C20

Measuring the Competitiveness of EU Wine Business Sector: A Composite Index Approach

M. Greco | Italian National Institute of Statistics (Istat) | Rome | Italy
M. Mazziotta | Italian National Institute of Statistics (Istat) | Rome | Italy
A. Pareto | Italian National Institute of Statistics (Istat) | Rome | Italy

ABSTRACT

The European Union is the world leading producer of wine. Since the introduction of the common market organization (CMO), the wine market has developed considerably. One of the main goal of the last wine reform was of making EU wine producers even more competitive preserving the best traditions of European wine growing and boosting its social and environmental role in rural areas.

The aim of this paper is to measure a multidimensional phenomenon, the "Competitiveness of EU wine business sector" in the nuts2 regions, through the use of a composite index. The results highlight both areas of the territory for which it is known the strong vocation and less known areas where you need to do further investigation.

Keywords: agribusiness, wine, enological vocation, composite index

PAPER

1. Introduction

The European Union is the world leading producer of wine. Between 2009 and 2014, the average annual production was 167 million hectolitres. It accounts for 45% of world wine-growing areas, 65% of production, 57% of global consumption and 70% of exports in global terms. Inside the European Union the picture is quite different among the Member States and the NUTS2 areas. Beside France, Italy, and Spain that are traditionally the largest EU wine producing countries, representing 81 per cent of total output, other Countries are significant in the sector as Germany, Portugal, Romania, Greece, Hungary, and Austria. And new Countries are emerging as Bulgaria, Croatia, and Slovenia. The aim of the paper is to try to measure the competitiveness of this sector in the EU nuts2 regions and its evolution in the period 2010-2013, through the use of a composite index. The source of data are the EU Farm Structure Surveys.

The competitiveness of EU wine business sector is clearly a multidimensional phenomenon since it is not possible to represent it only with a descriptive indicator; in fact, the phenomenon is composed of different dimensions that need to be considered contextually. In this regard, we have represented the phenomenon by three pillars: Structural, Entrepreneurial, and Qualitative. And each of the three pillars is composed of some individual indicators. In order to obtain a measure of each pillars and a "unique number" that represents the phenomena it is necessary to apply a composite index, combining the individual indicators. In fact, it is common awareness that multidimensional phenomena cannot be measured by a single descriptive indicator and that, instead, they should be represented with multiple dimensions applying methodologies known as composite indices. The paradigm of work for the measurement of these phenomena is developed as: 1) identification of a theoretical framework; 2) selection of the representative dimensions; 3) selection of individual indicators; 4) definition of the synthesis methodology (standardization and aggregation function).

2. The competitiveness of EU wine business sector

In the general context described in the previous section, the study and measurement of the competitiveness of EU wine business sector in the Nuts2 areas seems a necessary step in order to understand such an important sector for the economy and the social development of the rural areas. Among many factors, the structural characteristics of the viticulture, of the vineyard holding' management and of the quality production vocation are relevant and crucial in defining the capability of producing and marketing wine in a certain area. Therefore, three pillars have been chosen in this study, to represent the phenomenon:

Structural, Entrepreneurial, and Qualitative. Variables used are reported in Table 1.

Their relevance in regard to the pillar and the availability in official statistics of the parameters used have been the main criteria for choosing the elementary indicators. In fact, in order to select the individual indicators a formative approach is chosen: the selected individual indicators are causes of an underlying latent variable, rather than its effects. Therefore, causality is from the indicators to the concept and a change in the phenomenon does not necessarily imply variations in all its measures. In this model, the concept is defined by, or is a function of, the observed variables. In this case, indicators are not interchangeable (omitting an indicator is omitting a part of the underlying concept), the correlations between indicators are not explained by the measurement model (Diamantopoulos et al., 2008) and then their level is substantially negligible.

