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The highly variable economic performance of European agriculture

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ABSTRACT

The successive reforms of the Common Agricultural Policy (CAP), the enlargements of the European Union (EU) and the impacts of climate change have amplified the diversity of European agriculture. These rapid changes have resulted in the intensification of agricultural activities in some regions, while they have led to the marginalization of agriculture and its eventual abandonment in others. The objective of this paper is to investigate the factors that are behind the differential performance of agriculture across the EU-27 countries. Ward's, *k*-means and two-step clustering methods were used to classify European agriculture based on gross-value-added farm, land and labour productivity indicators. Significant differences were revealed between the Northern-Central counties and the continental peripheries (Mediterranean, Eastern, Northern Scandinavian). An exact logistic regression model was used to analyse the factors behind this differential performance. Agricultural sectors characterized by a young and better trained farm population are more likely to attain high economic performance. The odds to attain high economic performance are almost 9 times greater for countries with a highly trained farm population, namely, the Netherlands (72%) and Germany (69%), than for countries with poor farm training, while an ageing farm population such as in Portugal (72%) and Bulgaria (66%) is 92% less likely to be high performing. The importance of investments in agriculture was also identified. The significance of the wheat yield variable highlights the importance of both environmental conditions and technical efficiency on farm economic performance. Similarly, countries with a high share of utilized agricultural land in less favoured areas, such as in the Mediterranean, are 94% less likely to attain high economic performance. The redesign of CAP direct payments between old and new member states after 2013 combined with the impacts of agricultural trade liberalization and climate change are expected to deteriorate the position of low performing agricultural sectors further.

Introduction

Agriculture is the main land user in the European Union (EU), accounting for more than 47% of the total territory. In recent decades, European agriculture has experienced a continuous decrease in the number of farms, while the farm size shows a tendency towards larger holdings. The last decade Mediterranean countries (Portugal, Spain, Italy, Cyprus and Greece), i.e. those countries hit hardest by the debt crisis, show relatively low rates of decline in the number of holdings. This could stem from a lack of employment opportunities by the secondary and the tertiary sector or a tendency to maintain farms as a form of safety net during difficult times (European Commission, 2013a,b,c). On the contrary, Eastern European countries exhibit the highest rates of decline in the number of farm holdings due to the restructuring process of privatization and redistribution of agricultural land. A similar tendency is observed for the share of agriculture in gross value added (GVA). In 2012, agriculture in the EU-27 generated around 159.4 billion euro of value added, some 1.4% of the added value for the whole economy, while agricultural employment accounted for 5.3% of the total employment. Despite the decline in the relative economic weight of the primary sector as an inevitable consequence of economic progress (Byerlee et al., 2009), its economic role remains still significant in many rural areas. Indeed, the economic importance of agriculture is generally much greater in the east and south of Europe than in the west and north (Eurostat, 2013a).

The liberalization of agricultural trade and the successive Common Agricultural Policy (CAP) reforms have moved the agricultural sector to market orientation and less protection. These fundamental changes are accompanied by greater market volatility, which increases competitive pressures on farmers. Several regions located in the southern and eastern parts of the EU, stretching from Latvia,

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Slovakia, Hungary, Bulgaria and Romania to Greece, Italy, Spain and Portugal, appear to be much more exposed to the challenges of globalisation (Alexiadis et al., 2013). Various concerns have been raised that these rapid changes have led to changes in land use that in some regions resulted in intensification of agricultural activities (Krausmann et al., 2003; Stoate et al., 2009), while in others led to the marginalization of agriculture and its abandonment (Navarro and Pereira, 2012). Agricultural land abandonment poses significant threats on the environment, in terms of biodiversity and natural capital loss (MacDonald et al., 2000; Cramer et al., 2008), and creates negative socioeconomic impacts in rural areas. Agriculture beyond its primary function of supplying food and fibre, is the main contributor to rural vitality as it generates rural employment, impedes rural depopulation, and keeps traditions alive (OECD, 2001).

In addition to the above pressures, agriculture is particularly vulnerable to the impacts of climate change. The most significant effects on European agriculture will be manifest through the increasing frequency and severity of extreme weather events and through changes in the availability of water (European Commission, 2009a). Climate change will have the most severe impact in the Mediterranean region, which exhibits a lower adaptive capacity than Northern European agriculture (Skuras and Psaltopoulos, 2012; Iglesias et al., 2012). Climatic changes are likely to increase both the volatility of markets, by changing production patterns, and the economic disparities between and within the rural areas of EU member states. Smit et al. (2001) highlight that high economic resources increase adaptive capacity, while a lack of financial resources limits adaptation options.

