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3. What Role Geographical Distances and Cultural P**roximity** Play in Bilateral Wine T**rade of Hungary?**

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Wine plays an important role in Hungary as well historically and culturally. Hungary export wines to different part of the world, consequently the Hungarian wine trade could be influenced by geographical and cultural factors. The effect of the cultural and geographical proximity on international trade has already proven in international trade literature. The size of bilateral trade flows between any two countries can be approximated by the so-called Gravitation Theory of trade. The gravity equation is empirical evidence for relationship between the size of economies, their distances and the amount of their trade.

The aim of my paper is to analyse the effect of cultural and geographical proximity on bilateral wine trade between Hungary and its trading partners employing gravity model for a period of 2000 and 2012. The panel data of analysis is derived from World Bank WITS, WDI and CEPII, WTO databases. The explanatory variables of the model are geographical distance, common language and ethnography, contiguity, landlocked plus bilateral WTO memberships. I apply OLS, Random Effect and Pseudo Poisson-Maximum-Likelihood estimator to calculate the gravity equation. The results show that in case of Hungary cultural similarity and trade liberalisation have positive while geographical distance, landlocking and contiguity have negative impact on wine export.

Keywords: bilateral wine trade, Hungary, cultural and geographical proximity, gravity model

1. Introduction

The wine is a special product from economic, cultural and sociological point of view in the major wine producer countries. Wine also plays an important role in Hungarian culture historically. The importance of the Hungarian wine culture show that the wine production in the Carpathian basin dates back to the Roman times.

The evidence of Hungarian winemaking history is that Tokaj-Hegyalja was the world's first classified vineyard in 1772 (Tokaji 2015). Hungary has 22 wine regions and 67 thousand hectares vineyard area. More then 12 000 companies are involved in wine industry in Hungary (Sidlovits − Kator 2007). Hungary is able to export 450-650 thousands hl wine annually to the various parts of the world.

Worldwide famous Hungarian wines like Royal Tokaji Aszú Essencia 1999, Tokaji Furmint 2011, Vylyan Pinot Noir 2006, Sauska cuvée 5 2009 etc. are ranked among the Top

100 wines by Wine Spectator[1]. The Hungarian wines are in present on international market, consequently the wine trade would be influenced by geographical and cultural factors.

The effect of the cultural and geographical similarity on international trade has already proven in international trade literature. According to Tinbergen the size of bilateral trade flows between any two countries can be approximated by the so-called "gravity equation" by analogy with the Newtonian Gravitation Theory (Tinbergen 1962). The Newton's Law of Gravitation states that: "*any two bodies in the universe attract each other with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them"* (Newton 1729). Similarly, the gravity equation of trade is evidence for relationship between the size of economies, their distances and the amount of their trade.

Some articles have already applied gravity models to analysing wine trade in European Union or other wine region of the world, in contrary gravity regression studies that investigate the Hungarian bilateral wine trade has not published yet.

The aim of my paper is to analyse the effect of cultural and geographical proximity on bilateral wine trade referring to Hungary employing gravity model for a period of 12 years (2000-2012). I investigate general hypothesis of the impact of bilateral geographical distances and cultural similarity and the effect of free trade agreements on Hungarian bilateral wine export.

2. Literature review on Gravity model of wine sector

Regarding the New Trade Theories, the gravity models are very popular in the international trade literature. However, only a few researches were published in empirical trade literature which analyse wine trade by gravity equation.

Pinilla and Serrano (2008) analysed the long-term determinants of Spanish table wine exports by gravity model and panel data estimation technique between 1871 and 1935. The results of their model showed that Spanish table wine was exported to countries with large growing markets that were close both culturally and geographically. It is strong evidence for the cultural similarity hypothesis of general gravity models. Dascal et al. (2002) employed a Gravity model approach in order to analyze the main factors affecting the trade flows of wine in EU-12 countries for the period 1989-1997. Their results revealed that wine trade was

[1] Wine Spectator is an American magazine that each year announce the Top 100 Wines

positively influenced by an increase in GDP per capita, since greater income promotes trade. De Blasi et al. (2007) examined the magnitude of the trade flows for high quality wine from Italy to its main importing countries analysed by the gravity model. Moreover the enlargement of the EU encouraged exporters of high quality Italian wine because of the absence of trade barriers. Fertő et al. (2013) investigated the impact of IT and communication costs on wine export focusing on the EU-27 for a period of 1998-2011. Their results supported the validity of standard gravity model variables like market size, trade costs, common language and colonial links. Bianco et al. (2013) analysed the Argentinean wine industry by gravity model. They concluded that wine flows can be explained by importer countries' economic and political characteristics.

