Analysis of Italian High Quality Wine Exports using the Gravity Model Approach

Giuseppe De Blasi, Antonio Seccia, Domenico Carlucci, Fabio Santeramo

University of Bary, Italy; University of Naples "Federico II", Italy

seccia@agr.uniba.it

Contributed Paper prepared for presentation at the 105th EAAE Seminar 'International Marketing and International Trade of Quality Food Products', Bologna, Italy, March 8-10, 2007

Analysis of Italian High Quality Wine Exports using the Gravity Model Approach *

Giuseppe De Blasi[1], Antonio Seccia[1], Domenico Carlucci[1], Fabio Santeramo[2]
[1]University of Bari, Italy; [2]University of Napoli "Federico II", Italy
seccia@agr.uniba.it

Summary

Italian wine firms are facing a significant reduction in wine consumption and increasing competition in international markets. In fact, markets are becoming increasingly liberalized and producers of non-EU countries adopt even more aggressive strategies to increase their competitiveness. Nevertheless, demand for high quality wine which includes a large number of Italian wines, is increasing.
The aim of this work is to explain the magnitude of the trade flows for high quality wine from Italy to its main importing countries. This objective has been reached by establishing an appropriate econometric model derived from an extended form of the "Gravity Model". This model has been broadly applied to the analysis of international trade because it provides robust estimates. Note that applications to the specific products' trade are still limited in number.
The results obtained and the model itself are useful in forecasting potential trends in the exportation of high quality Italian wines. Moreover, it is possible to identify the growing markets where Italian ventures could exploit certain promotional and communication strategies. Finally, with respect to Italian high quality wine these estimates give a quantitative evaluation of the export gains that could result from the enlargement of the EU and from an increasing liberalization in international trade.

KEYWORDS: Gravity Model, High Quality Wine, Export Analysis, Italian Wine

1. Introduction

Competition in international wine markets has recently become more intense due to the progressive and consistent reduction in world-wide wine consumption coupled with the addition of new wine producing countries. Australia, Chile, the USA and South Africa (the so called New World wine producers) have quickly entered the international arena, challenging the market share held by traditional wine exporters, such as Italy, France and Spain (Old World wine producers). The increase in their wine exports has its legitimate causes. In fact, Australia, the USA and South Africa, combining appropriate technologies, optimal climate and growing conditions, have recorded a rapid growth in production but a commensurately slow growth of internal consumption. On the other hand, South American wine production has increased slowly in some countries while decreased in others, in addition to a drop in overall domestic consumption (Zanni, 2004).
It is necessary to underscore that, while the total world-wide consumption of wine has been declining, the demand for high quality wine, which comprises a large number of Italian wines, is in fact increasing. Wine consumption, traditionally linked to the nutritional aspects of eating habits, has been changing with changes in life-styles (urbanization, decreasing caloric needs, increasing importance of leisure time and social activities, etc.).

* The authors are jointly responsible for this paper; however, G. De Blasi has coordinated the work and wrote paragraphs 1 and 6, A. Seccia wrote paragraph 5, D. Carlucci wrote paragraphs 3 and 4, F.G. Santeramo wrote paragraph 2.

Thus, sensorial pleasure, symbolic value and psychological attitudes are becoming the most important determinants for wine consumption.
EU countries identify their high quality wines by using the Origin Denomination system, in which a product's differentiation is supported by specific characteristics of the land and the processing method. In this manner, it is possible to differentiate wines when referring to a precise market segment, distinguishing between popular wine consumers and those who prefer finer wines or wines that are well-known as Quality Wines Produced in Determined Regions (QWPDR).
Although Origin Denominations are very useful to differentiate superior quality wines from ordinary consumption wines, the classification alone is not enough to provide a real competitive advantage in the international marketplace, especially if the product is not effectively promoted using a targeted marketing strategy. The ability of a producer to provide effective communication and promotion actions plays a strategic role in international trade, but yet this is often neglected, or not executed using sufficient financial resources (Carbone, 2003).
This paper will elaborate on and estimate an econometric model which will explain the size of QWPDR trade flows from Italy to its main importing countries using the "Gravity Model" approach. Both the results obtained and the model itself are useful for forecasting potential trends in the exportation of high quality Italian wines, taking into consideration some macro-variables, such as wine production, GDP, population, agreements on trades, etc.
In particular, this model illustrates the possibility of identifying the main growing markets where all participants in the wine supply-chain, such as private wineries, joint-ventures, regional and national agencies, and producers' associations, can unite to concentrate product communication and promotional efforts.
Moreover, the model allows a quantitative evaluation of the effects that EU enlargement and growing international trade liberalization can have on export performances of Italian high quality wine.
Finally, this work represents one of the first attempts to assess the empirical validity of the "Gravity Model" with respect to a specific product category and its international trade.
The remainder of this paper is structured as follows: Section 2 provides a general overview of Italian quality wine exports during recent years; Section 3 discusses the theoretical framework of the Gravity Model; Section 4 examines a specific extended version of the Gravity Model; Section 5 discusses the estimation results; and Section 6 presents considerations and conclusions.

2. General Overview of High Quality Italian Wine Exports

During the last decade, the value (at constant prices) of Italian wine exports has increased significantly, as illustrated in **Graph 1**. Nevertheless, in 2003 there was a considerable reduction in exports, followed by only moderate growth in 2004 and 2005. With respect to Italian QWPDR exports, the trend resembles the one for the general category except for the period after 2003. During that period exports dropped and they have not returned to previously registered levels.
Furthermore, the last decade has seen a modification of the composition of Italian wine exports: in 1995 high quality wine exports represented almost 40 percent of total wine exports and by 2001 they accounted for 57 percent of the mix. Since 2002 the proportion of high quality wine in total exports has declined.
With regard to the international marketplace, Italy exports its quality wine to almost all countries in the world **(Table 1)**; however, 8 countries account for 80 percent of Italy's total high quality wine exports (the USA, Germany, the United Kingdom, Switzerland, Canada, Japan, Denmark and Austria).