The CAP has been created to regulate and support European agriculture. It aims to combine strong economic performance with the sustainable use of natural resources in the field of agriculture (European Council, 2001). Over the last two decades, CAP has undergone a substantial reform process, taking into account the wide diversity of the agricultural sector across Europe. The most recent set of reforms initiated in 2003 and continued in 2008, aimed to enhance the competitiveness of the farm sector and promotes a market oriented and sustainable agriculture. The central element of the radical reform in 2003 was the 'decoupling' of the majority of direct payments to farmers from production. Decoupled payments were linked to the respect of environmental, animal and plant health, food safety and animal welfare standards, as well as the requirement to keep all farmland in good agricultural and environmental condition ('cross-compliance'). The above reform was further reinforced by the 2008 CAP Health Check agreement, such that decoupling of support was strengthened, while in terms of rural development policy, intervention domains were extended in the fields of climate change, renewable energy, water management, biodiversity and innovation (European Commission, 2009b). From 2014 onwards, CAP will introduce a new framework of direct support that aims at a fairer distribution of payments both within and across member states, a compulsory scheme for young farmers and simplified provisions for small farmers (European Commission, 2013a,b,c).

From what has been said in this section, it is obvious that there are considerable differences in agriculture across the EU-27. It is therefore of interest to investigate why some agricultural sectors across EU manage to overcome short-term or long-term economic, environmental and social adversities and attain high economic performance while others fail. Although there is no unique set of physical conditions for rapid agricultural growth nor is there a single set of activities that guarantee success, it is nevertheless possible to identify common patterns from success stories. Within this context and taking into consideration the wide diversity of European agriculture, the objectives of this paper are (a) to identify the differences in the economic performance of European agriculture, and (b) to investigate the factors behind the differential performance of agriculture across Europe. To do so, a cross-country analysis was carried out on the distribution of farm economic performance. The next section presents the methodological framework of the study, namely the cluster analysis and the exact logistic regression analysis, while Section 'Results and discussion' presents the model results, i.e., the high and the low performing groups of countries and the odds ratio of the explanatory factors to farm economic performance. The paper ends with conclusions drawn from the analysis.

Methodology

Cluster analysis

Cluster analysis is a multivariate statistical technique that entails the division of a large group of observations into smaller and more homogeneous groups. In a similar way, cluster analysis can be applied to classify EU member states according to differentiated farm economic performance. The clustering procedure can be broadly classified in three categories, namely, hierarchical clustering, non-hierarchical clustering and two-step clustering. To discover the evidence of different clusters of countries in the present study, a combination of a hierarchical method and a partitioning method for clustering is carried out along with a two-step clustering procedure. The hierarchical method is applied in an exploratory way and the solution is used in a partitioning method to improve the cluster solution (Hair et al., 2006). Ward's method, an agglomerative hierarchical clustering procedure, is applied first. This method is based on least-squares criteria and minimizes the within-cluster sum of squares, thus maximizing the within-cluster homogeneity (Everitt et al., 2011). This approach starts with each observation in a single cluster and in the following steps clusters are joined, until only one cluster contains all the observations. *K*-means clustering is the partitioning method that follows the hierarchical method in our case. The goal of the *k*-means method is to split the total number of observations into a prearranged number of *k* homogeneous groups based on preferred characteristics (Lattin et al., 2003). For the two-step clustering procedure, cases are assigned into pre-clusters in the first step and in the second step the hierarchical algorithm is used to cluster the pre-clusters (Chiu et al., 2001).

Application

Several studies have explored farm performance across Europe, using indicators such as profitability, economic efficiency, and technical efficiency (Latruffe et al., 2012; Bojnec and Latruffe, 2013). Within this study, farm economic performance is assessed through the use of gross value added indicators that have been used often for measuring industry's economic performance. Thomassen et al. (2009) use gross value added productivity indicators to measure the economic performance of dairy farms. Similarly, Van Passel et al. (2007) use partial labour productivity, capital productivity and land productivity indicators to measure economic performance. Cluster analysis was carried out using three gross value added indicators, namely, gross value added per farm, gross value added per annual work unit (labour productivity), gross value added per ha (land productivity). The variables were averaged across a five-year reference period (2007–2011) to mitigate a year specific effect in farm performance caused by fluctuations either in production (due to bad weather conditions) or in input/output prices. Cluster analysis was performed in SPSS 13.0 (SPSS, 2004) and the prearranged number of clusters came from the applied Ward's method. The number of clusters was defined by the agglomeration coefficient which was used as stopping rule; a large increase of the agglomeration coefficient