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Abstract: This paper investigates the impact of exports on financial performances in Romanian wine industry as well as the main determinants of exports. The dataset includes mixed firm level (i.e. 207 companies) data, big data and mezzo-economic variables and covers the period 2009-2017. The results show that exports can improve the financial performance of Romanian wine producers. The latter seems also to be directly affected by the collection payment period and the number of employees per firm. Moreover, exports are strongly impacted by the wine productivity (especially in the case of the red wine varieties), by the intensive vine cultivated surfaces, firms' agglomeration and specific high temperature conditions.

Key words: Financial performances; Exports; Panel analysis; Wine Romanian industry

JEL-codes: F61, L66, C23

1. Introduction

In the recent period, after the rebound of wine production in the aftermath of the global economic and financial crisis, the wine industry registered a historically low production in 2017. Nevertheless this industry is still characterized by a continuing internationalization of trade (OIV, 2018). The increased trade competition on international markets raised new challenges: the race for exports can have deep implications for companies' performances, especially form a financial point of view. Hence, it would be interesting to analyse into more depth this link between wine exports and financial performances of wine producers. In this paper we will pay a particular attention to the study of this relation in the case of Romanian winemakers. We choose to develop our analysis on the Romanian case for several reasons.

First, as underlined by Siddle (2018), 2018 looks like the year when global wine industry starts to build serious relations with the so-called "emerging wine countries" defined as the nations that have been making wine for a long time but have been kept "on the second or third tier of actual wine supply" (Siddle, 2018). This would allow countries as Romania or Moldova to get a stronger place on the wine trade arena: the reasons that could explain this are not related to a sudden increase of the Romanian wine quality but to the fact that Romania together with other emerging wine countries have "collectively and individually got good volumes of wine to sell" (Siddle, 2018). For example, Romania saw a spectacular 61% increase on 2016 and 31% increase on 2017 of its wine production. OIV (2018) shows that Romania was the 13th world wine producer and 14th world wine consumer in 2017 (Tables 1 and 2)[1]. Compared to 2016, the Romanian wine consumption raised in 2017 by 8.5%: hence, consumption increases at a lower speed compared to the production.

Table 1: World wine production (excluding juice and musts)

Rank	Country	Year (mhl)		Variation 2017/2016
		2016	2017	(%)
1	Italy	50.9	42.5	-17
2	France	45.4	36.7	-19
3	Spain	40.0	32.1	-20
4	United States	23.6	23.3	-1
5	Australia	13	13.7	5
6	Argentina	9.4	11.8	25
7	China	11.4	10.8	-5
8	South Africa	10.5	10.8	3
9	Chile	10.1	9.5	-6
10	Germany	9.0	7.7	-15
11	Portugal	6.0	6.6	-10
12	Russia	5.2	4.7	-10
13	Romania	3.3	4.3	31
14	Brazil	1.3	3.4	169
15	Hungary	2.8	3.1	8

Source: 'State of the vitiviniculture world market' of International Organization of Vine and Wine (OIV), April 2018.

[1] The top 5 wine producers' rankings composed of Italy, France, Spain, United States and Australia. Significant falls in the wine production of top 4 countries are registered over 2016-2017 . Regarding the wine consumptions, the top 5 countries are United States, France, Italy, Germany and China.

Table 2: World wine consumption

Rank	Country	Year (mhl)		Variation 2017/2016 (%)
		2016	2017	
1	United States	31.7	32.6	2.9
2	France	27.1	27.0	-0.4
3	Italy	22.4	22.6	0.9
4	Germany	20.1	20.2	0.3
5	China	17.3	17.9	3.5
6	United Kingdom	12.9	12.7	-1.4
7	Spain	9.9	10.3	3.1
8	Argentina	9.4	8.9	-5.2
9	Russia	9.1	8.9	-2.5
10	Australia	5.5	5.8	4.9
11	Canada	5.0	4.9	-1.7
12	Portugal	4.6	4.5	-2.0
13	South Africa	4.4	4.5	2.4
14	Romania	3.8	4.1	8.5
15	Japan	3.5	3.5	0.0

Source: 'State of the vitiviniculture world market' of International Organization of Vine and Wine (OIV), April 2018.

Second, as argued by Siddle (2018), the quality of the Romanian wine can be comparable to the one of the historical esteemed wine producers, although this might not be understood this way by the international world trade.

Third, Romanian wine can be highly competitive (the costs related to the production might be lower than in other parts of Europe). Moreover, Romania has become part of the European Union in 2007 and has since benefited of funds that could help replace vines and increase the quality of vineyards (Siddle, 2018).

Fourthly, despite relatively good positions in the world wine production and consumption rankings, Romania suffers in terms of international openness. According to World Factbook online 2018 ranking, Romania is the 37th world wine exporter and the 43th world wine importer, as underlined in Tables 3 and 4[2]. Hence, there is a gap between production and exports rankings: this could hide an unexploited potential. According to Siddle (2018) and Halewood Wines (2018) "Romanian wine is a hidden gem waiting to be discovered by many export markets". For example, Majestic (a UK specialist drinks retailer) year-to-year figures for wines coming from Romania, Bulgaria, Hungary and Slovenia were up 400% on 2016 (Siddle, 2018). Hence, foreign consumers might get more confidence in wines coming from the East European side and this might trigger a change in the wine buying behaviour.

[2] The first world exporters are France, Italy, Spain, Australia and Chile, while the top 5 importers are United States, United Kingdom, Germany, China and Canada.

Table 3: World wine exporting countries

Rank	Country	2017 (billions US dollars)	World total (%)
1	France	10.3	29.1
2	Italy	6.8	19.1
3	Spain	3.3	9.2
4	Australia	2.1	5.8
5	Chile	2	5.7
...	.....	...	...
37	Romania	0.028	0.1

Source: World Factbook, Field Listing: Exports-Commodities, Central Intelligence Agency, 2018.