With respect to the European markets, Germany imports approximately 23 percent of Italian QWPDR exports; the United Kingdom and Switzerland import, respectively, 9 percent and 8 percent of Italian QWPDR exports. During the past few years, these European importing partners have registered a reduction of their demand for high quality imported wine, but the new country additions to the EU compensated for this reduction. The exportation of Italian high quality wine to these new EU members primarily involved Latvia, Malta, Slovak Republic and Slovenia. Recently, the Russian Federation and Ukraine have become more important markets.
During the past few years, the importation rate for Italian wine by North America has also increased. In particular, the USA leads the imports of Italian high quality wines at a rate of about 26 percent, while Canada also continues to increase its demand.
In Central and South America we observe very heterogeneous trends: Argentina, Brazil, the Dominican Republic, Ecuador, Guatemala and Peru have been reducing their imports of Italian high quality wines, while Colombia, Mexico and Venezuela have been increasing their demand.
Moreover, the most dynamic of the Asian partners, China and India, have registered astonishing growth of Italian high quality wine imports in recent years. On the other hand, Japan, which has historically been Italy's sixth largest importer of high quality wines, has curtailed its consumption.

3. Theoretical Framework of the Gravity Model

Many economists believe that the Gravity Model is a very powerful tool for international trade analysis. Timbergen (1962) and Pöyhönen (1963) were the first to propose the idea, and later it was extended by several other researchers. After these decisive contributions, the Gravity Model was used in many empirical studies for bilateral trade analysis (Prentice et al., 1998) and for the estimation of the impact of a variety of policy issues relating to, for example, free trade blocs (Martinez-Zarzoso et al., 2003), multilateral commercial agreements (Rose, 2002), migration and tourism flows (Karemera et al., 2000), and foreign direct investment (Brenton et al., 1999).
The basic concept of the Gravity Model for trade analysis borrows the gravity equation from physics: the volume of trade between two countries is proportional to their economic "mass" and inversely proportional to their respective distance.
The analytical relation of the basic Gravity Model is expressed as follows :

$$(1) \quad F_{ij} = G \frac{M_i^{\alpha} M_j^{\beta}}{D_{ij}^{\gamma}}$$

where, F_{ij} is the export flow from origin country *i* to destination country *j*, usually measured by its economic value; M_i and M_j are the economic size of the two countries, usually Gross Domestic Product (GDP) is considered; D_{ij} is the distance between the two countries, measured as physical distance between their first cities; G is a constant that depends on the units used to measure the other variables.
The multiplicative nature of the gravity equation means that it is possible to take natural logarithms and obtain a linear relationship between the log of trade flows and the log of economy sizes and distances as follows:

$$(2) \quad \ln F_{ij} = \alpha_0 + \alpha \ln M_i + \beta \ln M_j - \gamma \ln D_{ij} + \varepsilon_{ij}$$

This equation is estimated by the Ordinary Least Square (OLS), therefore it is assumed that the error term ε_{ij} is normally distributed.
Linnemann (1966) was the first to include several additional variables to the basic Gravity Model, obtaining what has been successively called the "Augmented Gravity Model". In fact, empirical estimations may add other variables like population, income per capita,

exchange rates, and dummy variables for the presence of common language, colonial links or commercial agreements among the trading countries (Deardorff, 1995; Head, 2003).

At the empirical level, the Gravity Model gives very robust estimates and provides a good fit to the observed data. In fact, most of the estimations for bilateral trade volumes with respect to GDP, distance and other explanatory variables, have given values for the determination index (R^2) ranging between 0.65 and 0.95, depending upon the specification of the equation (Harrigan, 2001).

Despite the success of the empirical analysis of trade patterns, the Gravity Model was extensively described as a theoretical orphan. However, in the last decade several authors have worked on reconciling international trade theories with the Gravity Model specification. Starting from the work of Anderson (1979), it has been shown that the formulation of the Gravity Model can be derived from different theoretical models such as Ricardian models, Hecksher-Olin (H-O) models and Increasing Returns to Scale (IRS) models of the New Trade Theory (Serlenga et al., 2004). As highlighted by Davis (2000), it is remarkable that in a short period of time, the Gravity Model has switched from being a theoretical orphan to a model for which many people were claiming its maternity.

It is also important to underscore that the empirical success of the Gravity Model has come without much consideration of its econometric properties. However, several authors have recently argued that the application of the basic Gravity Model can sometimes provide biased results of its estimates because of heterogeneous relationships between trading countries (Matyas, 1997; Cheng, 1999; Wall, 2000; Glick and Rose, 2001). This heterogeneity can be related to historical, cultural, ethnic, political or geographical factors that simultaneously explain the trade volume between countries in pairs, although these factors are often difficult to observe and quantify. Because of this, according to the authors, it is possible to control these factors by introducing the so-called "country-pair fixed effects" into the gravity equation in order to capture the unobserved heterogeneity. The Gravity Model with country-pair fixed effects assumes the following analytical form :

(3) $\ln F_{ij} = \alpha_0 + \alpha_{ij} + \alpha \ln M_i + \beta \ln M_j - \gamma \ln D_{ij} + \varepsilon_{ij}$

Note that the intercept has two parts: one common to all country pairs (α_0) and one specific for each country pair (α_{ij}). This is a classical regression model that can be estimated using the Least Square Estimator, and includes a Dummy Variable for each of the country pairs (LSDV). The fixed-effects introduction is a result of ignorance; in fact, as there is still no concrete idea as to the variables responsible for this heterogeneity, each country pair is differentiated by its own dummy variable which is able to capture the uniqueness within the pairs (Cheng et al., 2005).

