191* [0.020]	−3.202* [0.019]
EG-ADF test for co-integration	−2.081 [0.252]	−2.457 [0.126]	−1.877 [0.342]	−1.395 [0.584]	−2.353 [0.155]	−1.546 [0.510]	−2.149 [0.225]
Portmanteau test for white noise for autocorrelation	36.191* [0.000]	45.980* [0.000]	34.061* [0.000]	49.163* [0.000]	51.964* [0.000]	47.998* [0.000]	52.960* [0.000]
Durbin's alternative test for autocorrelation	3.794** [0.051]	2.088 [0.148]	2.858** [0.090]	21.332* [0.000]	8.361* [0.003]	7.712* [0.005]	1.128 [0.288]
Breusch–Godfrey LM test for autocorrelation	3.833** [0.050]	2.297 [0.129]	3.031** [0.081]	11.130* [0.000]	6.923* [0.008]	6.554* [0.010]	1.239 [0.265]
Breusch–Pagan/Cook–Weisberg test for heteroskedasticity	0.320 [0.572]	2.200 [0.138]	0.150 [0.697]	0.190 [0.663]	0.210 [0.643]	0.040 [0.850]	3.180** [0.074]
Ramsey RESET test using powers of the fitted values	2.310 [0.120]	3.510* [0.041]	3.310** [0.051]	8.630* [0.001]	6.580* [0.004]	2.050 [0.150]	2.660** [0.083]

(continued)

Table 5.1 (continued)

	Germany	Spain	France	Ireland	Italy	Portugal	UK
Model	Prais–Winsten	Prais–Winsten	Prais–Winsten	Prais–Winsten	Prais–Winsten	Prais–Winsten	ARCH family regression (Robust)
LM test for autoregressive conditional heteroskedasticity (ARCH)	0.868 [0.351]	0.040 [0.840]	0.436 [0.508]	1.630 [0.201]	0.155 [0.693]	0.566 [0.451]	9.841* [0.001]

Note: *Statistically significant at 5 %; **Statistically significant at 10 %

Table 5.2 Results obtained with time series econometric techniques, considering the Cobb–Douglas (1928) model extended with economic, social, and environmental variables (linear model obtained with logarithms), for the agricultural output in the period 1990–2011 (there are not results for Greece, due to a lack of data)

	Spain	France	Ireland	Italy	UK
Model	Prais–Winsten	Prais–Winsten	Prais–Winsten (Robust)	Prais–Winsten	Prais–Winsten (Robust)
Constant	−28.013* (−3.380) [0.004]	6.129* (3.080) [0.007]	−11.334* (−3.900) [0.001]	−18.159* (−2.570) [0.020]	6.061* (3.530) [0.002]
Agriculture value added per worker (constant 2005 US$)	0.813* (7.060) [0.000]	−0.744* (−4.020) [0.001]			
Employment in agriculture (% of total employment)	0.926* (4.740) [0.000]		2.929* (8.590) [0.000]	0.813* (2.500) [0.023]	0.747* (3.280) [0.004]
Additional variable[a]	6.134* (2.350) [0.031]	0.826* (3.580) [0.003]	1.540* (2.960) [0.009]	3.374* (2.670) [0.016]	−0.617* (−3.850) [0.001]
Breusch–Pagan/Cook–Weisberg test for heteroskedasticity	0.010 [0.931]	1.360 [0.244]	3.000** [0.083]	0.240 [0.621]	4.180* [0.040]
Ramsey RESET test using powers of the fitted values	2.190 [0.135]	0.160 [0.919]	2.060 [0.151]	3.860* [0.033]	2.110 [0.141]
LM test for autoregressive conditional heteroskedasticity (ARCH)	0.065 [0.798]	0.717 [0.397]	1.411 [0.234]	0.800 [0.371]	0.097 [0.755]

Note: *Statistically significant at 5 %; **Statistically significant at 10 %
[a]Rural population (% of total population) for Spain, Exports of goods and services (% of GDP) for France and Ireland, Fossil fuel energy consumption (% of total) for Italy, and GDP per capita (current US$) for the UK

the percentage of the gross capital formation and did not present statistical significance). In Table 5.2 the results presented for the models (countries) where the Ramsey RESET test using powers of the fitted values reveal a lack of independent variables. In this case several economic, social, and environmental variables analyzed in the previous section were tested, taking into account the availability of statistical information considered, in all estimations, only the period from 1990 to 2011. All the econometric estimations were made with Stata (2014) software.

