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SLOVAK WINE EXPORTS – DETERMINANTS AND COMPETITIVENESS

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Abstract

From 2004, the Slovak wine export is growing on average. Because of that, it is important to analyse the factors determining its successfulness in international market. The objective of this article is to identify the determinants of Slovak wine export, and to determine the trade competitiveness of Slovak wine. The results show that the growth of wine consumption per capita of the importing country has a positive effect on the Slovak wine exports. We also found that Slovak wine exporters tend to trade more with countries with different sized economies such as Germany, USA, United Kingdom, China and Japan. Surprising is that Slovak wines were considered inferior goods by foreign consumers. Moreover, RCA and RTA calculation results point to the fact that during the selected time period, Slovakia had a comparative disadvantage in wine. We did not find any evidence of impact of EU and EMU membership or FTAs signed by the Slovak Republic on the value of exported wine.

Keywords: *foreign trade, export determinants, gravity model, competitiveness, wine*

JEL classification: *Q17, F14, C23*

1 Introduction

Slovakia is a relatively small producer of wine; domestic production represents only about 0.2% of production of the European Union. The Slovak wine sector is currently characterised by reduction of domestic production, which fell from 515 500 hl in marketing year 2003/2004 to 309 700 hl in 2016/2017. This situation and relative stable domestic per capita wine consumption (approx. 13.8 l) causes

the wine imports to grow in average. The share of imported wines on Slovak total supply of wine increased from 29% (2003/2004) to around 65% (2016/2017). Another interesting characteristic of the sector is that Slovak consumers prefer table wines, but domestic production is mainly focused on high quality wines. As demand for domestic production is relatively small, part of the production is exported abroad. The value of exported wine is growing on average. The highest growth rate of wine exports was recorded in the first years after Slovakia's EU accession, and it was slowed down during the financial crisis period. The share of exported wine from the amount of domestic wine produced is very high in Slovakia. From 2015 till 2017, as much as 64% of domestic wine production in average was exported annually. (Database of Statistical office of the Slovak Republic)

During the period 2004-2014, Slovak wine was exported into 52 countries (Figure 1). A significant share of exports was carried out to European countries (e.g. Czech Republic, Germany, Hungary, Ukraine, Romania), but mainly to Czech Republic (85% of all exports). 2.1% of export volume was oriented to Asian countries (e.g. China, Japan, Vietnam), and Slovak wine was also traded to different American, African and Australian countries (e.g. US, Canada, Benin, Egypt, Australia and others).

Figure 1 **Geographic orientation of Slovak wine exports (2004-2014)**

Note: Importing countries are coloured grey.
Source: Own calculation based on INTRASTAT Slovak Republic.

The decision to sell wine to foreign markets should be made with respect to characteristics of these markets. One method of identifying the factors stimulating foreign trade is the gravity model. Most studies using gravity model deal with the simulation of total foreign trade of countries. A smaller number of studies is focused on foreign trade of specific commodities such as wine. For example,

study of Pinilla and Serrano (2012) highlights the role of trade policies in determination of Spanish table wine export possibilities; Balogh (2017) examined global wine trade flows and concluded that common cultural relations and trade agreements between trading partners lower the cost of wine export. Koutroupi, Natos, and Karelakis (2014) analysed the competitiveness of Greek wines in the European market. According to them, the key factors of business success are the level of consumption per capita in the EU countries, the existence of common borders and use of a common language among trading countries, and geographical range of mutual trading partners. One of the gravity model's basic variables, the distance between trade partners, is considered to be a trade barrier (Chang, Polachek, & Robst, 2004; Castillo, Villanueva, & Garcia-Cortijo, 2016). However, Dal Bianco, Boatto, Caracciolo, and Santeramo (2014) found out that the effect of distance is not as strong in the wine sector as in other sectors. It is because wine has a long shelf life, and therefore, it does not create additional variable costs related to product's delivery speed. Imported wines cannot be fully substituted, and consequently, the distant importers do not substitute wines imported from distant markets with wines of close business partners. Interesting results gives the study of Lombardi, Dal Bianco, Freda, Caracciolo, and Cembalo (2016). They assessed intra-EU flows of world's major wine exporters: Italy, France and Spain. According the study, the negative impact of distance was grater in case of bulk wine as in case of bottled wine.