In many studies, the Gravity Model estimation is made using panel data. These are sets formed by repeated observations of the same cross-sectional units over time. The use of panel data provides several advantages such as more variability in the data-set and the possibility of identifying the effects of time-varying variables (e.g. progressive reduction of trade barriers) (Kennedy, 2003). More precisely, the use of panel data allows for the incorporation into the Gravity Model of another type of fixed effects, namely "year-specific fixed effects", as indicated by the following notation:

(4) $\ln F_{ijt} = \alpha_0 + \alpha_{ij} + \alpha_t + \alpha \ln M_{it} + \beta \ln M_{jt} - \gamma \ln D_{ij} + \varepsilon_{ijt}$

Note that, in this last case, the intercept has three parts: one common to all years and country pairs (α_0); one specific to each country pair and common to all years (α_{ij}); and one specific to each year and common to all country pairs (α_t). This regression model is able to capture the relationship between relevant variables over time, as well as to identify the overall business cycle through the proper selection of dummy variables (t) for annual variations in trade flows.

4. Extended Version of the Gravity Model for the Analysis of Italian High Quality Wine Exports

In this work, the value of the exportation for high quality wine from Italy to its main partner countries is explained through an extended form of the Gravity Model using fixed effects. Among all the models tested, the one that exhibits the best outcome is the following:

(5) $\ln Exp_{jt} = \alpha_0 + \alpha_j + \alpha_t + \alpha \ln QwProd_{it} + \beta \ln PcGDP_{jt} + \gamma EU + \delta EUAN + \varepsilon_{jt}$

Where:

Exp_{jt} = value of QWPDR exports from Italy to country *j* in the year *t*, expressed in Euro at constant prices;

α_0 = constant;

α_j = specific "country-effect" for country *j*;

α_t = specific "year-effect" for year *t*;

$QwProd_{it}$ = Italian QWPDR production in the year *t*, expressed in hectoliters;

$PcGDP_{jt}$ = per capita GDP of importing country *j* in the year *t*, expressed in U.S. dollars at constant prices;

EU = dummy variable that assumes the value of 1 if the country *j* is member of European Union in the year *t*, 0 otherwise;

EUAN = dummy variable that assumes the value of 1 if the country *j* has started EU Accession Negotiations in the year *t*, 0 otherwise;

ε_{jt} = error term related to the observation with the country *j* and the year *t*.

This regression model has been estimated by Ordinary Least Squares, and includes a Dummy Variable for each partner country and each year (LSDV).

The classic Gravity Model uses total GDP as a proxy for output capacity of the exporting country. Nevertheless, while total GDP is appropriate for studies using aggregated export data, in the case of a specific agro-food product such as quality wine, this variable would overestimate the country's output capacity. For this reason, the physical production of the specific good analyzed (or alternatively its monetary value) was considered as the most suitable proxy of the output capacity for the exporting country, which in this case is Italy. The parameter of this variable is expected to be positive because it is expected that the higher the quality wine production, the higher its exportation volume, especially in the case of Italy where production of all wine exceeds total internal consumption.

At the same time, the income effect for the importing countries is considered by including total GDP in the standard Gravity Model. However, the countries that import high quality wine from Italy have substantial differences in terms of the size of their economies, living costs and income per capita. Therefore, GDP per capita has been included in this model as it is a stronger variable for explaining the income effect in importing countries. Using GDP per capita, we expect a positive parameter since the higher a country's income, the higher their demand for a higher quality of wine.

In this empirical model, the distance between Italy and each importing country has been omitted because of difficulties concerning the proper measure of the economic distance that would have encompassed transportation and communication costs (Cheng, 2005). The most common method to measure the distance is to consider the geographical distance between the capitals of the partner countries. In this way, it is implicitly assumed that overland transport costs are the same as those for overseas, and that all overland/overseas distances are equal in cost. Moreover, it is assumed that the capital cities, or any other single point in a country, are an appropriate proxy for the economic center. This might be acceptable for small countries with one major city, but is not an accurate measure for large countries such as the United States, Canada, Russia or China, which have a large number of major cities that are very distant from each other. On the other hand, the model with specific "country-effects" eliminates the need to include the distance variable.

As it was discussed in the introduction, one of the objectives of this work is to estimate the effects of regional integration considering the exporting performances of Italian high quality wine. The

most common method to estimate the effects of regional integration in a Gravity Model is to include dummy variables for each integration regime during the sample period (see, for example, Cheng, 2005). In this empirical model two dummy variables were included to estimate the regional integration effects: one related to the EU member countries (EU) and another related to some Central and Eastern European countries (Cyprus, Estonia, Hungary, Poland, the Czech Republic, Slovenia, Bulgaria, Latvia, Lithuania, Malta, Romania and Slovakia). These countries started in the EU Accession Negotiations (EUAN) during the sample period. As is widely known, there are no customs barriers within the countries of the European Union but instead there is a common customs tariff applied to imports from non-EU countries. However, some Central and Eastern European countries have started EU Accession Negotiations which would involve a progressive reduction (up to a cancellation) of customs barriers to all EU imports.

Finally, it is important to note that in this empirical model the intercept has three parts: one common to all years and country pairs (α_0); one specific to each country pair and common to all years (α_j); and one specific to each year and common to all country pairs (α_t). In particular, year-effects (one for each year) can be considered as indicators of globalization that capture export variations over time independently from other explanatory variables included in the model.

The data-set for this analysis has 605 observations over a period of 11 years (1995–2005). There are 55 countries included in the analysis and they encompass the largest importers of QWPDR from Italy. The volume of Italian high quality wine exported to these countries in 2005 accounted for more than 92 percent of the total.