Table 4: World wine importing countries

Rank	Country	2017 (billions US dollars)	World total (%)
1	United States	6.2	17.2
2	United Kingdom	4.1	11.5
3	Germany	2.9	8
4	China	2.8	7.8
5	Canada	1.9	5.3
...	.....	...	...
43	Romania	0.631	0.2

Source: World Factbook, Field Listing: Imports-Commodities, Central Intelligence Agency, 2018.

On this ground, our paper analyzes the impact of exports on financial performances of Romanian wine producers. To do so, we use a panel data approach and a sample that includes 207 active companies from the wine production industry, over the period 2009-2017. The main results show that exports stimulates the firms' financial performances and that trade is impacted by several regional[3] variables (e.g. wine production per ha, the vine cultivated area, the agglomeration effects and the external temperature. Exports seem to be higher in the regions specialized in the red wine industry.

The contribution of paper to the literature is threefold. First, to the best of our knowledge, the paper is one of the first studies that analyzes the impact of exports on financial performances in the Romanian wine industry by using a large micro-economic data set, with 207 active wine producers[4]. Second, the paper investigates the link between Romanian exports and companies'

[3] Officially, Romania is administratively divided in 41 departments (*judete*) or regions, including the capital Bucharest. These regions are considered at the NUTS 2 level. **NUTS** is the nomenclature of territorial units for statistics set at the European level. It is a geographical system, according to which the territory of the **European Union** is divided into hierarchical levels (European Commission, 2014). The four hierarchical levels are known as NUTS 0, NUTS 1, NUTS 2 and NUTS 3. Throughout this study, all the regional variables will be considered at the NUTS 2 level: this is the most detailed regional level at which data is available in the case of the Romania.

[4] The financial data provided by Bureau van Dijk is directly collected from the companies' financial reports.

profitability and identifies the determinants of exports (i.e. companies' characteristics, the economic context and the climate conditions). Third, the study uses an unique data set composed of various types of data: micro-economic data, big-data and mezzo-economic data and computes original measures that allow us to capture the wine exports at firm level.

The rest of paper is organized as follows. Section 2 presents the literature, Section 3 describes the methodology and data, while Section 4 analyses the empirical results. Section 5 sums up the robustness checks. Finally, Section 6 concludes.

2. Literature review

Bernard and Jensen (1995) develops a pioneer work in the literature that connects exports and economic performance at the micro-level. They use an extended longitudinal data provided by Census Bureau's Annual Survey of Manufactures (ASM) for US companies. Comparing the exporters and non-exporters, they find that the exporters generally perform better than non-exporters but only on short-term: this is due to key factors as firm size, productivity and capitalization power.

A series of studies have been developed following this paper. They consider either the productivity or the profitability to capture the firms' performance in relation to exports. However, only few analyses are devoted to the financial dimension: the literature that investigates the impact of exports on financial performances seems to be scarce. Within this framework, two strands can be identified: a first one that shows a positive impact of exports on profitability, while a second one finds mixed results (either a negative or a non-linear effect, or no connection between exports and financial performances).

One of the first papers underlying a positive influence of exports on financial performances is the one of Fryges and Wagner (2010). Their analysis is focused on Germany's manufacturing sector, over the period 1999-2004. The authors highlight that the exports generate higher profits because the enhanced productivity is not absorbed by sunk costs. Several other papers find the same positive impact of exports on profitability (i.e. Liargovas and Skandalis (2012) or Esmeray and Esmeray (2016)).

A negative connection between exports and profitability is put forward by Esen et al. (2016). They use data from Istanbul Stock Exchange, over the period 2009-2014 by considering 107 manufacturing companies, and explain that the fall of profitability is the result of additional production and marketing costs generated by the export activity. Vogel and Wagner (2010) find a non-linear link between exports and financial performances in the case of business services firms in Germany. They show the existence of a negative and significant profitability differential of exporters compared to non-exporters. Furthermore, they use a continuous treatment approach to analyze the impact of exports on profits. The interaction between exports and profitability takes the form of a S-shaped curve. This is explained as follows: in a first step, firms having a low share of exports over total sales have a smaller rate of profit compared to non-exporting firms; in a second step, with an increase in export intensity, the rate of profit raises as well. Nevertheless, the authors conclude that even in extreme cases, the average profits of the exporters are not really higher than the average rate of profit of the non-exporting companies. The same author studies the relation between exports and profitability in the case of German manufacturing firms (Wager 2012). He shows empirically that any additional productivity unit generated by exports is 'consumed' by the extra selling costs related to foreign market. Hence, Wagner (2012) claims that there is no significant relation between exports and profitability in the manufacturing sector. Similar results are found by Grazzi (2012).

The link between firm's profitability and exports can be analysed also through different channels. Mutascu and Murgea (2018) claim that the firms' "exports - financial performances" nexus is generally explained by three main theoretical transmission channels: cost channel, risk channel and knowledge channel. The cost channel is strongly connected to the market policy. The extension of foreign market shares or the penetration on new markets generate economies of scale. By exporting more, companies improve their productivity, reduce the costs and increase the returns. These good financial performances will be an incentive for further exports. The risk channel is related to company's risk exposure as a result of international trade openness. In this case, a higher openness will spread the business risks on existed markets, avoiding the failure. In the same time, the openness can also expose the company to market disturbances, which negatively affect the financial performances by increasing the protection cost. The knowledge channel captures the international free flows of ideas and of knowledge in general. The additional knowledge and experience gained from export activities stimulate the know-how and the innovation, improving the financial performances by compressing the costs.

In the wine area, few papers are strictly devoted to this topic, many of them focusing on the case of France. For example, by analysing the French wine industry, Viviani (2009) finds that the exports positively influence the financial performances but through the intangible expenses directly connected with companies' profit and risk. Similar results are put forward by Amadieu et al. (2013), for the same country. They show that exports improve the financial performances but the intensity of the effect depends on whether the wine producer is a corporation or a cooperative.