In addition to determinants mentioned above, also agricultural policies are considered a factor influencing exports. Slovakia and other EU members are signatories of many free (FTA) and regional (RTA) trade agreements. The FTAs can be used to negotiate a reduction of tariff and non-tariff barriers (Wesselink & Boschma, 2012; Dijoux, 2017), they can be employed by countries to create competitive advantages for their export of goods. However, the recent studies do not provide unambiguous evidence on positive effects of the free trade agreements on trade stimulation; as in case of Soloaga and Wintersb (2001), who investigated the potential of FTA between EU and EFTA. Hatab, Romstad, and Huo (2010) estimated the effect of RTA on Egypt's agricultural export and found out that the RTA variable was not significant but positive. Thus, the fact that a country is a member of RTA with Egypt did not influence its export volume. Eger (2004) states that FTAs are not expected to have a short-term effect on trade volumes, but in the long run.

2 Data and Methods

2.1 Analysis of export determinants using the gravity model

The gravity model is used for modelling the allocation of traded goods transmitted from the export country (*i*) to the destination (importing) countries (*j*). The objective of this article is to identify the determinants of Slovak wine export in period of 2004-2014 using the gravity model approach, and to determine the trade competitiveness of Slovak wine. In this period, Slovak wine was globally exported into 52 countries. After elimination of outliers (countries, where export occurred only once), we got a data set consisting of observations for 42 countries. As a base for identifying of export determinants, we use model developed by Carlucci, De Blasi, Santeramo, and Seccia (2008):

$$\ln Exp_{jt} = \alpha_0 + \alpha.\ln Prod_{it} + \beta.\ln PcGDP_{jt} + \gamma.\ln Pop_{jt} + \delta.\ln Dist_j + \lambda.kGroup_k + \varepsilon_{jt} \quad (1)$$

Where: Exp_{jt} – value of Italian wine exports to country *j* in year *t* in EUR (constant prices)
α_0 – constant term
$Prod_{it}$ – production of Italian quality wine in year *t* in hl
$PcGDP_{jt}$ – GDP per capita of importing country *j* in year *t* in USD (constant prices)
Pop_{jt} – population of importing country *j* in year *t* in mil. of inhabitants
$Dist_j$ – distance between importing country *j* and the exporting country *i* (Italy) in km
$Group_k$ – dummy variable, which takes the value 1 if country *j* belongs to group κ
ε_{jt} – error term

We extend model (1) by including other variables, which are expected to influence Slovak wine exports. To identify the relationship of dependent variable and independent variables, we estimate several models, and then, we select the best fitting model according criteria described later in this paper.

The gravity equation has logarithmic form. In a particular year, dependent variable (value of Slovak wine export) can reach also zero values, but logarithm of 0 is not mathematically defined. One way to solve this problem is to add the constant 1 ($Exp_{jt}+1$) to all values of dependent variable; such model remains balanced. The second method assumes omitting all observations with zero dependent variable, $Exp_{jt} \neq 0$, (Koren & Tenreyro, 2005). Hence, an unbalanced model is created.

The first estimated model (balanced model A) is a simple extension of classic linear regression analysis to a panel data model, i.e. pooled regression model. It is an estimation method, where the heterogeneity of countries is not identified. The equation for model A is following:

$$\ln Exp_{jt} = \alpha_0 + \alpha.\ln Prod_{it} + \beta.\ln PcGDP_{jt} + \gamma.\ln Pop_{jt} + \delta.\ln Cons_{jt} + \zeta \ln Dist_j + \eta.\ln RFE_{jt} \quad (2)$$