Data on Italian QWPDR exports (dependent variable) was extracted from the database of the Italian Institute of Statistics (ISTAT). Exports are expressed in thousands of Euros at current prices. This data was deflated using Consumer Price Indexes (CPI) given by ISTAT. Data for Italian QWPDR production was also obtained from the ISTAT database in thousands of hectoliters. Finally, data for "per capita GDP" was obtained from the World Economic Outlook Database of International Monetary Fund and is expressed in current U.S. dollars which were deflated using Consumer Price Indexes (CPI) from the U.S. Bureau of Labor Statistics.

5. Estimation Results

Estimation results for Equation 5 are reported in **Table 2** that includes the most important performance indicators for the empirical model.

In particular, it is important to highlight that the F-statistic is 1,073.52 with a p-value that is less than 0.01, which means a good overall significance of the model, while the R-squared measure is 0.968, which indicates an almost perfect fit to the observed data.

The size of Italian QWPDR production is a variable with a significant effect (at 1%) on Italian quality wine exports and its coefficient is positive, as expected. Considering the logarithmic form of the equation, this coefficient can be read directly as elasticity. Therefore, a coefficient slightly higher than one (1.08) can be interpreted that an increase or a decrease in Italian quality wine production will lead, respectively, to a proportional increase or decrease in Italian quality wine exports. This can be explained by taking into account that consumption of high quality wine in Italy represents only a small share of Italy's internal production, thus a production variation generates directly proportional effects on exports. This has two important implications: first, Italy shows an export-oriented nature regarding the analyzed good and, second, there is a real possibility that a strong increase in Italian quality wine production could be absorbed by the international market. In other words, Italy should increase the proportion of high quality wine in total production because there are favourable conditions in place which would increase exportation. In fact, although Italy exports high quality wine to more than fifty countries, a large share of these flows go to just a few large trading partners (the five largest importers absorb about 70 percent of Italian quality wine exports). On the other hand, the production of Italian high quality wine could easily be increased, from a production perspective. This is due to the fact that a large share of Italian wine production, especially in the southern

regions, belongs to the "table wine" category, despite the existence of favourable factors (land, climate, know-how, institutional context, etc.) which would allow for the production of a higher quality wine. Nevertheless, a step forward on the production front must not be done without commensurate marketing and promotional activities. In order to expand its exportation of high quality wine, Italy must take into account the increasing competition in the international arena, and concentrate its communication and promotional efforts in the countries which indicate favourable market conditions. At the same time it must protect its existing market share in its main importing countries, notwithstanding the absence of immediate or future expansion possibilities.

GDP per capita in importing countries also has a significant effect (level of 1%) on quality wine imports from Italy. This variable is a measure of demand in the importing countries and its effect is positive. More precisely, a one percent increase in per capita GDP in a given importing country could have as a consequence an increase of 1.6 percent in the value of quality wine imports from Italy, if other variables remain constant. Therefore, according to these results, the value of Italian quality wine exports is income elastic. On the other hand, income elasticity greater than one is predictable for a processed good such as quality wine, and this could be explained considering that the international market is larger if a bigger amount of product is available. Consequently, if Italian producers of high quality wine intend to expand their exportations, it is natural to look to those countries where income growth is constant and solid. It is also important to observe that any decrease in income for the trade partners, in other words an economic recession, would have serious negative consequences on the volume of Italian quality wine exports. Looking at **Table 3,** that shows the IMF estimates for annual percent change of GDP per capita, it is interesting to highlight that, among countries with the highest income growth rates, there are three very populous countries, China, Russia and India, where expansion possibilities for Italian quality wine exports are very attractive. Currently these countries import less than 1% of total exports of Italian high quality wine. However, this share could increase exponentially if Italian exporters succeed in penetrating these markets and in consolidating their presence. At the same time, it is important to highlight that the main countries importing Italian high quality wine (the United States, Germany, the United Kingdom, Switzerland, Canada, Japan and almost all western European countries) show a moderate but stable income growth (ranging between about 1 and 2 percent) and therefore it would be strategic to advertise, defend and consolidate Italian market shares against any possible aggressions by the new wine producing countries.

During the period considered, the European Union has passed an historical enlargement: on 1 May 2004, ten new countries of Central and Eastern Europe (Cyprus, the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia, Slovakia and Malta) have joined the fifteen existing member States: Austria, Belgium, Luxemburg, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and United Kingdom. The EU dummy variable included in the model has a positive and statistically significant coefficient (at 1%). More precisely, the model suggests an increase of 136 percent ($e^{0.859} - 1 = 1.36$) on Italian quality wine exports towards EU countries with respect to non-EU countries, ceteris paribus. This is easily understandable if it is taken into account that there are no customs barriers within EU countries and, that these countries are also physically closer to Italy.

Before their EU adhesion, some Central and Eastern European countries had started EU Accession Negotiations to consider a progressive reduction of customs barriers on EU imports, including those from Italy. More precisely, EU Accession Negotiations began on 31 March 1998 with the six best-prepared countries (Cyprus, Estonia, Hungary, Poland, the Czech Republic and Slovenia) and on 15 February 2000 were expanded to include all other candidate countries (Bulgaria, Latvia, Lithuania, Malta, Romania and Slovakia). The coefficient of EUAN dummy variable is positive and statistically significant (a little over 1%). Furthermore, the model shows an increase of 36 percent ($e^{0.304} - 1 = 0.36$) of the

exports of Italian high quality wine towards all the Central and Eastern European countries that have started EU Accession Negotiations, if all conditions remain the same. In addition, it is interesting to note that all new EU members and, in particular, the Baltic Republics (Latvia, Estonia, Lithuania) show high income growth rates (ranging between about 4 and 9 percent). Therefore, these countries represent very interesting, and as yet untapped, markets. With respect to New World competitors, the exporters of Italian quality wine could gain extra profit from the EU enlargement due to any cancellation of customs barriers.