The Romanian wine industry has not been much analysed. Only few papers are available in the literature: they assess the wine competitiveness or the trade performances of the sector. A brief presentation of the existing studies is proposed below.

In order to analyze the drivers and barriers to wine export innovation, Nakata and Antalis (2013a) conduct a survey of seven experts and structural managers in the Romanian wine industry. The main outcomes show that the internal factors driving exports are the international market focus and the passion for excellence, while the external ones are related to sales declines and to the new foreign producers entries into the industry. The wine exports external barriers are related to the negative image of the country and to an underdeveloped internal wine market.

In another study, Nakata and Antalis (2013b) investigate the effects of Bourdieu's (1977) theory of cultural capital and Berry's (2003) theory of acculturation on wine industry in order to understand the nature of different types of wine produced in Romania. According to Nakata and Antalis (2013b, p.1), Romania produces "a range of distinct wine styles for domestic and international markets, from wines made with native varietals or noble varietals to blended wines and wines made with low-grade grapes." The cultural tensions 'Romania - Western Europe' pushes the Romanian winemakers to produce those varieties of wines by adopting the noble grape.

Ladaru et al. (2014) analyze statistically the evolution of the wine sector till 2013, trying to identify the channels through which an improvement of competitiveness in the Romanian wine sector can be reached. Different, very broad measures that can be applied to increase the national and global attractiveness of Romanian wines are identified.

Beciu et al. (2017) underline, in a survey, that low export prices characterize the Romanian wine on international markets. These authors claim that it is crucial to gain access to extra-European markets, where prices can be higher and allow for better marginal profits.

Tamas (2017) uses a gravity model and a generalized least squares approach in order to explore the structure of the Romanian wine imports and exports. The main results reveal that Romanian wine trade flows are negatively impacted by price and distance, while the GDP per

capita has a positive impact on wine trade flows. Moreover, the GDP and exchange rate are not statistically significant.

Within this framework, overall, two gaps can be identified in the literature related to the Romanian wine analysis. The first gap is the lack of in-depth economic and econometric studies in relation to the Romanian wine production sector (i.e. studies that consider the determinants of exports in connection with financial performances, using not only economic factors, but also environmental ones). The second gap is related to the lack of econometric analyses focussing on the Romanian wine industry at the firm level and using financial data. Our paper aims to fill in these gaps by investigating how the exports interact with the financial performances of the Romanian companies of the wine industry, using an original database and different econometric tools.

3. Data and methodology

Methodology

The influence of wine exports on financial performances in the case of Romanian wine industry is analysed based on a panel model approach. Several regressions are run over the period 2009-2017, using an original data set, mixing firm-level data for 207 active winemakers, big data and mezzo-economic data.

The empirical strategy supposes two steps: *(a)* the first one explores the main determinants of wine exports, while the second one *(b)* focuses on the impact of wine exports on financial performances for the considered companies. Several robustness checks are performed in both cases.

According to the literature, we expect a positive impact of wine exports on financial performances in the wine Romanian industry. In the same time, we cannot neglect the assumptions of a negative relation or no link at all between exports and financial performances.

(a) The 'determinants of exports' analysis uses classical panel Ordinary Least Squares (OLS) regressions by considering exogenous determinants, such as: wine productivity, vine-cultivated area, an agglomeration index, export price, and climate conditions (i.e. temperature and precipitations).

The basic panel OLS model is as follows:

$$Exports_{it} = \alpha + \sum \beta_k X_{k,it} + \varepsilon_{it} \quad (1)$$

where $Exports_{it}$ translates the wine exports of the company i at moment t. α *is the intercept*, while $\beta_{1,k}$ are the slopes of independent variables X_k (i.e. wine productivity, vine cultivated surface, agglomeration effect and climate conditions), with $k = 1 .. n$. The error term is ε_{it} varying over both companies and time.

(b) The 'exports and financial performances' analysis follows a dynamic approach by using the Generalized Method of Moments (GMM) - system estimators. The GMM approach tackles the endogeneity issue generated by the reverse causality between exports and financial performances, but also caused by omitted variables or measurement errors. Additionally, such estimators allow controlling for heteroscedasticity. Roodman (2009, p.86) underlines several advantages of the GMM estimations. They can be used in the case of "1) "small T, large N" panels, meaning few time periods and many individuals; 2) a linear functional relationship; 3) one left-hand-side

(LHS) variable that is dynamic, depending on its own past realizations; 4) independent variables that are not strictly exogenous, meaning that they are correlated with past and possibly current realizations of the error; 5) fixed individual effects; 6) heteroskedasticity and autocorrelation within individuals but not across them".

In our modelling framework, we use the Arellano-Bond (1991) dynamic GMM estimator (GMM-dynamic). Hence, our model can be written as follows:

$$\Delta FinPerf_{it} = \varphi \Delta FinPerf_{it} + \beta_1 \Delta Exports_{it} + \psi \Delta X'_{it} + \Delta \nu_i + \Delta \varepsilon_{it} \quad (2)$$

where φ denotes the coefficient of the lagged dependent variable *FinPerf* that captures the financial performances of company i at time t, *Exports* represents the variable of interest (i.e. firms' exports), while ψ is the coefficient of the vector of control variables *X'*. The standard random variable with zero mean is captured by ν_i. The error term is ε_{it} which varies over both country and time.

To take account of the fact that in these modelling strategies the lagged levels of regressors might be poor instruments for the first-differenced ones we also employ the Blundell and Bond (1998) approach. The latter offers an improved version of the GMM-dynamic estimator, the so-called GMM-system estimator which considers also the level of variables, as showed in equation (1). A system with two equations represents the core of GMM-system estimator: one differenced and another one in level. Hansen's J-test is used to check the validity of instruments, its alternative - Sargan test - being inconsistent under robust GMM estimations. As Mileva (2007) suggests, the Arellano-Bond test for autocorrelation allows detecting the autocorrelation in residuals by following the AR(2) test in first difference.