Observing Table 5.1 it is possible to verify that there are no problems with the unit root and with the co-integration. There are some problems, however, with the autocorrelation and because of this the Prais–Winsten was used as an estimation method. On the other hand there are some complications with the heteroskedasticity and with the autoregressive conditional heteroskedasticity, for the model of the UK, and in this way the robust ARCH family regression was considered for the estimation. The Ramsey RESET test using powers of the fitted values reveal that there is a lack of independent variables in the models of Spain, France, Ireland, Italy, and the

UK. The results in this table reveal that agricultural employment has a positive effect on the agricultural output in almost every country (for Portugal this variable does not have statistical significance). The productivity of the labor force has a positive effect in Spain and a negative influence in France and Portugal.

In Table 5.2 the results suggest that the agricultural output is, also, influenced by the rural population (% of total population) in Spain, by the exports of goods and services (% of GDP) in France and Ireland, fossil fuel energy consumption (% of total) in Italy, and GDP per capita (current US$) in the UK.

The problems related with the lack of independent variables remain for Italy. Maybe, in future studies it will be possible to test other variables, not considered in this study.

Conclusions

A previous review of literature revealed that there are many determinants for agricultural output with diverse sources, namely, economic, social, environmental, and biological. Considering the importance of farming for the economic performance of countries, this original study is an important contribution towards the understanding of agricultural economic determinants in some of the European Union countries, namely those with greater dimension and those that had financial help from International Institutions, such as Portugal, Ireland, and Greece.

The data analysis reveals that the economic problems of countries such as Portugal and Greece have lasted for some time. For example, Portugal has suffered some difficulties in agricultural productivity, through the excess in farming employment, compared to other European countries, and in the number of people in urban agglomerations compared to rural areas. On the other hand, Portugal has more forest area and less pollutant emissions, namely from the agricultural sector. Both, Portugal and Greece, suffered problems derived from inflation and interest rates for lending.

Sometimes, it is difficult to understand how these differing countries can have the same economic rules and similar common policies, without other instruments of control. Maybe, it will be possible to find somewhere in time, a common steady state, after several mechanisms for catching up, but until now this continues to be difficult to discover how.

The econometric results show that the original Cobb–Douglas model, namely in agricultural productivity and employment, explains the near totality of the evolution for farming output in the several countries considered. Only the models associated with Spain, France, Ireland, Italy, and the UK needed to be complemented with some economic, social, and environmental variables.

There are yet some questions that need more specific analysis, which may prove to be an interesting opportunity for future research, namely in trying to

(continued)

better understand the agricultural economic dynamics in some countries at a microeconomic level.

Either way, this is one original approach to the agricultural economic performance in the European Union that aims to be a contribution for researchers and professionals of the sector, helping them to make informed choices and well-based decisions, namely at a macro level, but, also, at a micro level.

References

Almeida, A. T., Moura, P. S., Marques, A. S., & Almeida, J. L. (2005). Multi-impact evaluation of new medium and large hydropower plants in Portugal centre region. *Renewable and Sustainable Energy Reviews, 9*, 149–167.

Areal, F. J., & Riesgo, L. (2014). Farmers' views on the future of olive farming in Andalusia, Spain. *Land Use Policy, 36*, 543–553.

Castillo, J. S., & García, M. C. (2013). Analysis of international competitive positioning of quality wine from Spain. *Ciencia e investigación agraria, 40*(3), 491–501.