The analysis of year-specific fixed effects shows an increase of the exportation volume of Italian high quality wine over time which is independent with respect to the variations of all the other variables. More precisely, the year-specific effects are positive and significant for the years included in the period of 1997–2003 and they show a regular increase over time with the exception of 2003 which shows a considerable decline. Note that, for comparison, the year dummies are measured relative to 1995, which has been omitted. Between 1995 and 2002, the export of Italian high quality wine increased by 86 percent ($e^{0.62} - 1 = 0.86$) independently with respect to the variations of all the other variables. This could be considered as the "globalization effect", taking into account that most of the WTO agreements are the result of the Uruguay Round Negotiations signed at the Marrakesh ministerial meeting in April 1994. However, the high rate of Italian quality wine export growth could also be derived from other factors, such as the increase in international demand as it relates to a change in consumer preference. The drop in 2003 could probably be explained by the introduction of the Euro currency and its rapid strengthening with respect to other major international currencies, in particular the U.S. dollar, which resulted in unfavourable softening of Italian exports.

Finally, looking at the results for country-specific fixed effects in **Table 4**, it is possible to observe that all fixed effects are positive and statistically significant at one percent except for Slovenia, which shows an effect non statistically different from zero. Examining **Table 5**, it is possible to verify that some of the countries with the highest fixed effects are very populous countries such as China, India, United States, Brazil, Russia, Mexico and Japan, so in these countries the larger Italian quality wine exports can be related to the high number of consumers. Other countries with high fixed effects are geographically close to Italy and are also some of the most important Italian trade partners, such as Germany, the United Kingdom and Switzerland. Other countries such as Kenya, the Philippines, Canada and Thailand are very distant and not very populous countries, but they have high fixed effects probably likely due to their consumers having a particular preference for Italian high quality wine. On the other hand, some of the countries with the lowest fixed effects are very small countries such as Cyprus, Slovakia, United Arab Emirates, Israel, Latvia and Singapore, so in these countries the slighter Italian quality wine exports can be related with the low number of consumers. Other countries with low fixed effects such as Portugal, Greece, Hungary, New Zealand and Spain are wine producing countries and their consumers probably like more domestic quality wine.

6. Conclusions and Final remarks

In this work it has been shown that the Gravity Model is a very useful analytical tool even when trade analysis is conducted on a specific product. In particular, this model which has been optimally adapted for these specific research purposes, is able to explain with great accuracy the size of trade flows using easily disposable data. Moreover, the Gravity Model may also be used to forecast potential trends in trade flows and to estimate the impact of a variety of policy issues.

Examining the results of the analysis of exports of Italian high quality wine some points can be highlighted.

The production of Italian high quality wine should be increased because there are advantageous opportunities in international markets. Considering that the exportation of this specific product is income elastic, as shown by the empirical model, Italian producers should diversify their targeted export markets/countries taking into account their income growth. In other words, the research results indicate that producers exporting their wine should focus on reducing the dispersion of their profits by choosing a diversified portfolio that takes into account the income growth of each country/area. In this way, the portfolio should focus on countries with high income growth rates, in order to take advantage of the income growth effect on exports. However, it should also include countries with moderate but stable income growth rates in order to maintain market share. The aforementioned approach should reduce the risk of a negative impact on the demand of high income growth countries, given that these economies could be less stable in the long run.

Finally, it is possible to evaluate both the effects of regional integration and the impact of the international trade liberalization on the exporting performance of Italian high quality wine.

According to the model, the enlargement of the EU presents a great opportunity for the exporters of high quality Italian wine. In fact, there is a high probability that these Italian exporters could penetrate the Central and Eastern European markets which are rapidly growing. In this way they would exploit a significant commercial advantage related to the absence of customs barriers, even if it is also important to strengthen their own presence in these markets before the eventual and greater trade liberalization which would effectively reduce this advantage.

At the same time, considering the possible connection to WTO agreements signed at the end of Uruguay Round Negotiations, we can observe that these agreements have positively influenced the exportation of high quality Italian wine. Therefore, it is desirable that the negotiations on agriculture in the Doha Development Agenda Round are rapidly concluded with an agreement. Obviously, this evaluation refers exclusively to the effects of a strong liberalization of the international trade on the performance of the exports of high quality Italian wine and not other products.

7. References

Anderson, P. S. (1979). A Theoretical foundation for the gravity equation. American Economic Review, 69: 106-116

Bergstrand, J. H. (1989). The generalized gravity equation, monopolistic competition, and the factor-proportions theory in international trade. Review of Economics and Statistics, 71(1): 143-153

Brenton, P., Di Mauro, F., Lucke, M. (1999). Economic integration and FDI: An empirical analysis of foreign investment in the EU and in Central and Eastern Europe, Empirica, 26 (2): 95-121

Cheng, I-H. (1999). The political economy of economic integration. Ph.D. Dissertation, Birkbeck College, University of London

Cheng, I-H., Wall, H. J. (2005). Controlling for heterogeneity in Gravity Models of trade and integration. Federal reserve Bank of St. Louis Review, 87 (1): 49-63

Carbone, A. (2003). The role of Designation of Origin in the Italian food system. In Gatti, S., Giraud-Héraud, E., Mili, S. (eds), Wine in the Old World – New risks and opportunities. Milano, Italy: Franco Angeli, 29-41