$$+\theta.\ln SIM_{jt} + \lambda_1.EU_{jt} + \lambda_2.OECD_{jt} + \lambda_3.WTO_{jt} + \lambda_4.Curr_{jt} + \lambda_5.FTA_{jt} + \lambda_6 Hist_j + \lambda_7.Bord_j$$

$$+\lambda_8.Lang_j + \varepsilon_{jt}$$

Where: Exp_{jt} – value of Slovak (*i*) wine exports to importing country *j* in year *t* in EUR (constant prices)
α_0 – constant term
$Prod_{it}$ – production of Slovak wine in year *t* in 1000 hl
$PcGDP_{jt}$ – GDP per capita of importing country *j* in year *t* in USD (constant prices)
Pop_{jt} – population of importing country *j* in year *t* in mil. of inhabitants
$Cons_{jt}$ – consumption per capita of importing country *j* in year *t* in litres
$Dist_j$ – distance between importing country *j* and the exporting country *i* in km
RFE_{jt} – relative factor endowments between the trading countries *i* and *j*
SIM_{jt} – similarity index of the trading countries *i* and *j*
EU_{jt}, $OECD_{jt}$, WTO_{jt} – dummy variable, which takes the value 1 if a country pair *ij* belongs to these organizations
$Curr_{jt}$ – dummy variable, which takes the value 1 if a country pair *ij* has a common currency
FTA_{jt} – dummy variable, which takes the value 1 if the country pair *ij* has a signed free trade agreement
$Hist_j$ – dummy variable, which takes the value 1 if a country pair *ij* has a common territorial history
$Bord_j$ – dummy variable, which takes the value 1 if a country pair *ij* has a common state border
$Lang_j$ – dummy variable, which takes the value 1 if a country pair *ij* has a common language base
ε_{jt} – error term
α – η; λ_1 – λ_8 – sensitivity change of the dependent variable to changes in independent variables.

The second estimated model (mode B) is unbalanced pooled regression model with the same equation as for model A (2).

According to studies done on the topic of international trade, e.g. De Blasi, Seccia, Carlucci, and Santeramo (2007), to capture unobserved heterogeneity, it is suggested to consider adding fixed effects into the panel model. Here, country-specific effects or time effects can be considered. These effects could have a fixed or a random characteristic. The Hausman test was performed to define whether the supposed effects are random or fixed. A presence of fixed effects in the panel data was determined. For this reason, we estimate also models C-F with fixed effects. The balanced model C and the unbalanced model D include country-specific fixed effects. As non-time varying variables cannot be estimated in model with country-specific fixed effects, variables common language base, common territorial history, common state borders and distance between trade partners have to be excluded from models C and D.

Models E (balanced) and F (unbalanced) include both country-specific and time fixed effects. Because of the presence of time-specific fixed effects, also non-country varying variables (as is the production of country *i*) have to be excluded from the models.

All fixed-effects models are estimated by OLS, and dummy variables for all partner countries and years (LSDV) are included. The best fitted model is selected by comparing the following characteristics (König & Schulze, 2008):

- measure of adjusted R-squared coefficient, i.e. the higher is the coefficient, the more variability in dependent variable is explained through the model,
- Mean square error (MSE), where the better model is the one with lower MSE,
- Akaike information criterion (AIC), where the better is the model with the lower AIC.

Description of variables

In this chapter, we characterised variables selected to explain the development of Slovak wine exports. Independent variables were selected in accordance with the results of related studies considering the current situation in the Slovak wine market.