These empirical evidences motivated me to establish a gravity model for Hungarian wine export since that this field were not covered yet by the empirical literature.

3. Methodology and estimation method

Applying gravity model of trade requires some basic assumptions on trade. Whatever the price, a country will consume at least some of every good from every country (Anderson 1979). All goods are traded, all countries trade and in equilibrium, national income is the sum of home and foreign demand for a unique good that each country produces (e.g. GDP). For this reason, larger countries import and export more (Bacchetta et al. 2012). The higher transport costs generally reduce trade flows. Based on these standard assumptions various types of Gravity model developed in trade literature. I employ standard Gravity model in this study. The standard formula of Gravity equation can be calculated as follows (Anderson - van Wincoop's 2003):

$$X_{ij} = G * S_i * M_j * \varphi_{ij} \qquad (1)$$

where X_{ij} is value of exports from i to j,
M_j denotes importing country's GDP,
S_i comprises exporter's GDP,
G is a variable that does not depend on i or j e.g. level of world liberalization,
φ_{ij} represents the ease of exporter i to access of market j.

The log-linear model of gravity equation can be calculated by taking simply the natural logarithms of all parameters (Bacchetta et al. 2012):

$$\ln X_{ij} = \ln G + \ln S_i + \ln M_j + \ln \varphi_{ij} \qquad (2)$$

A number of variables are generally used to capture trade costs such as bilateral distance, landlocking, common borders, language or cultural features such as post-colonial history. There is much evidence of these proxies e.g. transport costs increase with geographical distance and they are higher for landlocked countries and islands by contrast they are lower for neighbouring countries. In addition, trade costs are probably lower for countries whose have a common language or other relevant cultural characteristic because they can understand better each other's culture (Bacchetta et al. 2012). Trade agreements are generally included in the form of dummies such as WTO membership. However, the use of gravity data brings up several problems as well.

3.1 Concerns with gravity data

We have to face the following problems if we use gravity data. The observations in gravity data would be heterogeneous in a variety of ways. Consequently homoscedasticity assumption of the error term in regression is often being likely to be violated. The use of bilateral panel data has the advantage of mitigating the bias generated by heterogeneity across countries. In a panel the country-pair heterogeneity would cause concerns that can be controlled for using country-pair fixed effects including dummies (Bacchetta et al. 2012).

Moreover gravity panel data would contain zero trade values. The zero trade flows reported in the data either would be really zero or reflects systematic rounding errors associated with very small trade flows therefore dropping zero trade flows out of the sample may result in a loss of useful information (Linders − de Groot 2006). Number of estimation method are suggested to calculate gravity models such as standard Ordinary Least Squares, Random Effect or Fixed Effect, Tobit, Poisson or Heckman estimators.

Zero trade flows can be handled by estimating the model in levels by the help of Pseudo Poisson maximum likelihood (PPML) estimator. Santos and Tenreyro (2006) highlight that in the presence of heteroscedasticity the PPML is a robust estimator.

3.2 Econometric specifications

My unbalanced panel data set includes bilateral wine trade data of Hungary with 103 trading partner for 12 years (2000-2012), giving 787 observations. The dependent variables of the model come from World Bank World Integrated Trade Solution (WITS) database in HS-6

level, product code 2204[2], used in level form (World Bank 2014). The economic size is included by exporter and importer's GDP, measured in constant 2005 US dollar (WDI 2014). The proxies for geographical distances are the simple distances of most populated cities in kilometres and island-landlocked dummies. The cultural distance is included by common language and ethnography, common border by the contiguity dummies. The impact of free trade area is represented by dummy of WTO memberships. The set of bilateral covariates come from Research and Expertise Centre on the World Economy (CEPII 2014) database. Information on WTO memberships can be found on WTO official website (WTO, 2014). I employ three different models: OLS and Random Effects suggested by Baier and Bergstrand (2009) and PPML suggested by Santos and Tenreyro (2006) to estimate the gravity equation for Hungarian wine trade. The detailed information about the variables can be found in Table 1. The estimations were run without zero trade flows assuming that they are derived from missing trade data. In all models fixed effects are included by importer and year dummies.