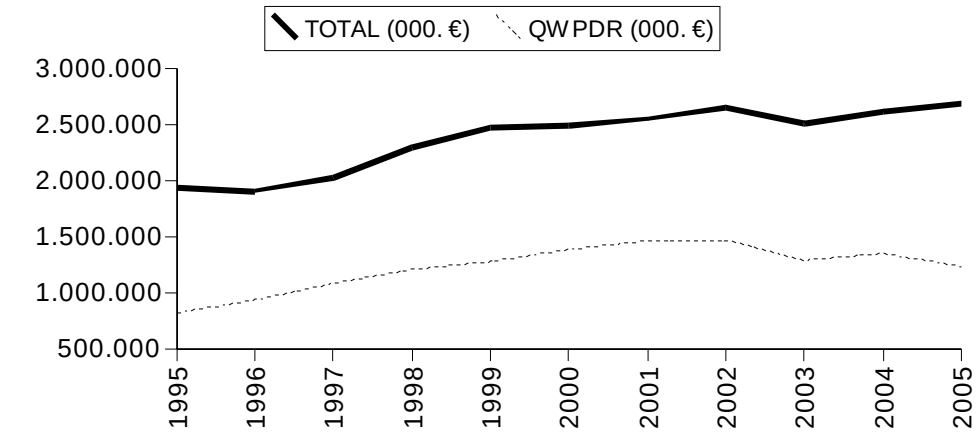
Davis, D.R. (2000). Understanding international trade patterns: advantages of the 1990s. Unpublished manuscript, Columbia University

Deardorff, A. V. (1995). Determinants of bilateral trade: does gravity work in a neoclassical world?. NBER Working Papers No. 5377. Cambridge, MA.

Glick, R., Rose, A.K. (2001). Does a currency union affect trade? The time series evidence. NBER Working Paper N. 8396. National Bureau of Economic Research

Harrigan, J. (2001). Specialization and the volume of trade: do the data obey the laws?. FRB of New York Staff Report N. 140
Head, K. (2003). Gravity for beginners. Working Paper. University of British Columbia
Karemera, D., Oguledo, V. I., Davis, B. (2000). A Gravity Model analysis of international migration to North America. Applied Economics, 32 (13): 1745-1755
Kennedy, P. (ed.) (2003). A guide to Econometrics. Cambridge University Press
Linnemann, H. (1966). An econometric study of international trade flows. Amsterdam: North-Holland Pub. Co.
Martinez-Zarzoso, I., Nowak-Lehmann, F. (2003). Augmented Gravity Model: an empirical application to Mercosur-European trade flows. Journal of Applied Economics, VI (2): 291-316
Matyas, L. (1997). Proper econometric specification of the Gravity Model. The World Economy, 20(3): 363-368
Pöyhönen, P. (1963). A tentative model for volume in trade between countries. Weltwirtschaftliches Archiv, 90 (1): 93-100
Prentice, B.E., Wang, Z., Urbina, H.J. (1998). Derived demand for refrigerated truck transport: a Gravity Model analysis of Canadian pork exports to the United States. Canadian Journal of Agricultural Economics, 46 (3):317-328
Rose, A. (2002). Do we really know that the WTO increases trade. NBER Working Paper N. 9273
Serlenga, L., Shin, Y. (2004). Gravity Models of intra-EU trade: application of the Hausman-Taylor estimation in heterogeneous panels with common time-specific factors. Edinburgh School of Economics Discussion Paper, n. 88, University of Edinburgh
Tinbergen, J. (1962). Shaping the World Economy: Suggestions for an international economic policy. New York, The Twentieth Century Fund
Wall, H. J. (2000). Gravity Model specification and the effect of the Canada-U.S. border. Working Paper N. 2000-24A, Federal Reserve Bank of St. Louis
Zanni, L. (ed.) (2004). Leading Firms and Wine Cluster – Understanding the evolution of the Tuscan wine business through an international comparative analysis. Milano, Italy: Franco Angeli

Graph 1. Italian wine export trends from 1995 to 2005 (at constant prices)



(Source: ISTAT)

Table 1. Italian QWPDR exports towards main importing countries

Countries	Value*	Share	Countries	Value*	Share
USA	337,181	26.14%	China	1,104	0.09%
Germany	297,417	23.06%	New Zealand	914	0.07%
United Kingdom	114,135	8.85%	United Arab Emirates	909	0.07%
Switzerland	103,050	7.99%	Thailand	876	0.07%
Canada	76,516	5.93%	Israel	713	0.06%
Japan	46,267	3.59%	Latvia	625	0.05%
Denmark	33,054	2.56%	Venezuela	618	0.05%
Austria	27,356	2.12%	Estonia	492	0.04%
Belgium - Lux	23,046	1.59%	Costa Rica	489	0.04%
Netherlands	20,464	1.45%	Hungary	472	0.04%
France	18,703	1.45%	Cyprus	464	0.04%
Sweden	17,270	1.34%	Malaysia	413	0.03%
Norway	11,264	0.87%	Lithuania	376	0.03%
Russian Fed.	7,262	0.56%	Philippines	371	0.03%
Ireland	6,352	0.49%	India	355	0.03%
Brazil	5,289	0.41%	Dominican Republic	317	0.02%
Finland	4,980	0.39%	South Africa	251	0.02%
Spain	2,914	0.23%	Colombia	250	0.02%
Australia	2,777	0.22%	Ukraine	246	0.02%
Poland	2,709	0.21%	Portugal	246	0.02%
South Korea	2,111	0.16%	Romania	211	0.02%
Hong Kong	1,974	0.15%	Slovak Republic	194	0.02%
Czech Republic	1,782	0.14%	Kenya	167	0.01%
Singapore	1,668	0.13%	***World***	**128,990,436**	**100.00%**
Mexico	1,526	0.12%	*UE(15)*	566,845	43.94%
Malta	1,262	0.10%	*UE(25)*	575,354	44.60%
Greece	1,151	0.09%	*North America*	413,698	32.07%