Due to the orientation of Slovak consumers on table wines, which are mostly imported, we assume that changes in domestic wine production affect the size of its export. Therefore, we estimate the impact of variable *production* in this paper. *GDP per capita* of importing country represents the income elasticity of foreign demand for Slovak wine. We expect that an increase in income of importing countries affects the size of Slovak wine export positively. We also expect a positive effect of increase in population and increase in wine consumption of these countries on Slovak wine exports. Regarding the variable *distance*, trade theory largely assumes that distance between business partners influences trade among countries negatively. On the other hand, the strength of this relation may

be limited due to the type of commodity traded, as reported by some studies. Other variables with an expected influence on the Slovak wine export are *common territorial history*, *common national borders* and *common language elements* of trading countries, *common currency* and *country membership in international organizations*. We want to determine whether these factors influence the Slovak wine export positively, and therefore, which countries it is advantageous for Slovak exporters to focus on. Indexes *RFE* and *SIM* represent the rate of economic similarity between the export country and import countries. RFE coefficient is a proxy for the level of country's equipment with production factors. If RFE has the value of 0, country *i* and country *j* show the same level of equipment with production factors. The higher the RFE, the greater is also the difference in country's equipment with production factors. We assume that the differences in production factors' equipment motivate countries to mutual trade. For calculating RFE, we use the equation by Baltagi, Egger, and Pfaffermayr (2003):

$$RFE_{ijt} = \left| InPcGDP_{it} - InPcGDP_{jt} \right| \quad (3)$$

SIM index determines the similarity between *i* and *j* in size of their economy measured by GDP (Kabir & Salim, 2010):

$$SIM_{ijt} = 1 - \left(\frac{lnGDP_i}{ln(GDP_i + GDP_j)} \right)^2 - \left(\frac{lnGDP_j}{ln(GDP_i + GDP_j)} \right)^2 \quad (4)$$

SIM index takes values from 0 to 0.5, where the value of 0.5 means that the size of the trading countries' economy is the same, and 0 indicates the absolute difference in the size of economy. *FTA* represents the free trade agreements between countries that signed such agreement. Considering the results of some studies, we expect a slightly positive sign of the FTA coefficient, which would mean that Slovak wine exports between the member states improved.

The source of data on population of each country and its GDP is the World bank database. Wine consumption per capita of importing countries is drawn from data portal Wineinstitute.org. Distance between Slovakia and importing countries was calculated based on the air distance within their capital cities. Data on the Slovak wine production is obtained from Eurostat, and data on value of the Slovak wine exports from INTRASTAT database of the Slovak Republic. The list of FTAs is obtained from RTA database of the World trade organization.

2.2 Analysis of Slovakia's competitiveness in wine

As mentioned in the Introduction chapter, most of Slovak wine exports (more than 95%) is carried out to European countries. Therefore, the competitiveness of Slovak wine exports will be identified relative to the corresponding export

performance of European countries. The Slovak wine competitiveness in European agri-food market in period of 2004-2014 is in this paper determined using the relative trade advantage (*RTA*) index introduced by Vollrath (1991). RTA is calculated as a difference between relative export comparative advantage (*RCA*) introduced by Balassa (1965) and relative import comparative advantage (*RMA*):

$$RTA = RCA - RMA \quad (5)$$

$$RCA = (X_{ij} / X_{it}) / (X_{nj} / X_{nt})$$

$$RMA = (M_{ij} / M_{it}) / (M_{nj} / M_{nt})$$

where:

X_{ij} – export of product *j* of country *i*
X_{it} – total export of country *i*
X_{nj} – export of product *j* of reference group of countries *n*
X_{nt} – total export of reference group of countries *n*
M_{nj} – import of product *j* of country *i*
M_{it} – total import of country *i*
M_{nj} – import of product *j* of reference group of countries *n*
M_{nt} – total import of reference group of countries *n*
t – agri-food commodities
n – EU-28 countries

RCA measures Slovak wine exports relative to its total agri-food exports and to the corresponding export performance of EU-28 countries representing the most important trade partners of Slovakia. It applies that if RCA1>1, then Slovakia has a comparative advantage in wine export on the international market. If RCA1<1 Slovakia is not competitive, it has not a comparative advantage in wine export. If RTA>0, Slovakia has a relative comparative trade advantage in wine, and if RTA<0, there is no relative comparative trade advantage.

3 Results and Discussion

As mentioned in the Methodology, we estimated 6 models, which under different conditions describe the relationship between the Slovak wine exports in the period of 2004-2014 and factors affecting its value. In Table 1 we summarise the characteristics of estimated models, and we list the order according their suitability to explain the variability of dependent variable.