Table 1 - List of indicators of competitiveness of EU Wine business sector

Indicator	Pillar
Area under vines/utilised agricultural area	Structural
Vineyard holdings/agricultural holdings	Structural
Production value at basic price of the wine sector on agricultural output	Structural
Production value at basic price of the wine sector/resident population	Structural
Area of the specialised vineyard holdings/utilised agricultural area	Entrepreneurial
Specialised vineyard holdings/vineyard holdings	Entrepreneurial
Standard Output of the specialised vineyard holdings/Number of Specialised vineyard holdings (euro)	Entrepreneurial
specialist vineyard holdings marketing more than 50%	Entrepreneurial
Vineyard holdings with Standard Output >50.000 euro/vineyards holdings (%)	Entrepreneurial
Vineyard holdings with area under vines > 150 ha/Vineyard holdings	Entrepreneurial
DOC/DOCG area under vines/utilised agricultural area	Qualitative
Organic area under vines/utilised agricultural area	Qualitative
Organic vineyard holdings/agricultural holdings	Qualitative

3. Mazziotta-Pareto Index

The composite indices of competitiveness were constructed by the MPI (Mazziotta-Pareto Index). The MPI is a non-compensatory composite index that can be used to measure multidimensional phenomena, such as development and poverty (De Muro et al. 2011).

The index is designed in order to satisfy the following properties: (i) normalization of the indicators by a specific criterion that deletes both the unit of measurement and the variability effect; (ii) synthesis independent from an „ideal unit (i.e., a hypothetical geographical unit represented by the best values of the individual indicators), since a set of „optimal values is arbitrary, non-univocal and can vary with time; (iii) simplicity of computation; (iv) ease of interpretation.

The steps for computing the MPI are given below.

Let us consider a set of individual indicators positively related with the phenomenon to be measured. Given the matrix $\mathbf{X}=\{x_{ij}\}$ with n rows (geographical areas) and m columns (indicators), we calculate a standardized matrix $\mathbf{Z}=\{z_{ij}\}$ as follows:

$$z_{ij} = 100 + \frac{(x_{ij} - M_{x_j})}{S_{x_j}}10 \qquad (1)$$

where M_{x_j} and S_{x_j} are the mean and standard deviation of the indicator j respectively.

Denoting with M_{z_i} and S_{z_i}, respectively, the mean and the standard deviation of the standardized values of the area i, the composite index is given by:

$$MPI_i^- = M_{z_i} - S_{z_i} cv_i \qquad (2)$$

where $cv_i = S_{z_i}/M_{z_i}$ is the coefficient of variation for the area i.

This approach is characterized by the use of the product $S_{z_i} cv_i$ to penalize the areas with unbalanced values of the indicators. The 'penalty' is based on the coefficient of variation and it is zero if all the values are equal. The aim is to reward the units that, with equal mean, have a greater balance among the indicators values. Therefore, the MPI decomposes the score of each unit in two parts: mean level (M_{z_i}) and penalty ($S_{z_i} cv_i$) (Mazziotta and Pareto 2015).

The method provides a 'robust' measure and less 'sensitive' to inclusion or exclusion of individual indicators. In fact, over the past few years, the method has been subjected on several occasions both to influence analysis that to robustness analysis (through the introduction of a stochastic disturbance in the matrix) in order to verify the 'goodness of fit' compared to many other composite indices (Mazziotta C. et al. 2010). The results have always been the 'strength' of the method thanks to its statistical and mathematical properties. Three composite indices of Structural, Entrepreneurial and Qualitative enological vocation were computed by (1) and (2). Then, a global composite index was obtained by applying (2) to the three previous indices.

4. The results

The results of the global composite index, at NUTS2 level in European Union, are showed in Figure 1 and 2. The areas with highest values of the composite index (green in the map) are located in France (Figure 1). Languedoc-Roussillon has reached the highest score followed by Provence-Alpes-Cote d'Azur and Aquitaine.

Medium values of the composite index are recorded in some areas of Spain (La Rioja, Castilla-la Mancha, Region de Murcia), of Italy (Toscana, Abruzzo, Trento, Veneto e Friuli-Venezia Giulia), Austria (Burgenland), Germany (Rheinland-Pfalz) and France again (Alsace, Champagne-Ardenne, Corse and Bourgogne).