* The value is expressed in thousands of Euros at constant prices (mean from 2003 to 2005) (Source: ISTAT)

Table 2. Regression results (country-specific fixed effects are omitted)

Variable	*Coefficient*	*Std Error*	*T-Statistic*	*p-value*	*Significant*
Constant	-2.8320	1.1356	-2.4940	0.01293	**
ln_QwProd	1.0824	0.4410	2.4547	0.01442	**
ln_PcGDP	1.6058	0.1798	8.9316	<0.00001	***
EU	0.8591	0.1666	5.1571	<0.00001	***
EUAN	0.3044	0.1232	2.4703	0.01381	**
Year-specific effects					
1996	0.0853	0.1109	0.7689	0.44226	
1997	0.1528	0.0862	1.7719	0.07698	*
1998	0.2565	0.0738	3.4740	0.00055	***
1999	0.2976	0.0801	3.7156	0.00022	***
2000	0.4964	0.0820	6.0566	<0.00001	***
2001	0.6025	0.0838	7.1899	<0.00001	***
2002	0.6209	0.0890	6.9766	<0.00001	***
2003	0.2555	0.0883	2.8954	0.00394	***
2004	0.1459	0.0937	1.5569	0.12008	
2005	0.1327	0.0823	1.3549	0.24512	

Dependent Variable = $\ln\_Exp_{it}$
Number of observations = 605
F-Statistic (67, 537) = 1,073.52 (p-value < 0.00001)
R^2 = 0.971897
Adjusted R^2 = 0.968391
Log-likelihood = -302.692
Significant: *** at 1% ; ** at 5% ; * at 10%

Table 3. Annual percent change of Per capita GDP*

	Countries	*2005*	*2006*	*2007*		*Countries*	*2005*	*2006*	*2007*
	China	9.6	9.5	9.5		Jamaica	0.9	2.3	2.6
§	Latvia	10.9	11.6	9.4		Brazil	0.8	2.2	2.5
§	Estonia	10.1	9.8	8.3		Spain	2.8	3.0	2.5
§	Slovak Republic	6.1	6.5	7.0		Jordan	4.5	3.4	2.4
	Russia	7.0	6.9	6.9		Finland	2.8	3.3	2.3
§	Lithuania	8.1	7.2	6.9		Colombia	3.5	3.0	2.3
§	Bulgaria	6.3	6.4	6.8	$	United Kingdom	1.2	2.2	2.2
§	Romania	4.4	5.9	5.9		Australia	1.3	1.8	2.2
	India	7.2	6.7	5.6		Norway	2.0	1.7	2.2
	Argentina	8.0	6.8	4.8		Israel	3.0	1.9	2.2
§	Czech Republic	5.9	5.9	4.7	$	Japan	2.6	2.7	2.1
	Hong Kong	6.4	5.1	4.6	$	Austria	1.4	2.6	2.1
§	Poland	3.5	5.1	4.5	$	Denmark	3.0	2.4	2.1
	Ireland	3.3	4.4	4.2	$	Canada	2.0	2.2	2.0
	Malaysia	3.2	3.7	4.0		Belgium	1.5	2.7	2.0
	Thailand	4.4	3.4	4.0		Mexico	1.5	2.5	2.0
§	Slovenia	3.6	4.2	3.8	$	United States	2.3	2.5	1.9
§	Hungary	4.3	4.7	3.7		Ecuador	3.3	3.0	1.8
	Ukraine	3.4	5.8	3.6		Sweden	2.3	3.6	1.8
	Peru	4.9	4.5	3.5		France	0.6	1.8	1.8
	Dominican Rep.	7.7	4.0	3.5	$	Switzerland	1.7	2.9	1.7
	Greece	3.7	3.7	3.5		Venezuela	7.2	5.4	1.6
	Korea	3.5	4.2	3.4		Portugal	0.3	1.1	1.4
	Kenya	3.7	3.6	3.4		Guatemala	0.6	1.5	1.4
	Philippines	3.0	2.9	3.3		Netherlands	1.3	2.6	1.2
	South Africa	3.9	3.0	3.0	$	Germany	0.9	2.0	1.2
	Luxembourg	3.6	3.1	2.9	§	Malta	1.8	0.9	1.0
§	Cyprus	3.7	2.6	2.9		Italy	-1.0	1.1	1.0
	Costa Rica	4.0	4.7	2.8		New Zealand	1.3	0.3	0.5
	Singapore	3.7	5.1	2.7		United Arab Emirates	0.8	3.6	-1.7

* Data for years 2006 and 2007 are IMF estimates
§ = New member states of European Union
$ = Main importing countries of Italian quality wine
(Source: World Economic Outlook Database of International Monetary Fund)

Table 4. Regression results (country-specific fixed effects)

Countries	*Fixed effects*	*Std Error*	*T-Statistic*	*p-value*	*Significant*
Argentina	2.1227	0.3400	6.2429	<0.00001	***
Australia	2.9739	0.2863	10.3859	<0.00001	***
Austria	3.8581	0.2126	18.1481	<0.00001	***
Belgium-Luxembourg	2.9838	0.2553	11.6861	<0.00001	***
Brazil	6.7128	0.3167	21.1973	<0.00001	***
Canada	5.7184	0.2588	22.0972	<0.00001	***
China	6.0576	0.5024	12.0571	<0.00001	***
Colombia	3.8812	0.3777	10.2760	<0.00001	***
Costa Rica	3.4879	0.3105	11.2323	<0.00001	***
Cyprus	0.9056	0.1960	4.6203	<0.00001	***
Czech Rep.	2.8922	0.2183	13.2518	<0.00001	***
Denmark	3.5209	0.2376	14.8202	<0.00001	***
Dominican Rep.	4.6414	0.3919	11.8422	<0.00001	***
Ecuador	3.2333	0.4074	7.9361	<0.00001	***
Estonia	2.2039	0.2597	8.4878	<0.00001	***
Finland	2.2294	0.2130	10.4670	<0.00001	***
France	3.6118	0.2021	17.8741	<0.00001	***
Germany	6.3913	0.2104	30.3775	<0.00001	***
Greece	1.5149	0.1616	9.3732	<0.00001	***
Guatemala	3.8514	0.4124	9.3385	<0.00001	***
Hong Kong	2.1890	0.2741	7.9849	<0.00001	***
Hungary	1.7646	0.2542	6.9419	<0.00001	***
India	5.4767	0.6659	8.2247	<0.00001	***
Ireland	2.1093	0.2195	9.6109	<0.00001	***
Israel	1.5755	0.3146	5.0082	<0.00001	***
Jamaica	2.8917	0.3558	8.1276	<0.00001	***
Japan	4.8962	0.3213	15.2404	<0.00001	***
Kenya	6.1438	0.6221	9.8768	<0.00001	***
Latvia	1.8710	0.4206	4.4481	0.00001	***
Lithuania	2.6393	0.3317	7.9573	<0.00001	***
Malaysia	3.2262	0.3114	10.3611	<0.00001	***
Malta	2.4494	0.2215	11.0560	<0.00001	***
Mexico	4.2231	0.2725	15.4960	<0.00001	***
Netherlands	3.5789	0.2127	16.8226	<0.00001	***
New Zealand	2.0537	0.2447	8.3930	<0.00001	***
Norway	2.8663	0.3343	8.5744	<0.00001	***
Peru	3.4877	0.3793	9.1957	<0.00001	***
Philippines	5.7582	0.4956	11.6184	<0.00001	***
Poland	4.2278	0.2608	16.2138	<0.00001	***
Portugal	0.0000				
Russia	6.2919	0.3668	17.1526	<0.00001	***
Singapore	2.0868	0.2610	7.9952	<0.00001	***
Slovak Rep.	0.9694	0.2987	3.2448	0.00125	***
Slovenia	0.0083	0.2438	0.0340	0.97290	
South Africa	3.6344	0.3290	11.0475	<0.00001	***
South Korea	2.7615	0.2713	10.1769	<0.00001	***
Spain	2.1990	0.1998	11.0083	<0.00001	***
Sweden	3.2740	0.2247	14.5676	<0.00001	***
Switzerland	5.3786	0.3199	16.8144	<0.00001	***
Thailand	5.0654	0.3771	13.4322	<0.00001	***
Ukraine	4.8920	0.5258	9.3038	<0.00001	***
United Arab Emirates	1.2367	0.2781	4.4471	0.00001	***
United Kingdom	5.3947	0.2123	25.4065	<0.00001	***
United States	6.7005	0.2981	22.4758	<0.00001	***
Venezuela	4.3123	0.3005	14.3505	<0.00001	***

Significant: *** at 1% ; ** at 5% ; * at 10%

Table 5. Country-specific fixed effects and population*

Countries	*Fixed effects*	*Population*	*Countries*	*Fixed effects*	*Population*
Brazil	6.7128	184,18	Ecuador	3.2333	13,22
United States	6.7005	296,56	Malaysia	3.2262	25,95
Germany	6.3913	82,46	Belgium-Lux	2.9838	10,86
Russia	6.2919	142,70	Australia	2.9739	20,40
Kenya	6.1438	33,45	Czech Rep.	2.8922	10,23
China	6.0576	1.307,56	Jamaica	2.8917	2,66
Philippines	5.7582	84,24	Norway	2.8663	4,61
Canada	5.7184	32,23	South Korea	2.7615	48,29
India	5.4767	1.094,25	Lithuania	2.6393	3,43
United Kingdom	5.3947	60,22	Malta	2.4494	0,40
Switzerland	5.3786	7,27	Finland	2.2294	5,23
Thailand	5.0654	65,11	Estonia	2.2039	1,35
Japan	4.8962	127,74	Spain	2.1990	41,38
Ukraine	4.8920	46,93	Hong Kong	2.1890	6,97
Dominican Rep.	4.6414	8,53	Argentina	2.1227	37,83
Venezuela	4.3123	26,43	Ireland	2.1093	4,13
Poland	4.2278	38,16	Singapore	2.0868	4,35
Mexico	4.2231	105,30	New Zealand	2.0537	4,10
Colombia	3.8812	46,04	Latvia	1.8710	2,31
Austria	3.8581	8,23	Hungary	1.7646	10,10
Guatemala	3.8514	13,72	Israel	1.5755	6,75
South Africa	3.6344	46,89	Greece	1.5149	11,10
France	3.6118	62,70	United Arab Emirates	1.2367	4,68
Netherlands	3.5789	16,31	Slovak Rep.	0.9694	5,41
Denmark	3.5209	5,41	Cyprus	0.9056	0,83
Costa Rica	3.4879	4,33	Slovenia	0.0083	2,00
Peru	3.4877	27,95	Portugal	0.0000	10,52
Sweden	3.2740	9,04			

* Population is expressed in Millions of habitants
(Source: World Economic Outlook Database of International Monetary Fund, year 2005)

Contact information

Prof. Antonio Seccia
Department of Agricultural Economics and Policy, Evaluation and Rural Planning
University of Bari
via Giovanni Amendola, 165/A
70126 Bari – Italy

Phone: +39 – 080 544 28 89
Fax: +39 – 080 544 25 27
E-mail: seccia@agr.uniba.it