Table 1 **Comparison of estimated models according to selected criteria**

model	*type**	*rank*	*AIC*	*adj. R^2*	*MSE*
A	bal (pooled)	6	291.808	25.824	17.493
B	unbal (pooled)	3	202.237	33.585	7.143
C	bal (country FE)	5	268.096	41.513	13.800
D	unbal (country FE)	2	132.113	67.060	3.543
E	bal (country, time FE)	4	267.434	41.839	13.709
F	unbal (country, time FE)	1	127.378	68.584	3.379

*bal – balanced model
unbal – unbalanced model
FE – fixed-effects model
Source: Own calculation.

We can conclude that unbalanced models are more suitable to describe variability of our dependent variable. The best model is the unbalanced model F with fixed effects, which consist of both country-specific and time-specific effects. Based on the value of adjusted determination coefficient's we can say that the model and selected determinants explain variability of dependent variable to 68.44%. The Durbin-Watson statistic tests the residuals to determine if there is any significant correlation based on the order in which they occur in the data file. Since the P-value is greater than 0.05, there is no indication of serial autocorrelation in the residuals at the 95.0% confidence level. With exception of 4 coefficients, the coefficients of country-specific fixed effects are significant at the 99.0% confidence level. The estimation results of model F (5) are shown in the table below[1]:

$$\ln Exp_{jt} = 56.1874 - 3.7408 \ln PcGDP_{jt} - 4.0381 \ln Pop_{jt} + 2.5889 \ln Cons_{jt} \quad (6)$$

$$- 0.2794 \ln RFE_{jt} - 6.0126 \ln SIM_{jt} + 1.7969\ EU + 3.2888 OECD_{jt} - 2.071 WTO_{jt}$$

$$- 0.6433 FTA_{jt}$$

Table 2 **Regression results, best fitting model F**

Parameter	Estimate	Standard Error	T Statistic	P-Value	Significant
Constant	56.1874	16.6479	3.3751	0.0009	***

[1] oefficients of the fixed effects are omitted. In the equation 7, a simplified model is presented (the most insignificant variables were eliminated from the model).

Parameter	Estimate	Standard Error	T Statistic	P-Value	Significant
GDP per capita	-3.7408	1.8232	-2.0518	0.0419	**
Consumption	2.5889	0.6692	3.8690	0.0002	***
Population	-4.0381	1.3487	-2.9942	0.0032	***
RFE	-0.2794	0.2347	-1.1905	0.2357	
SIM	-6.0126	1.8316	-3.2827	0.0013	***
EU	1.7969	1.5759	1.1402	0.2560	
OECD	3.2888	2.7608	1.1913	0.2354	
WTO	-2.0710	1.1643	-1.7787	0.0773	*
FTA	-0.6433	0.9955	-0.6462	0.5191	
R-squared = 77.3068 percent **R-squared (adjusted for d.f.) = 68.4399 percent** **Standard error of est. = 1.84233** **Mean absolute error = 1.14152** **Durbin-Watson statistic = 2.06349 (P=0.6771)** **Lag 1 residual autocorrelation = -0.0317808** **Significant: *** at 1%; ** at 5%; * at 10%**					

Source: Own calculation.

GDP per capita represents the income elasticity of foreign demand for the Slovak wine. The estimated coefficient of the variable is significant at a significance level of 95%; we can say that one percent increase in GDP per capita of importing country would cause a decline in the value of Slovak wine exports by 3.74%, ceteris paribus. Thus, foreign consumers perceive Slovak wines as inferior goods. This could be related to further result that even the increase in the population of importing countries had not have a positive impact on the Slovak wine exports value. Compared to our assumptions, this fact is surprising. An explanation could be that that in bigger countries, there is usually a wider range of wine products which people can choose from, and it is likely that foreign consumers preferred other than Slovak wines more.