Data

One of the main challenges in the analysis of the Romanian wine exports is the lack of data. Our study overcomes this problem by mixing firm-level data, big data and mezzo-economic data. Our empirical approach is constructed on an extended unbalanced panel, covering the period 2009-2017. The panel includes 207 firms representing the Romanian active companies from the wine industry.

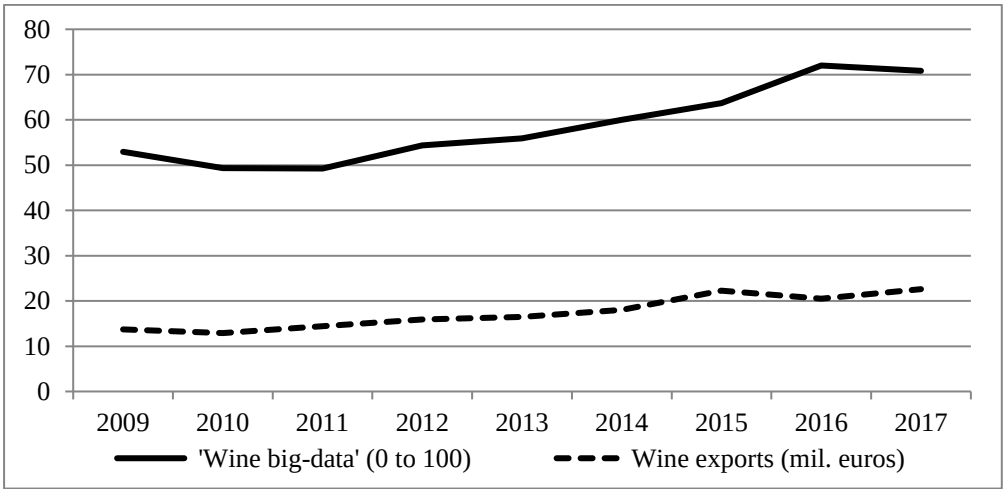
The main panel is divided into two sub-panels: the first one is used for the *'determinants of exports'* study, while the second one serves in the *'exports and financial performances'* analysis.

(a) In the analysis of the 'determinants of exports' we include the following variables: wine exports at firm level, wine average productivity at regional level, vine cultivated areas at regional level, agglomeration index, national export price, temperature, and precipitations. As each region produces different varieties of wine given its geo-climatic regional characteristics, three dummies variables are also considered to discriminate between red, white, and mixed wine varieties produced at regional level.

The dependent variable is the **wine exports** being expressed in Euros. Due to lack of data at firm level, this variable is a constructed one: it is obtained by multiplying a company's operational revenues (Euros) and 'wine big-data' regional variable (transformed in percentage). 'Wine big-data' variable is obtained based on Google Trends Index of Google search engine and measures the intensity of internet search for the English word 'wine', in Romania, at regional level. Herein, we follow the approach of Askitas and Zimmermann (2015) in which different variables in social sciences can be approximated by using internet resources. We assume that the

wine exports are positively and strongly correlated with the intensity of Google search for the 'wine' word (i.e. the higher the intensity of Google search for the 'wine' word, the higher the wine exports in the area should be). Google Trends Index search results generate values between 0 and 100, where 0 (or 0%) is the minimum level, while 100 (or 100%) is the maximum one. Hence, the exports of wine are higher if the indicator is close to 100. In order to underline the correlation of our index of exports with the national wine exports data we plot the two in the Figure 1: this illustrates the annual trend of both 'wine big-data' and wine exports variables available at the national level.

Figure 1: 'Wine big-data' and wine exports in Romania over 2009-2017



Source of data: (a) 'Wine big-data' - Google Trend Index, (b) Wine exports - Romanian National Institute of Statistics, 2018.

Figure 1 shows that both the 'wine big-data' index and the country wine exports have the same trend with one exception: over the recent period (2015-2017), they seem somewhat disconnected. We also computed the correlation coefficient between the two variables: it is equal to 0.918, which strengthens the idea that the 'wine big-data' index can be a proxy for wine exports.

Constructing this proxy has several advantages: it is a rather simple process, has low costs and allows collecting data under various forms in terms of period, frequency, countries, companies etc[5].

The first three independent variables are **average productivity in the wine industry at the regional level,** the **vine cultivated area in each region,** as well as an agglomeration index. The former are specific determinants for wine exports, according to the Romanian Wine Exporters and Producers Association - WEPA (2016). The latter is a constructed index for each NUTS 2 region, taking into account the number of firms. The average wine productivity at regional level is expressed in litters per hectare, while the regional vine cultivated area is measured in hectares. We compute the agglomeration index as the number of active winemakers per NUTS 2 region.

[5] Vögele (2017, p.17-18) highlights however several limits, emphasizing that "the index is self-referential and relative to itself,… the number of topics available is limited,… different countries may vary in their degrees of Internet penetration and Google's market share,… the data collection process of Google Trends gives rise to the risk of selection bias,… the data cannot be validated as direct surveys".

This index is meant to capture the concentration of wine companies in a specific region. All these three variables available at the regional level are linked to the firm-level data as for each company, we have information on its geographical position: hence, for each of the firms in our sample, we can identify the region it is located in. We expect the regional average wine productivity to be positively linked with wine exports. The expected impact of regional vine cultivated areas on wine exports is mixed. Brunow et al. (2018) show that agglomeration triggers economies of scale that stimulate the exports through an increased productivity. Hence, we expect a positive sign of the agglomeration index in relation to exports.

The **export price** variable captures the economic conditions at the national level. Export price reveals the average national price per exported litter in Euros. A negative correlation between export price and exports could be expected, as Tamas (2017) notes, referring to the Romanian case.