Table 1 Description of variables

Dependent variable:	
wine export	Hungarian bilateral wine export, value in 1000 USD (HS-6 classification level, product code of wine: 2204) used in level form
Independent variables	
lnExpGDP:	GDP of Hungary as wine exporter (GDP constant 2005 in US dollar) used in logarithm form
lnImpGDP	GDP of wine importer as trading partner of Hungary (GDP constant 2005 in US dollar) used in logarithm form
lndist	simple distance of most populated cities in km (between Hungary and trading partners) used in logarithm form
Independent dummy variables	
contiguity	1 if the two trader countries are contiguous and 0 otherwise
comlang_ethno	1 if a language is spoken by at least 9% of the population in both countries and 0 otherwise
landlocked:	1 if one of the traders are landlocked and 0 otherwise
WTO:	1 if both traders are member of WTO and 0 otherwise (it refers to Hungary and trading partners)

Source: own composition based on the sample

I estimated the following models (excluding zero trade flows):

OLS and Random Effect estimators

$$wine\ export = ln\ GDPExp + ln\ GDPImp + ln\ dist + contig + comlang\_off + landlocked + WTO$$

[2] Product code 2204: wine of fresh grapes, including fortified wines, grape must.

Pseudo Poisson-Maximum-Likelihood estimator

wine export= ln GDPExp + ln GDPImp + ln dist + contig + comlang_off + landlocked +WTO

The Table 2 presents the descriptive statistics of the included variables. Scale explanatory variables used in logarithmical form. The rest of the variables are dummies.

Table 2 Descriptive statistics of variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
wine_export	794	1301.76	3107.97	1.00	20635
lnExpGDP (HUN)	1339	25.39	0.08	25.22	25.48
lnImpGDP	1288	24.97	2.04	20.10	30.29
lndist	1339	7.97	1.08	5.07	9.81
contig	1339	0.06	0.23	0	1
comlang_ethno	1339	0.02	0.14	0	1
landlocked	1339	0.13	0.33	0	1
WTO	1339	0.84	0.36	0	1

Source: own calculation based on Word Bank WITS, WIDI, CEPII and WTO database

3.3 Pattern of Hungarian bilateral wine trade

Regarding the sample and analysed period, the majority of the wine export destinations (103 importers) are not neighbouring with Hungary (94%). It may be due to the fact that bordering countries like Austria, Romania, Croatia, Serbia and Slovakia also produce and export notable amount of wine (Table 3).

Table 3 Pattern of Hungarian bilateral wine export by trading partners (2000-2012)

Pattern of the Hungarian wine trade	Number of trading partners in case of non-zero wine export	Share
Number of neighbouring countries	6	6%
Number of non-neighbouring countries	97	94%
Total number of wine importer countries	**103**	**100%**
Number of countries with common language and ethnography	2	2%
Number of countries without common language and ethnography	101	98%
Total number of wine importer countries	**103**	**100%**

Source: own construction based on the sample and World Bank WITS database

The export destination' countries mainly have not common language and ethnography with Hungary (98%). It can be explained that the Hungarian language is rare and unique in the World. Moreover it is spoken only around Hungarian borders and ancient territory of Austro-Hungary Monarchy. However a number of Hungarian colonies live and work in European countries plus all over the World that may influence Hungarian wine trade as well.

Based on the sample's data we can predict that "contiguity" variable probably will not influence positively the wine export of Hungary. It also confirmed by the top 10 highest and lowest wine export destinations of Hungary because among the top 10 highest export destinations are not neighbouring countries at all, e.g. Germany or Czech Republic (Table 4). On the other hand these trading partners are not so far geographically. The lowest wine importer' countries in value consist mainly of Asian, African and long-haul countries like Chile, Cuba, Algeria and India. It can predict that trade costs increase by geographical distance and Hungary export less wine to countries far away.

Table 4 Top 10 highest and lowest wine export destinations of Hungary (2000-2012)

Top highest wine importer	Export value in USD	Top lowest wine importer	Export value in USD
Germany	18109000	India	1000
Germany	17559000	Chile	1000
Germany	17463000	Kazakhstan	1000
Germany	16941000	Cuba	1000
Germany	16764000	Cyprus	1000
Czech Republic	16337000	Syrian Arab Republic	1000
Germany	15867000	Luxembourg	1000
Germany	15622000	Cuba	1000
United Kingdom	14323000	Algeria	1000
Czech Republic	14105000	Tunisia	1000

Source: own construction based on the sample

4. Gravity regression results

In this part I interpret the regression results of gravity model concerning the Hungarian bilateral wine export. I estimated the linear-logarithm model of bilateral wine trade excluding zero trade flow assuming that zero trade flows referring to missing trade data and they may be not really zero. Preliminary tests confirm the presence of heteroskedasticity, thus I applied robust estimations. The OLS and Random Effect model can prove significant relationship between value of wine trade and its determinants. In case of Random Effect model the sign of common language and ethnography variable contradict to the expected result, suggested by

the gravity literature in addition the robust standard errors of estimated coefficients are very high. It shows that Random Effect is not the best estimator of the model. It is true for the OLS estimation as well (Table 5).