These results confirm the importance of some traditional areas under vines and are generally expected. Languedoc-Roussillon, for instance, is the single biggest wine-producing region in the world, being responsible for more than a third of France's total wine production

Figure 1 – Global index of the competitiveness of EU wine business sector. Year 2013
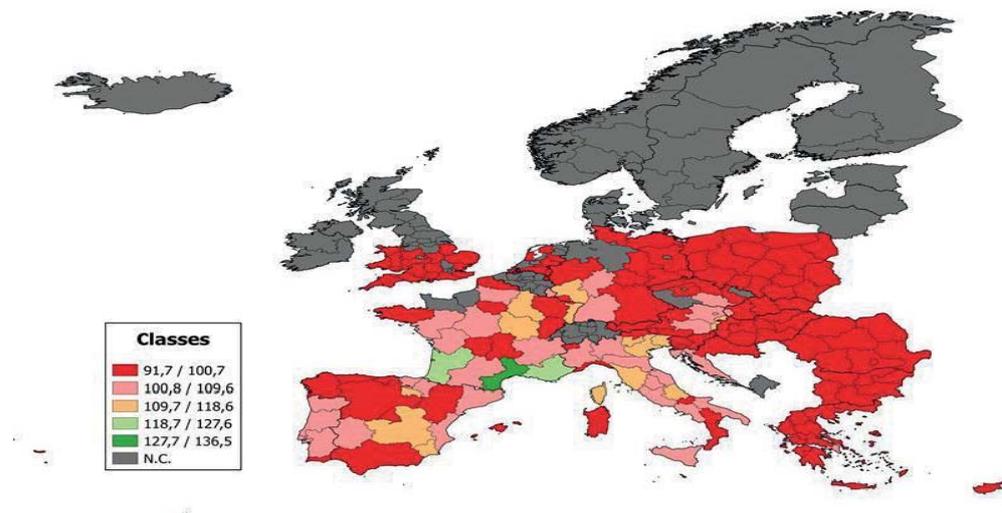

Figure 2 shows the results of the trend of the composite index in the period 2010 -2013.

As can clearly be seen, the score of the areas in this figure is completely different from the first one. The most suitable areas reached generally less points than the emergent but still marginal areas in the business wine sector. This can be explained with the fact that the new areas have more rooms for improvement than the traditional ones. At the opposite, the leader areas have more difficulties to improve or to keep their front-runner position. The areas with the highest values of this composite index are located in some regions of United Kingdom, Austria, Poland and in France. While, among the areas with the lowest scores (red in the map) there are two very important for the sector: Toscana and Provence-Alpes_Cote d'Azur, immediately after Languedoc-Roussillon that was the leader region in the first map.

Figure 2 – Global index of the competitiveness of EU wine business sector. Trend 2010-2013
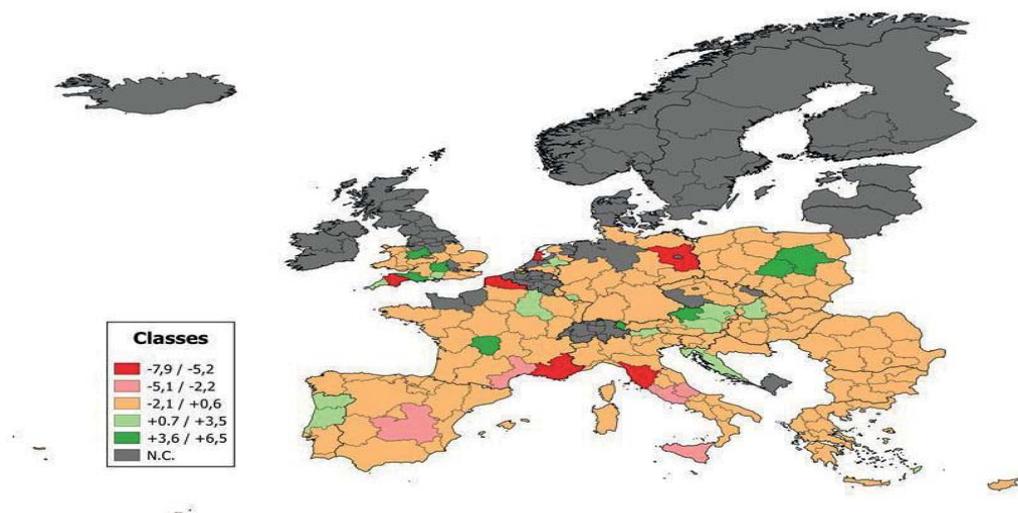
Let us have a look to the results of the simple indicators associated to the three dimensions. In the following maps the colours are in function with the score (more dark is the colour and more high is the value of the index).