Finally, two climate variables are also considered as export determinants: **temperature** and **precipitations**. Temperature is expressed in Celsius degree, while precipitation in mm per year. Both variables are registered at regional level being extended at company level based on geographical coordinates of the latter. According to Chill et al. (2007), climate conditions influence not only the volume of wine production but also the quality of wine. In this context, specific climate conditions can stimulate exports as they impact the volume and the quality of the wine production. However, overall, the sign of these environment variables is controversial because of the grape specific characteristics.

Three **wine variety dummy** are constructed as well: a red wine dummy, a white wine dummy, and a mixed wine dummy, respectively. Each dummy is introduced separately in the considered models and takes the value 1 if a region is predominantly producing red/white/mixed wine, and 0 otherwise. For each of the 41 NUTS 2 regions, we compute the specialization index in term of dominant grape varieties: this is shown in Table A1, in the Appendix.

The operational revenues used to estimate the exports are taken from the Orbis platform database of Bureau van Dijk (2018), while the variables available at the regional level (average productivity of the wine industry, vine cultivated surface, temperature and precipitations) are available on the website of the Romanian National Institute of Statistics (2018). The agglomeration index is computed based on the information provided level by Orbis platform database of Bureau van Dijk (2018): it is a count variable that is constructed as the number of firms active in each regions[6]. The export price is available at national level and it is provided by the Romanian National Institute of Statistics.

(b) In the study of 'exports financial performances nexus' we employ the following variables: return on assets (ROA), wine exports, collection period, credit period, interest ratio, number of employees, and total assets.

The dependent variable is **ROA**, reflecting the company's profitability as net income over total assets as a percentage. Lu and Beamish (2004) show that the rate is the best way to measure the company's financial performances. The variable of interest is the **wine exports** as it is constructed in the previous sub-panel. According to the literature review section, we can expect a positive link between exports and ROA.

A set of control variables is also used. The **collection period** and the **credit period** capture the quality of payment management regarding the commercial relations with customers and providers, respectively. The collection period shows the number of payment days in the

[6] We are able to identify, based on the Orbis information, the geographic coordinates of each firm. Hence, we are able to know the NUTS 2 region each firm is located in.

commercial relationships with the customers, while the credit period reflects the number of payment days in the commercial relationships with the providers. Tang (2014) claims that one can expect a positive or a negative relation between the collection period and the financial performances of a firm. A higher collection period compresses the operational costs, increases the sales and secures the customer loyalty but, in the same time, can seriously affect the balance of payment. The credit period is positively connected with financial performances because of lower operational costs. Both variables are expressed in number of payment days.

An **interacted collection - credit period** variable is constructed as the ratio between the collection period and the credit period. This is done in order to check for the quality of the management payment period. Given the above assumptions for collection and credit periods, we expect a mixed impact on the financial performance, for this interacted variable.

The debt status of a company is measured by the **interest paid** in Euros. Its impact on financial performances is controversial. Modigliani and Miller (1958) show a positive influence of debt on profitability, while Smith and Warner (1979) put forward a negative one.

Two other variables are alternatively used to test the impact of company size on financial performances: the **number of employees** and the **total assets**. The number of employees simply captures the number of persons employed in each firm, while the total assets is expressed in Euros. On the one side, we can expect a positive correlation between the firm size and the profitability as a result of economies of scale. On the other side, Mehran (1995) suggests a negative link can be also identified as small companies can be more flexible and find, in an easier way, good business opportunities.

Finally, a **time dummy** variable is used to control for the period 2015-2017, where some disconnections between 'wine big-data' index and real country wine exports are observed (see Figure 1). The period dummy takes the value 1 for the period 2009-2015, and 0 otherwise.

All firm-level variables are taken from Orbis platform database of Bureau van Dijk (2018), with the exception of wine exports. In order to use the same scale of measurement, all variables used in the paper are normalized between 0 and 1 (0 - low intensity, 1 - high intensity).

Detailed information about the raw variables, for both scenarios, are presented in Tables A2-3, in Appendix. The stationarity property of the normalized variables is tested via Maddala and Wu (1999) test only for the second scenario, as in the first one the variables generally are scalars. We follow exclusively the first generation of panel unit-root test by assuming cross-sectional independence, the sub-panel being unbalanced (i.e. the second generation of panel unit-root tests assumes cross-sectional dependence and requires balanced panel). Table A4, in Appendix, shows the main results of unit root test, with constant and, with constant and trend, respectively. Finally, a VIF test (Variance Inflation Factors test) for normalized variables is performed for each scenario in order to detect any multicollinearity issue, as illustrated in Tables A5-6 in Appendix.

4. Results and interpretation

The results are presented separately by following our two-model scenarios: one scenario related to the 'determinants of exports' and another one referring to the 'exports and financial performances' at firm level.

(1) The results of the **'determinants of exports' analysis** are presented in Table A7, in Appendix. They are obtained using OLS panel models (1)-(4).

The VIF test of multicollinearity is illustrated in Tables A5, in Appendix. As the average value does not exceed the Ringle et al.'s (2015) recommend level of 5 or the rule of 10 suggested

by Hair et al. (1995), no evidence of multicoliniarity bias is found in the constructed panel models.

Model (1) in Table A7 shows clearly that the average regional productivity and the vine cultivated area are key determinants of wine exports in Romania, both of them being statistically significant. The productivity is positively correlated with exports, while the cultivated surface has the opposite impact. Unlike productivity, the vine-cultivated surface does not confirm our expectations showing that extended surfaces compress exports.

Further, by introducing in Model (2) variables capturing specific economic conditions (i.e. agglomeration index and export price), the productivity and surface determinants remain robust. Herein, the agglomeration index is significant and positively linked with exports. However the export price is not significant. The results show that the wine producers export more as the concentration of wine companies in an area increases, reinforcing the results of Brunow et al. (2018).

Model (3) replaces the economic conditions with the climate ones by considering temperature and precipitations. Only the temperature is significant showing a positive impact on exports. In other words, the level of exports increases, under a specific higher temperature. Precipitations do significantly affect exports. This estimation partially confirms the findings of Chill et al. (2007).

Finally, Model (4) includes all the determinants mentioned above. They are all significant, with the exception of export price and precipitations. In other words, the exports are stimulated by a higher productivity in the wine industry, smaller cultivated surfaces, agglomeration economies, higher temperature (i.e. considered as a key element for the wine quality).

We take a step further in the analysis and investigate the impact of specific wine varieties on exports. Table A8, in Appendix, presents the full Model (4) extended with the wine variety dummies. The estimations are run using OLS in a panel framework, as shown in the models (5)-(7). The results underline that only the regional specialization in the red wine variety is positively correlated with wine exports, while the white and mixed ones are negatively linked to exports. This suggests that in the Romanian wine industry if a region is specialized in red wine, its wine producers could export more.

(2) The estimations of **'exports and financial performances' analysis** are illustrated in Table A9, in Appendix, as panel GMM-system models (8)-(11).

The results of Maddala and Wu's (1999) test for panel unit root, presented in Table A4, in Appendix, show that all normalized variables used in this step are stationary in level. Table A6, also available in Appendix, does not reveal any multicoliniarity issue in the estimated models, as the average value of VIF test is lower than the critical level of 5 or of 10.

Model (8) shows that exports are strongly significant, having a positive impact on ROA. Both credit and collection period variables are significant but negatively correlated with ROA, while the paid interest is not significant. Controlling for company size via the number of employees, we find that there is a significant and negative correlation between the number of workers and ROA. Model (9) also controls for the company size but through the total assets. This variable is however not significant. Herein, the exports and the collection period maintain their significance and signs as in the previous model, while the credit period and the paid interest become not significant.

Models (10) and (11) use alternatively the number of employees and the total assets, removing the effect of the paid interest. The exports, the collection period and the number of employees are significant having the sign put forward in the previous estimations, while the credit period and total assets are not significant.

Overall, the results show that the wine exports variable has a positive impact on ROA being robust in all the constructed scenarios. This fully confirms the findings of Fryges and Wagner (2010), Liargovas and Skandalis (2012) or Esmeray and Esmeray (2016). It is also noteworthy that the collection period and the number of employees are also robust, both having a negative impact on ROA. These outputs are in line with the result of Tang (2014) in terms of collection period, and the finding of Mehran (1995) regarding the company size. The paid interest, the credit period and the total assets are not significant in the analyzed scenarios. Moreover, it seems that firms exports are enhanced in the regions specialized in red wine.

5. Robustness check

Robustness checks are run at two levels: first, we introduce more variables in the model that explains the relation between financial performances and exports: hence, a time period variable is employed to account for changes over the considered period and an interaction between the collection and the credit variables is constructed and used in the analysis; second, two alternative variables are used to capture the wine exports.

A first robustness check is run with respect to the model that links the financial performances and the firm-level wine exports (obtained using a Big Data approach). We aim at taking account of the impact that the time dimension of our study can have on the results (in this respect a time period dummy is used) and of possible interactions between key variables presentd in the initial equation 2. The results are presented in Table A10. Hence, Model (12) introduces a new variable capturing the interaction between the collection period and the credit variable in order to check for the quality of the payment management period, using the number of employees as a control for the company size. The variables exports and number of employees are significant maintaining their previous signs, while the interacted variable is not significant. Finally, Model (13) analyzes the same relation while controlling for the period where there is a lower correlation between the 'wine big-data' index and the real country wine exports ("a disconnected period). Herein, the dummy period is not significant denoting that the 'disconnection' observed does not generate bias in estimations. Moreover, the wine exports, the collection period and the number of employees remain significant, keeping the signs they had in the previous estimations.

In a second robustness check, we aim at measuring the 'wine exports' index using another variable: the estimated wine exports. To do so, we use a two-step approach. First, we run the full Model (4) in step (a) *'determinants of exports'*. Thus, we can obtain the estimated wine exports, by taking account of both significant and non-significant variables in the regression. We call this variable - **wine export (all)**. Then we employ the same approach but when computing the estimated exports we take account only of the significant regressors. We call this variable the **wine exports (selected)**. We follow this approach in order to avoid any potential bias generated by the 'omitted variable' issue. In a second step, we run the equation (2) that links financial performances and exports, alternatively, with the two estimated wine exports variables. The results are presented in the Table 11 in Appendix.

These models are run by introducing or dropping a time dummy, hence by taking account of a key element of the first robustness check approach. As the results do not change in the presence (or in the absence) of the time dummy, we present the outcomes obtained in the presence of this variable. They clearly show that both estimated wine exports alternatives impact significantly the ROA, while the collection period and the number of employees are also significant and have the expected signs. The time dummy is not significant.

6. Conclusion

In the wine industry, exports play a crucial role in explaining the financial performances of firms as the competition on the foreign markets has sharply increased. Despite its position as a top world wine producer and consumer, Romania is not a key wine exporter. Within this framework, it is interesting to investigate if Romanian wine firms could perform better in terms of financial performances if they are exporters. Hence we analyze the possible effects of exports on the financial performances of winemakers in order to see if further openness could increase the financial performance.

The key results of this study show that, by exporting more, the companies can improve their financial performances while controlling for the collection payment period and the firm size. In other words, the profitability rises if exports expand and decreases if the collection payment period increases and/or if additional workers are hired. Our results suggest that higher exports generate more revenues being able to absorb the associated costs and that a reduction of the collection period, without diminishing the sales can lead to additional cash flows that can further support those operations. Any additional employee seems to reduce the profitability. Herein, the related costs must be compensated by higher productivity generated by exports: this way an economies of scale effect can be reached. The Romanian wine producers' financial performances do not seem influenced by the management of credit payment period or by the concomitant adjustment of both ‘collection - credit’ payment periods.

The wine exports seem to be strongly enhanced by a higher regional productivity, in agglomerated wine companies’ regions, specialized in red wine, if this occurs under specific, rather high, temperatures.

Several policy implications can be derived from our results. Hence, in order to improve their financial performances, Romanian wine producers can implement strategies meant to stimulate exports, especially in the red wine industry, and can better coordinate the management of collection payment periods, while controlling for the number of employees. Additionally, the management of production, the vine cultivated surfaces, the agglomeration effect and the temperature conditions can also play a key role in the export strategy.

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Appendix

Table A1: Wine varieties at NUTS 2 regional level (only in the case of regions with wine production)

Variety	NUTS 2 Regions
Red wine	Arad, Arges, Bucuresti, Buzau, Dolj, Ialomita, Ilfov, Mehedinti, Olt, Prahova, Timis, Valcea.
White wine	Alba, Bistrita-Nasaud, Brasov, Cluj, Iasi, Maramures, Mures, Salaj, Satu Mare, Sibiu.
Mixed wine	Bacau, Braila, Constanta, Galati, Neamt, Tulcea, Vaslui, Vrancea.

Table A2: Description of variables - 'determinants of exports' analysis

Variable	Description	Source of data	Unit	Expected sign
Wine exports	The indicator reveals the value of total exports in absolute value at firm level.	Romanian National Institute of Statistics	Euros	
Wine productivity	The indicator shows the volume of total production of wine per hectare at regional level.	Romanian National Institute of Statistics	Litters/ ha	+
Vine cultivated surface	The indicator denotes the vine cultivated surface at regional level.	Romanian National Institute of Statistics	ha	+
Agglomeration index	The index shows the number of vineyard producers at regional level.	Constructed based on Orbis platform database of Bureau van Dijk	Days	+
Export price	The indicator reveals the export price as average at regional level.	Romanian National Institute of Statistics	Euros	+
Temperature	The indicator shows the average air temperature at regional level.	Romanian National Institute of Statistics	Celsius degree	+/-
Precipitations	The indicator denotes the average precipitations at regional level.	Romanian National Institute of Statistics	mm/ year	+/-
Red wine dummy	The variable takes the value 1 if the region mainly produces red wine, and 0 otherwise.	Constructed	1 or 0	+/-
White wine dummy	The variable takes the value 1 if the region mainly produces white wine, and 0 otherwise.	Constructed	1 or 0	+/-
Mixed wine dummy	The variable takes the value 1 if the region mainly produces red and white wine, and 0 otherwise.	Constructed	1 or 0	+/-

Table A3: Description of variables - ‘exports and financial performances’ analysis

Variable	Description	Source of data	Unit	Expected sign
ROA	The rate is calculated by dividing the net income by total assets at firm level.	Orbis platform database of Bureau van Dijk	%	
Wine exports	The indicator translates the volume of total exports in absolute value at firm level.	Constructed based on Orbis platform database of Bureau van Dijk and using a Big Data approach	Euros	+
Collection period	The indicator denotes the number of payment days in the commercial relationships with the customers for each firm.	Orbis platform database of Bureau van Dijk	Days	+/-
Credit period	The indicator shows the number of payment days in the commercial relationships with the providers for each firm.	Orbis platform database of Bureau van Dijk	Days	+
Paid interest	The indicator captures the total interest paid in absolute value by each firm.	Orbis platform database of Bureau van Dijk	Euros	+/-
Number of employees	The indicator shows the effective number of workers per firm.	Orbis platform database of Bureau van Dijk	Persons	+/-
Total assets	The indicator reveals the total assets in absolute value at firm level.	Orbis platform database of Bureau van Dijk	Euros	+/-
Period dummy	The variable takes the value 1 for the period 2009-2015, and 0 otherwise.	Constructed	1 or 0	+/-

Table A4: Panel unit root tests - ‘exports and financial performances’ analysis

Tested variable	Maddala and Wu (1999) test (level, normalized values)	
	Constant	Constant and trend
ROA	1238.1***	1072.9***
Wine exports	841.1***	674.1***
Collection period	1287.5***	970.1***
Credit period	113.9***	46.536***
Interacted collection - credit period	40.13***	2.416
Paid Interest	523.4***	591.3***
Number of employees	320.3***	606.1***
Total assets	1176.6***	1291.2***

(a) *, **and *** reveals stationarity significance at 10, 5 and 1%, respectively;
(b) The null hypothesis assumes there is a common unit root process.

Table A5: VIF test - ‘determinants of exports’ analysis

Variable	VIF	1/VIF
Vine cultivated surface	5.09	0.196382
Agglomeration index	4.12	0.242548
Wine productivity	1.94	0.515799
Precipitations	1.41	0.711535
Temperature	1.20	0.830212
Export price	1.09	0.919114
Mean VIF	2.48	

Table A6: VIF test - ‘exports and financial performances’ analysis

Variable	VIF	1/VIF
Number of employees	1.43	0.701553
Paid Interest	1.40	0.716238
Total assets	1.34	0.748421
Collection period	1.23	0.812685
Credit period	1.22	0.821480
Wine exports	1.20	0.832033
Mean VIF	1.30	

Table A7: Empirical results - ‘determinants of exports’ analysis

Dependent variable: wine exports at firm level (wine exports obtained using Big Data)					
Variable	Model				Expected sign
	(1)	(2)	(3)	(4)	
Wine productivity	0.028* (0.015)	0.036 ** (0.015)	0.044*** (0.015)	0 .048*** (0.016)	+
Vine cultivated area	-0.033*** (0.006)	-0.070*** (0.011)	-0.036*** (0.006)	-0.068*** (0.011)	+
Agglomeration Index		0.036*** (0.009)		0.033*** (0.009)	+
Export price		0.006 (0.005)		0.004 (0.005)	-
Temperature			0.038*** (0.011)	0.033*** (0.011)	+/-
Precipitations			0.010 (0.010)	0.009 (0.010)	+/-
Constant	0.015** (0.007)	0.009 (0.008)	-0.013 (0.010)	-0.014 (0.011)	
Type of panel estimation	OLS	OLS	OLS	OLS	
R-squared	0.022	0.035	0.033	0.043	
Obs.	1,177	1,177	1,177	1,177	
Groups	207	207	207	207	

Note:
(a) (…) denotes the standard error;
(b) ***, **, and * show significance at 1, 5 and 10 % level of significance, respectively.

Table A8: Empirical results - 'determinants of exports' analysis considering the wine varieties

Dependent variable: wine exports at firm level (wine exports obtained using Big Data)				
Variable	Model			Expected sign
	(5)	(6)	(7)	
Wine productivity	0 .056***	0 .046***	0 .057***	+
	(0.016)	(0.016)	(0.016)	
Vine cultivated area	-0.056***	-0.069***	-0.056***	+
	(0.011)	(0.011)	(0.012)	
Agglomeration Index	0.030***	0.031***	0.032***	+
	(0.009)	(0.009)	(0.009)	
Export price	0.006	0.004	0.005	-
	(0.006)	(0.006)	(0.006)	
Temperature	0.018	0.014	0.039***	+/-
	(0.012)	(0.015)	(0.011)	
Precipitations	0.005	0.016	-0.001	+/-
	(0.010)	(0.011)	(0.011)	
Constant	-0.023**	-0.003	-0.016	
	(0.011)	(0.012)	(0.011)	
Red wine dummy	0.019***			+/-
	(0.005)			
White wine dummy		-0.016**		+/-
		(0.008)		
Mixed wine dummy			-0.016***	+/-
			(0.006)	
Type of panel estimation	OLS	OLS	OLS	
R-squared	0.058	0.051	0.054	
Obs.	1,177	1,177	1,177	
Groups	207	207	207	

Note:
(a) (…) denotes the standard error;
(b) ***, **, and * show significance at 1, 5 and 10 % level of significance, respectively.

Table A9: Empirical results - ‘exports and financial performances’ analysis (firm-level wine exports obtained using Big Data)

Dependent variable: ROA					
Variable	Model				Expected sign
	(8)	(9)	(10)	(11)	
Wine exports	0.056*** (0.014)	0.067*** (0.026)	0.064*** (0.013)	0.071** (0.028)	+
Collection period	-0.150** (0.061)	-0.162*** (0.061)	-0.161** (0.072)	-0.179** (0.071)	+/-
Credit period	-0.043* (0.025)	-0.038 (0. 028)	-0.030 (0.019)	-0.025 (0.022)	+/-
Paid interest	0.008 (0.023)	-0.015 (0.014)			+/-
Number of employees	-1.384* (0.725)		-1.256** (0.584)		+/-
Total assets		-0.041 (0.082)		-0.037 (0.081)	+/-
Constant	0.555*** (0.024)	0.541 (0.023)	0.550*** (0.018)	0.536*** (0.019)	
Type of panel estimation	GMM-system	GMM-system	GMM-system	GMM-system	
Number of instruments	41	41	40	40	
Arellano-Bond p-vales test for AR(2)	[0.076]	[0.147]	[0.068]	[0.141]	
Hansen test [p-value]	6.32 [1.000]	9.39 [1.000]	10.63 [1.000]	8.57 [1.000]	
Obs.	1,177	1,177	1,177	1,177	
Groups	207	207	207	207	

Note:
(a) (…) denotes the standard error;
(b) ***, **, and * show significance at 1, 5 and 10 % level of significance, respectively.

Table A10: Empirical results - ‘exports and financial performances’ analysis (big data wine exports) - Robustness check

Dependent variable: ROA			
Variable	Model		Expected sign
	(12)	(13)	
Wine exports	0.063*** (0.016)	0.056*** (0.015)	+
Collection period		-0.150** (0.066)	+/-
Credit period		-0.043* (0.023)	+/-
Interacted collection – credit period	-0.0001 (0.001)		+
Paid interest	-0.015 (0.020)	0.008 (0.024)	+/-
Number of employees	-1.432* (0.777)	-1.386** (0.707)	+/-
Period dummy		-0.0002 (0.011)	+/-
Constant	0.530*** (0.019)	0.556*** (0.021)	
Type of panel estimation	GMM-system	GMM-system	
Number of instruments	40	42	
Arellano-Bond p-vales test for AR(2)	[0.135]	[0.083]	
Hansen test [p-value]	9.46 [1.000]	4.36 [1.000]	
Obs.	1,177	1,177	
Groups	207	207	

Note:
(a) (…) denotes the standard error;
(b) ***, **, and * show significance at 1, 5 and 10 % level of significance, respectively.

Table A11: Empirical results - 'exports and financial performances' analysis (estimated wine exports) - Robustness check

Dependent variable: ROA			
Variable	Model		Expected sign
	(14)	(15)	
Estimate wine exports (all)	0.901* (0.511)		+
Estimated wine exports (only significant)		0.787* (0.457)	+
Collection period	-0.144** (0.065)	-0.144** (0.065)	+/-
Credit period	-0.052 (0.032)	-0.054 (0.033)	+/-
Paid interest	0.021 (0.025)	0.019 (0.026)	+/-
Number of employees	-1.286** (0.554)	-1.353** (0.613)	+/-
Period dummy	0.001 (0.014)	0.001 (0.011)	+/-
Constant	0.542*** (0.024)	0.549*** (0.017)	
Type of panel estimation	GMM-system	GMM-system	
Number of instruments	42	42	
Arellano-Bond p-vales test for AR(2)	[0.124]	[0.111]	
Hansen test [p-value]	2.82 [1.000]	9.27 [1.000]	
Obs.	1,177	1,177	

Note:
(a) (...) denote the standard error;
(b) ***, **, and * show significance at 1, 5 and 10 % level of significance, respectively.