Table 5 The Gravity regression results of Hungarian wine export

	(1) OLS	(2) RE	(3) PPML
VARIABLES	wine_export	wine_export	wine_export
lnExpGDP	omitted	-1,206	omitted
		(5,445)	
lnImpGDP	1,406***	1,406*	2.833***
	(431.2)	(723.7)	(0.336)
lndist	-449.7***	-20,107**	-1.350***
	(99.52)	(9,079)	(0.108)
contig	-8,002***	-44,597**	-12.21***
	(2,400)	(20,189)	(1.938)
comlang_ethno	6,246***	-29,286*	5.876***
	(1,000)	(15,664)	(0.519)
landlocked	-2,067***	-522.8**	-4.723***
	(684.2)	(236.1)	(0.549)
WTO	2,591***	25,756**	5.048***
	(672.4)	(11,547)	(0.567)
Constant	17,008	571,517*	50.56***
	(39,753)	(312,502)	(19.22)
Observations	787	787	787
R-squared	0.929	0.929	0.957

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
OLS - Ordinary Least Squares, RE - Random Effect,
PPML - Pseudo Poisson-Maximum-Likelihood; lnExpGDP refers to Hungary
note: lnExpGDP was omitted because of collinearity in (1) and (3) models

Source: own calculation based on Word Bank WITS, WDI, CEPII, WTO database

As concerns the result of PPML estimation all coefficients of regression are significant, the standard errors are pretty much smaller and also have the expected sign as empirical literature suggests.

The contiguity variable is significant but has negative sign in all estimation. It confirms that Hungary does not export noteworthy wine to their bordering countries for the reason that they are also wine producer and exporter countries.

The results show that in case of Hungarian wine trade, the transport costs also increase in line with the geographical distance and they are higher for landlocked trading partners (if both traders are landlocked). The importer's GDP, common language and ethnography variables affect positively the Hungarian wine export as empirical evidences preliminary predicted. Furthermore, because of historical reason Hungary exports wine rather to Germany

or UK that to direct adjacent countries. Otherwise Germany is the most important trading partner of Hungary in terms of all products.

The geographical distance influences negatively the Hungarian wine export (significant coefficients) accordant with empirical results. The elasticity of trade to distance is generally between -0.7 and -1.5 in gravity models (Bacchetta et al. 2012) that is well satisfied by the estimated distance coefficients of Hungarian wine traders (-1.35 in PPML model). In addition if Hungary and its trading partners have already been member of the World Trade Organisation, it is affecting positively the Hungarian wine trade.

In summary, cultural similarity, economic size and trade liberalisation have positive while geographical distance, contiguity and landlocked have negative impact on Hungarian wine export in bilateral relations.

5. Conclusions and limitations

Wine plays an important role in Hungary historically and culturally. Hungary export wines to international markets therefore its wine trade would be influenced by geographical and cultural factors as well. The impact of geographical and cultural similarity on trade can be analysed by Gravity model of trade. The Gravity model is evidence for relationship between the size of economies, their distances and the amount of their trade by analogy with the Newtonian Gravitation Theory.

Only a few researches were published in empirical literature which explored wine trade by gravity equation. These empirical works provide exact link between cost of wine trade and cultural similarity or geographical distance.

In this paper, I employed standard gravity model for Hungarian bilateral wine trade. The proxies for wine trade costs were the bilateral distances and cultural similarity. The impact of free trade agreements were applied by dummy variables of bilateral WTO memberships. I applied three linear-logarithm panel regression models: OLS and Random Effects suggested by Baier, S. L. and Bergstrand, J. H. (2009) and PPML suggested by Santos Silva and Tenreyro (2006) to estimate the gravity equation for Hungarian wine trade. In all models country and time fixed effect were included by importer and year dummies.

The regression results showed that in case of Hungarian wine trade, the transport costs also increased in line with the geographical distance and they were higher for landlocked trading partners. The negative impact of contiguity variable proved that Hungary did not export notable amount of wine to their directly neighbouring countries for the reason that they

are also wine producers and exporters. The costs of wine export could be lower if trading partners both are member of the WTO that confirms the incentive role of the freer trade.

We can conclude that common cultural factors, economic size between Hungary and its wine trading partners can enhance trade while geographical distance and landlocked conditions make the wine export more expensive.

It has to be mentioned that the study have several limitations and restrictions. The analysed data are measured at macro level and did not take into consideration the quality of wine. The model assumed that wine products across countries are homogenous however wine is differentiated product. I calculated the model excluding zero trade flows assuming that zero trade flows are referring to missing trade data and they are not really zero.

Further research is needed in order to take into consideration other cultural and geographical factors of Hungarian wine trade or to calculate the models for longer time period.

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