Based on the estimation we can say that an increase in wine consumption per capita of importing countries increased the value of wine exports from Slovakia.

In 2004, there was a relatively large expansion of the European Union. The expectation was that this situation would affect Slovak wine exports positively. However, the results show that the EU membership of Slovak trade partners did not affect the changes in Slovak wine exports significantly. Moreover, the variable common currency in the European Monetary Union (*Curr*) was finally eliminated from the model due to the high insignificancy of its coefficient.

We can say that at the 90.0% confidence level, the fact that the trading partners (*i* and *j*) are members in the WTO, did not influence the Slovak wine exports positively. Comparable results were determined also in the study of Lissovolik and Lissovolik (2004). According to them, some of the exporting countries tend to export more to non-WTO countries than to WTO countries. However, to be able to explain these facts better, it is needed to explore the issue further and in more detail.

RFE index indicating the level of country's *i* and *j* equipment with factors of production is not significant. On the contrary, the index of similarity is highly significant; thus, the differences in size of the Slovak economy and economies of its trading partners encouraged the Slovak wine exports. Countries that in terms of economy size differ from Slovakia the most are the US, Japan, Germany, China, Malta, France and the United Kingdom. Empirical data in the observed period confirm results of the estimated model, where the value of exports to mentioned countries exceeded the value of exports to countries with similarity index close to 0.5 (except for the Czech Republic, which in this case is considered an outlier).

Given the fact that the most suitable model to describe relationship between the dependent and independent variables is the model with both country-specific and time-specific fixed effects, it was not possible to examine the effect of time and country non-varying variables: common language base, shared territorial history, common national borders and distance between trading partners and Slovakia.

Next, we determined the performance of Slovak wine export relative to other European countries. Table 3 shows the calculated values of RCA and RTA index during the selected time period 2004-2014.

Table 3 **Calculated values of RCA and RTA index for Slovak wine exports**

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	over-allav-erage
RCA	0.12	0.09	0.11	0.23	0.18	0.14	0.11	0.16	0.11	0.10	0.14	0.13
RTA	-0.21	-0.25	-0.32	-0.27	-0.33	-0.96	-0.56	-0.59	-0.36	-0.54	-0.64	-0.41

Source: Own calculation based on Eurostat data.

RCA and RTA index point out to the fact that in the examined period Slovakia had neither comparative advantage or relative comparative advantage in wine on the European market. Both indexes had negative development in average. This result is expected as it is in line with result for trade performance

4 Conclusion

The aim of this paper was to is to identify the determinants of Slovak wine export to 42 countries worldwide in period of 2004-2014 using the gravity model approach, and to determine the competitiveness of Slovak wine in the European market.

As expected, the growth of wine consumption per capita of the importing country has resulted to an increase of the Slovak wine exports. This means that for Slovak exporters it is necessary to monitor the preferences of foreign consumers and to focus on markets that have the potential to absorb the additional supply. Surprising is the result that Slovak wines are considered inferior goods by foreign consumers. It is likely that countries, where the income per capita grew faster, would gradually reduce the consumption of Slovak wines. Therefore, it is preferable to direct the wine exports to countries with stable incomes than to faster growing economies. Moreover, RCA and RTA calculation results point to the fact that during the selected time period, Slovakia had a comparative dis-advantage in wine. Because of that, Slovak wine producers should look for ways how to make the wine product more attractive in eyes of foreign consumers, or how to increase its added value. But also important it is to stimulate the interest of domestic wine consumers with choice of appropriate marketing tools: through the organization of wine roads and wine tourism globally, tastings and through trying to win awards at national and international exhibitions, what would present the product positively.

Using the best model estimated, we were unable to identify a significant impact of membership in the EU and EMU on the value of exported wine. We also found that Slovak wine exporters tend to trade more with countries with different sized economies such as Germany, USA, United Kingdom, China and Japan. We did not find any evidence of impact of free trade agreements signed by the Slovak Republic on the value of wine exported to member states. The reason may be that the period was too short for the FTAs effect to manifest itself.

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