Caurla, S., Delacote, P., Lecocq, F., Barthès, J., & Barkaoui, A. (2013). Combining an inter-sectoral carbon tax with sectoral mitigation policies: Impacts on the French forest sector. *Journal of Forest Economics, 19*, 450–461.

Clancy, D., Breen, J. P., Thorne, F., & Wallace, M. (2012). A stochastic analysis of the decision to produce biomass crops in Ireland. *Biomass and Bioenergy, 46*, 353–365.

Cobb, C. W., & Douglas, P. H. (1928). A theory of production. *American Economic Review, 18* (Suppl), 139–165.

Darradi, Y., Saur, E., Laplana, R., Lescot, J.-M., Kuentz, V., & Meyer, B. C. (2012). Optimizing the environmental performance of agricultural activities: A case study in La Boulouze watershed. *Ecological Indicators, 22*, 27–37.

Gatto, P., Zocca, A., Battisti, A., Barrento, M. J., Branco, M., & Paiva, M. R. (2009). Economic assessment of managing processionary moth in pine forests: A case-study in Portugal. *Journal of Environmental Management, 90*, 683–691.

Hirt, U., Kreins, P., Kuhn, U., Mahnkopf, J., Venohr, M., & Wendland, F. (2012). Management options to reduce future nitrogen emissions into rivers: A case study of the Weser river basin, Germany. *Agricultural Water Management, 115*, 118–131.

Hoyos, D., Mariel, P., Pascual, U., & Etxano, I. (2012). Valuing a Natura 2000 network site to inform land use options using a discrete choice experiment: An illustration from the Basque Country. *Journal of Forest Economics, 18*, 329–344.

Kraatz, S. (2012). Energy intensity in livestock operations – Modeling of dairy farming systems in Germany. *Agricultural Systems, 110*, 90–106.

Krausmann, F., Schandl, H., & Sieferle, R. P. (2008). Socio-ecological regime transitions in Austria and the United Kingdom. *Ecological Economics, 65*, 187–201.

Maestre-Valero, J. F., Martínez-Granados, D., Martínez-Alvarez, V., & Calatrava, J. (2013). Socio-economic impact of evaporation losses from reservoirs under past, current and future water availability scenarios in the semi-arid Segura Basin. *Water Resources Management, 27*, 1411–1426.

Nastis, S. A., Michailidis, A., & Mattas, K. (2013). Crop biodiversity repercussions of subsidized organic farming. *Land Use Policy, 32*, 23–26.

Peña-Haro, S., Llopis-Albert, C., Pulido-Velazquez, M., & Pulido-Velazquez, D. (2010). Fertilizer standards for controlling groundwater nitrate pollution from agriculture: El Salobral-Los Llanos case study, Spain. *Journal of Hydrology, 392*, 174–187.

Skuras, D., Petrou, A., & Clark, G. (2006). Demand for rural tourism: The effects of quality and information. *Agricultural Economics, 35*, 183–192.

Stata. (2014). *Statistics/Data analysis*. StataCorp, LP.

Steinmann, H. H., Dickeduisberg, M., & Theuvsen, L. (2012). Uses and benefits of glyphosate in German arable farming. *Crop Protection, 42*, 164–169.

Tzouramani, I., Sintori, A., Liontakis, A., Karanikolas, P., & Alexopoulos, G. (2011). An assessment of the economic performance of organic dairy sheep farming in Greece. *Livestock Science, 141*, 136–142.

Via, J. D., Mantinger, H., & Baric, S. (2013). Die Entwicklung des Obstbaus in Südtirol: I. Die landwirtschaftliche Aus- und Weiterbildung. *Erwerbs-Obstbau, 55*, 109–119.

Wang, L., Butcher, A. S., Stuart, M. E., Gooddy, D. C., & Bloomfield, J. P. (2013). The nitrate time bomb: A numerical way to investigate nitrate storage and lag time in the unsaturated zone. *Environmental Geochemistry and Health, 35*, 667–681.

World Bank. (2014). *Several statistics*. Washington, DC: World Bank.