Figure 3 - Simple index of the structural dimension. Year 2013 and trend 2010- 2013
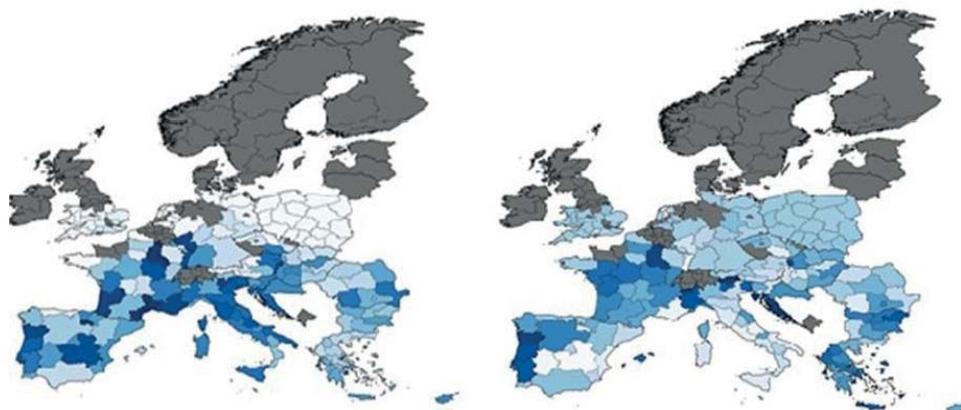

Figure 4 - Simple index of the entrepreneurial dimension. Year 2013 and trend 2010- 2013
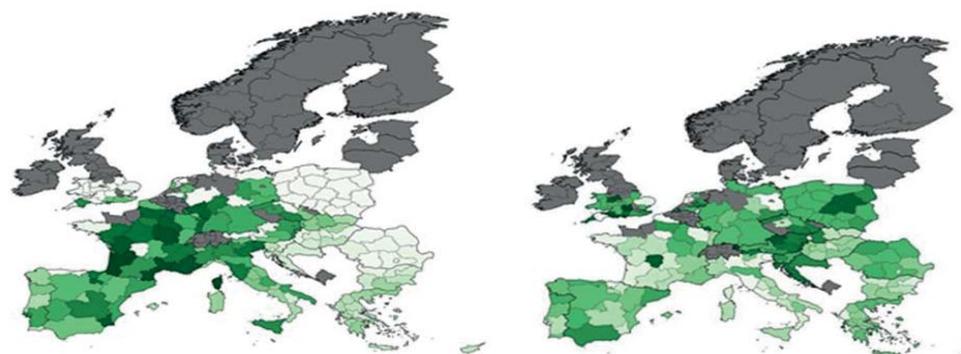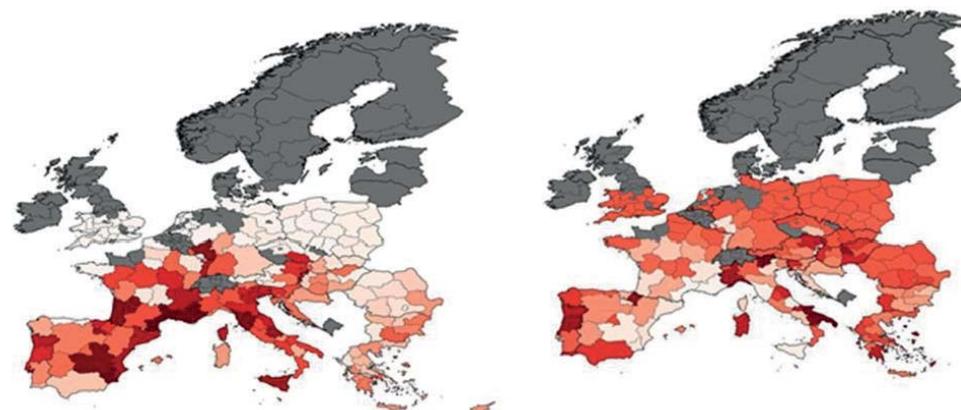

Figure 5 - Simple index of the qualitative dimension. Year 2013 and trend 2010- 2013

For the structural pillar (figure 3) areas with the best performances in 2013 are Languedoc-Roussillon, Champagne-Ardenne and La Rioja while in Bolzano/Bozen, Jadranska Hrvatska and Valle d'Aosta/ Vallee d'Aoste there have been the best trend.

France is the leader Country also in the entrepreneurial pillar (figure 4) placing 7 regions (Aquitaine, Corse, Languedoc-Roussillon, Bourgogne, Provence-Alpes-Cote d'Azur, Poitou-Charentes Champagne-Ardenne) in the first eight positions of the rank. The supremacy of the France in this pillar is broken only by the Region of Murcia (in seventh position). Considering the trend, United Kingdom has placed 3 areas in the first four positions of the rank (Berkshire Buckinghamshire and Oxfordshire, Dorset and Somerset, Shropshire and Staffordshire). Austria fit in the second position with Vorarlberg.

For the qualitative pillar (figure 5), France confirm its leadership placing Languedoc-Roussillon and Provence-Alpes-Cote d'Azur at the first two positions in the rank. They are followed by Region de Murcia, Toscana and Castilla-la Mancha. The trend shows as Italy is investing much in the quality wine. In fact, the first 5 regions in the ranking (Bolzano/Bozen, Puglia, Basilicata, Trento, Liguria come from this Country.

5. Final remarks

The study proposes a composite index to measure the competitiveness of wine business sector inside the European Union combining individual indicators distributed in three pillars: Structural, Entrepreneurial and Qualitative. We start from the assumption that the phenomenon considered is multidimensional and then it is necessary to reduce the dimensions.

The index, derived from the MPI method, classify the nuts2 areas in five classes, from the most devoted to the less devoted in the wine sector. The temporal reference of the analysis is 2013 and 2010-2013 trend.

The results confirm the leadership of the traditional Countries (France over all, followed by Spain and Italy) and rank the European regions according to the three pillars. Less expected are the results of the indexes on the trends that show, even in a very short time of the three years, the improvements of an emerging Country as United Kingdom (in the entrepreneurial dimension) and of a traditional one as Italy (in the structural and qualitative dimension). The UK is become a premium wine-producing region, with around 500 vineyards in England and Wales covering some 4,500 acres and producing sparkling and still wines. English and Welsh wines have also been winning many prestigious awards.

Further developments of the work could be to improve the number of the simple indicators in each pillar and to weight the simple indicators.

References

http://ec.europa.eu/agriculture/wine/

http://www.englishwineproducers.co.uk/

Diamantopoulos, A., Riefler, P., Roth, K. P. (2008). Advancing formative measurement models. J. Bus. Res., 61, 1203–1218.

De Muro, P., Mazziotta, M., Pareto, A., 2011. Composite Indices of Development and Poverty: An Application to MDGs. Social Indicators Research 104, 1–18.

Mazziotta C., Mazziotta M., Pareto A., Vidoli F. 2010. La sintesi di indicatori territoriali di dotazione infrastrutturale: metodi di costruzione e procedure di ponderazione a confronto. Rivista di Economia e Statistica del Territorio, Vol. 1, pp. 7-33.

Mazziotta, M., Pareto, A. (2015). On a Generalized Non-compensatory Composite Index for Measuring Socio-economic Phenomena. Soc. Indic. Res., DOI 10.1007/s11205-015-0998-2.