The challenge of the international organic certification:
a new opportunity for agricultural trading?

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Summary

The successful literature about gravitational models stresses that bilateral trade flows among countries is influenced by GDP factors and transaction costs. In other words the mass of bilateral trade would be related to the typical demand-supply factors which explain the quantity of traded goods in perfect competition models and a wide series of variables which express transaction costs whose role is strongly highlighted by institutional economists. If compared to the previous literature our paper shows a twofold novelty. First it is the first attempt to analyse the bilateral trade of specific agricultural goods for Italy by a cross country and panel analysis and second it provides an original specification for transaction costs. In particular, we assume that the level of organic certification standards harmonisation between Italy and extra-European countries could represent a good "proxy" for the cultural, political and social affinity in bilateral trading. Interestingly we find that the absence of specific import harmonisation rules between Italy and other extra-European countries decreases the level of bilateral trade for all the agricultural produce. A plausible explanation could be that harmonisation of organic standards is a signal of low transaction costs. In this context for a specific country the awareness of a high harmonisation level of organic standards towards another region could represent affinity in the trading activities for the whole agricultural produce. The policy agenda about the harmonisation of the agricultural standards should be tackled in the context of a more complex agenda concerning the affinity of political, cultural and social practices among different regions in the agricultural and in all the other economic sectors.

KEYWORDS: Food trade, gravitational models, harmonisation, organic agriculture, Italy

1. Introduction

Traditional gravitational models point out that the magnitude of import and export among countries strongly depends on the distance among regions and on the size of the involved economies (Bergstrand, 1985; Evenett and Keller, 1998). The shorter the distance and the greater the GDP, the more trade will occur. However recent literature outlines that gravitational models could be suitable also to investigate the role of transaction costs in affecting trading. The concept of transaction costs is crucial in the New Institutional Economics questioning the general findings deriving from neoclassical theories (Williamson, 2000). Williamson explains that transaction costs derive from contact, negotiation and control activities corresponding to the different stages of the transaction. The contact cost is related to the search of the transaction partner. The negotiation cost are those beard for the correct and unambiguous writing of the contract and finally the control costs are those expressing the activities devoted to control the implementation of the contract from the partner. Though a wide literature focussed on the investigation of transaction costs, only a few contributions provided reliable monetary estimations (Wallis and North 1986). Gravitational models are suitable for extensions capturing the impact of transaction costs for trading. Whereas Frankel and Rose (2002) study the impact of a

common currency in the mass of bilateral flows, den Butter and Mosch (2003) find that trust has a statistically significant impact on the trading mass.

Our paper provides a contribution to this debate in the specific field of the agricultural sector. Starting from gravitational models we assume that trading of agricultural produce is affected by the same factors identified by the previous literature as the distance among regions and the size of the economy. As first step we will test these assumptions for the specific agricultural sector for Italy by a cross country analysis in 2003 and by a panel analysis in the lapse of time 1997 – 2003.

As second step we will introduce a new set of variables representing more sophisticated transaction costs in bilateral trading for Italy other than the physical distance. A first criterion is to discriminate European and extra-European countries. A very intuitive concept suggests that countries included in the European Union could represent lower transaction costs in the bilateral trade with Italy because of the common currency, harmonised rules, common habits and traditions. The novelty of this paper is that we introduce a criterion in order to identify areas showing lower transaction costs for non European Union countries.

Recently wide scientific debate regarded the growth of organic farming aimed at minimizing the negative externalities of farming on the environment and on social justice. Many researchers agree on the fact that production and consumption of organic food is driven by ethical and social values (Seyfang, 2006). The pursue of organic practices is guaranteed by certification activities driven by professional inspectors. An important pitfall of this procedure is that organic standards are different in each country. Our assumption is that the extent of the differences among certification standards represent a good proxy of the differences in the "affinity" in the agricultural sector among countries.

Given this background our paper will answer the following research question. Assuming that differences represent lower transaction costs, how much do these transaction costs affect the trade of agricultural produce?

We think that this paper could provide an interesting and original message. Harmonisation of certification standards cannot be considered an isolated activity. Policy makers should work to harmonize (without eliminating) cultural and habits differences sector among countries. This harmonisation could represent an impulse for integration of certification standards but also for trust in the relationships among regions driving a wider mass of trading and growth for all the agricultural produce. In the section 1 we will briefly introduce the model and we will explain the data source. In the section 2 we will show the results. Finally the conclusions.

2. Model set up

The gravitational model is characterised by a very simple and intuitive notion. The mass of bilateral trade among regions would is influenced by the typical factors influencing the trading of goods in a perfect competition market such as demand and supply factors and by transaction costs. The typical transaction costs which are expressed by the literature are transport costs (which are usually represented by the distance among regions). The conceptual model can be expressed by an equation as follows:

(1) $T_{ij} = A * (Y_i Y_j / D_{ij})$

Where

T_{ij} = bilateral trade

A = constant of proportionality

$Y_{i,j}$ = the GDP for countries i and j

Dij = physical distance between the country i and the country j.

T_{ij} expresses the mass of bilateral trade among countries *i* and *j*, $Y_{i,j}$ represents the economic size of countries *i* and *j* and in particular the supply side factors. In other words the basic assumption is that more countries produce GDP and more is the trading attraction. Previous literature generally also identifies demand side factors. The willingness to buy trading goods is usually expressed by the level of GDP per capita between two countries.

On the basis of the previous comments a more accurate expression interprets the equation (1) by a Cobb Douglas as follows:

$$(2)\ PX_{ij} = A^1 (Y_i * Y_j)^{\beta_1} ((Y_i / L_i) * (Y_j / L_j))^{\beta_2} * (D_{ij})^{\beta_3}$$

Where *P* is the price, *L* is the level of population and *X* is the trading mass . *(Y_i*Y_j)* and *the (Y_{i,j}/L_{ij})* factors mean that the supply and demand factors are expressed as the interaction of economic size indicators for the involved countries. To make the previous equation suitable for an econometric analysis we should consider the following model:

$$(3)\ \log V_{ij} = \alpha^1 + \beta_1 \log(Y_i * Y_j) + \beta_2 \log((Y_i / L_i) * (Y_j / L_j)) + \beta_3 \log(D_{ij}) + \varepsilon_{ij}$$

where V_{ij} is the monetary value of the agricultural trading mass (import + export), ε_{ij} is the usual normal stochastic error and log is the natural logarithm. Of course being the values expressed in natural logarithms, each coefficient should be interpreted as elasticity. We will label this model as the *Basic Gravitational Model* (BGM) that we will use to apply the gravitational model for the agricultural international trading in Italy by a cross country and a panel analysis. Empirical studies focussing on the specific topic of the agricultural produce are not wide-spread in the previous literature(Sevela, 2002; Dascal *et al.*, 2002) and our specific case study for Italy is quite original.

The second step will be to introduce a more sophisticated set of variables expressing transaction costs in the trading of agricultural produce. A first transaction costs variable distinguishes between . European and extra-European countries. Currency dummies or variables expressing law/political transaction costs are variables which typically express transaction costs which strongly affect each sector of the economic activity. In this context we will consider a dummy variable as follows:

4) DEU = 1 if the trading partner is an EU member and 0 if it is not.

It is a very intuitive assumption. The underlying hypothesis is that the agricultural trading between Italy and another European countries will be facilitated because of the absence of transaction costs deriving from factors such as borders, currency exchange costs and trust relationships. Of course if we applied the same analysis to the other European Union partners this dummy variable would express the same value for each country.

Moreover we introduce a more specific dummy variable which identifies partners with lower transaction costs among extra-European regions. Our aim is to identify a variable that could express the degree of cultural, social and political "affinity" among countries about agricultural practices. To reach our goal we focus on the specific sector of organic food. Our assumption is that the trust factor in the organic sector among trading partners shows

an even more important role than in the whole agricultural sector. For this reason policies implemented by countries in order to facilitate the import procedures of organic food from other regions could represent a concrete and interesting signal showing affinity between countries in the agricultural habits and practices. If this assumption is true a high level of organic standards harmonisation among regions should indicate both a high level of trust and a lower level of transaction costs among trading countries. This will determine a higher level of bilateral trade. The important consequence of this assumption is that the "hot" issue concerning the harmonisation of organic standards should be assessed in a more general context involving the cultural and social affinity among countries in the international marketing. In line with this strand of research we introduce a dummy variable as follows:

5) DEO = 1 if the trading partner can enjoy a privileged organic export procedure in Italy on the basis of the European laws[1] and DEO = 0 if it is not.

This description of this dummy variable needs a further comment. As the reader can notice our implicit assumption is that if Italy allows a third country simplified import procedures both the import and export mass between these countries will increase. We should specify that this dummy variable does not properly represent equivalency between Italy and other regions. As expressed by IFOAM (2004) the issue of standards equivalence cannot be safely assessed on the basis of unambiguous criteria. For this reason the meaning of this dummy variable is the perception of equivalence rather than a strict and objective interpretation of equivalence in organic standards. Moreover this dummy variable captures lower transaction costs in trading concerning both all the economic sectors and the specific agricultural sector. The fact that Italy grants equivalency to a third country expresses affinity in the bilateral relations concerning laws, culture, politics affecting the industrial, services and primary sectors and affinity in the specific agricultural practices or food quality standards. For this reason we assume this dummy variable as a good proxy of lower transaction costs affecting more generally economy or the specific agricultural sector.

Now that we have clarified the meaning of our dummy variables we can set up our Adjusted Basic Gravitational Model (*ABGM*) as follows:

6)

$$\log V_{ij} = \alpha + \beta_1 \log(Y_i * Y_j) + \beta_2 \log((Y_i / L_i) * (Y_j / L_j)) + \beta_3 \log(D_{ij}) + \beta_4 DEU + \beta_5 DEO + \varepsilon_{ij}$$

Data are extracted from different sources. Data about *V* are extrapolated from the FAOSTAT core dataset. Data about GDP are taken from the International Monetary Fund Dataset. Data about the distance among regions are extracted from the Frenkel and Rose's (2002) dataset. The analysis is driven by a 130 cross country (2003) and a balanced panel (122 countries, 1997 – 2003) dataset. Data about GDP and *V* in the panel data are expressed in real terms. Next section shows the results.

3.   Results

The analysis is driven by the E-Views Software. First we present results for the cross country analysis with the *BGM* model.

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[1]   The European Law 2092/91 recognises for some non European countries equivalency in organic standards. Actually 8 countries benefit from this law: Australia, Argentina, Costa Rica, Hungary, New Zealand, Czech Republic, Switzerland and Israel. Hungary and Czech Republic in the lapse of time 1997-2003, which is the period of interest of our analysis, had not joined the European union. Equivalency concerns both standards and conformity assessment.

TABLE 1 ABOUT HERE

From the basic model we get interesting information.. The distance (D) and the interaction variable concerning GDP (*PROD Y*) show significant coefficients. As we said before, coefficients should be interpreted as elasticities, so a 1% increase of D and *PROD Y* respectively generate a 0.81% decrease and a 0.79% increase of bilateral trading *V*. The interaction variable expressing GDP per capita (PROD YPC) is statistically insignificant (5% significance level). Though in Frenkel and Rose (2002) this variable is statistically significant in other works we find similar results (Sohn and Yoon, 2001; den Butter and Mosch 2003). The model is satisfactorily performing if we consider a 0.73 value of the adjusted R^2 index. Both the significant coefficients associated to D and *PROD Y* show the expected signs highlighted by the previous published literature about gravitational models. If we consider the more complete ABGM model, results are again rather encouraging.
As the reader can notice from the table 2 the *ABGM* model confirms the results we obtained in the table 1 and mainly both dummy variables *DEU* and *DEO* are significant. Moreover both dummy variables are associated to coefficients showing a strong positive impact.

TABLE 2 ABOUT HERE

This result would suggest that bilateral trade of agricultural produce is more strongly addressed towards EU countries and towards extra-EU countries if they enjoy a privileged export procedure of organic produce in Italy. The fact that those countries can benefit from privileged export procedures could be the signal that Italy recognises those countries as affine in trading and this would stimulate bilateral trade flows. The reader should notice that the coefficients associated to the two dummy variables show similar coefficients values. A Wald Test confirms that these two coefficients are not statistically different (see Appendix 1, Table 5). