Vienna 2019 Abstract Submission

Title
Portuguese wine firm’s technical efficiency: Panel data models

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Conference Presentation

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Keywords
Stochastic frontier models: panel data; time-varying models; firm heterogeneity technical efficiency; Portuguese wine firms.

Research Question
Taking advantage of the use of panel data and stochastic frontier models, the main goal of the paper to compute the level of technical efficiency of Portuguese wineries.

Methods
Estimation of technical efficiency based on single equation stochastic frontier panel models, namely factor models and true fixed effects models, using data from a panel of 388 Portuguese wineries covering

Results
Technical efficiency varies little over time. Models that separate unit-specific effects show lower levels of efficiency. Promotion and export activities are positive drivers of efficiency. Government subsidies stunt technical efficiency.

Abstract
Over the last few decades, the wine industry worldwide has undergone deep changes, at the regional, national and international levels, reflecting the effects of globalization. Increasing competition both due to the openness of international markets and the rise of other alcoholic beverages (beer and spirituous) as well as changes in consumption patterns resulted in an economic environment in which it becomes increasingly difficult for companies to survive. This scenario is especially true for the traditional or old-world wine countries (namely France, Italy, Spain and Portugal), which have their wine industries based on the terroir model, characterized by an economic and social heterogeneous productive structure, dominated by micro-, small- and medium-sized firms.
In order to survive and be competitive in the global market, wine firms must adopt strategies that can provide solutions to the market as well as foreseeing future market needs. At the same time, firms must ensure an efficient use of its inputs, in order to guarantee the maximization of profits and thus, competitiveness. Therefore, efficiency and productivity analysis at firm level has become crucial to wine managers as a useful tool for the definition of new strategic plans, and policy related decisions. However, measuring efficiency in the wine market is a challenging task considering that the wine market features most characteristics of a monopolistic competition structure, with wineries with different sizes, producing a large spectrum of products with different costs that are sold at different prices.

This product heterogeneity, asymmetric information and competitiveness results in a wide range of possibilities to wine firms, with differences reflecting on their economic results. Analyzing technical efficiency provides insights into the differences that management practices may have regarding the use of inputs of a firm. The main rationale is that good managing practices foster efficiency, whilst bad managing practices stunt efficiency.

Technical efficiency can be computed by different methods, generally based on non-parametric linear programming methods or parametric regression methods. The former is usually referred to the Data Envelopment Analysis (DEA), while the latter is referred to the Stochastic Frontier Analysis (SFA). In the DEA, which stems from a benchmark, there is no need to specify a functional form of production and it can handle multiple inputs and output levels. However, the results may be very sensitive to the effects of outliers in the considered inputs and outputs. Moreover the deviation of an observation from the frontier must be attributed to (in)efficiency, regardless of being provoked by management decisions or from stochastic source, which constitutes the main drawback of the DEA approach. The SFA approach tends to overcome this drawback, decomposing the deviations in two components: the traditional random error term and a latent production inefficiency term. Therefore, in this approach, it is expected that deviations from the frontier arise from management errors and from uncontrollable factors (random error). Moreover, the availability of panel data in the SFA allows the latent inefficiency term to be correlated with the regressors in the frontier production function and to be time varying. Thus, the SFA is recommended to be used when the goal is to know more about the sources of (in)efficiency.

Regarding the variables used in this field for the estimation of the stochastic frontier production function, the output is usually measured with the total production in value or the total of sales. The inputs considered are labor, usually proxied by the number of employees, labor cost or even work hours, and capital, usually proxied by net capital stock, investment in fixed assets or depreciations. Additionally, intermediate consumption is also included as an input into the frontier production function. The sources of inefficiency in the wine sector are yet to be fully unlocked, especially considering panel data approaches. However, research considering panel data SFA usually refer to firm experience, proxied by age, labor quality, i.e., education, exploration subsidies and other firm activities as determinants of (in)efficiency.

The main goal of this paper is to analyze the performance of Portuguese wineries, through the estimation of their level of technical efficiency. The main novelty lies on the estimation of technical efficiency using a set of a panel data models as well as estimating the determinants of that efficiency. In order to achieve this goal, ant to test the robustness of the results, different panel data stochastic frontier (SF) models are applied to a sample of Portuguese wine-firms, covering the period from 2014 to 2017.

The paper includes the estimation of models from four different panel SF “generations”, divided into (i) models in which inefficiency is time-invariant (ii) models that allow for time-varying inefficiency (iii) models that disentangle unit-specific effects and time-varying inefficiency and (iv) models that separate unit-specific effects from persistent and time-varying inefficiency. The estimations emerge from a production function, where the logarithm of total turnover is the output, and the logs of the number of employees, capital depreciations, costs of raw materials, and supplies and services are the inputs. The exogenous determinants of technical efficiency are firm age, promotion activities, export activities and subsidies received.

Methodologically, the analysis includes the estimation of the of the production function frontier, assuming different specifications of the error term that represents inefficiency and hereafter point-estimates of technical efficiency are computed.

Efficiency levels fluctuate depending on the model specification. Average technical efficiency spans from near 15% to near 75%. Moreover, the results show that there are few differences on the technical efficiency in time-invariant and time-varying SF models, allowing us to conclude that technical efficiency varies little in time, which can be explained with the short time-span of the sample. The models that separate unit-specific effects tend to show lower levels of technical efficiency, pointing to the need to separate what is unit-specific heterogeneity and what is persistent and residual technical efficiency. These findings suggest that most of the disparities in efficiency in Portuguese wineries are mainly due to firm’s management decisions.
Regarding the determinants of efficiency, the results show that promotion costs, i.e., spending in advertising and product promotion is a positive driver of technical efficiency. Export activities are also a positive determinant of efficiency. On the other hand, government subsidies have an inverse relationship, stunting firms’ efficiency. Summing up, the results suggest that Portuguese wineries’ managers have space to ensure a better use of available resources and thus improving the levels of technical efficiency. Thus, they should focus on export activities as a diversification/expansion tool as well as promotion activities to gain market recognition.

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Portuguese wine firm's technical efficiency: Panel data models

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Funding

This work was supported by the project NORTE -01-0145-FEDER-000038 (INNOVINE & WINE – Innovation Platform of Vine & Wine) and by European and Structural and Investment Funds in the FEDER component, through the Operational Competitiveness and Internationalization Program (COMPETE 2020) [Project No 006971 (UIC/SOC/04011)]; and national funds, through the FCT – Portuguese Foundation for Science and Technology under the UID/SOC/04011/2013.

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Abstract¹ (800 to 2000 words)

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¹ This is a preliminary version.
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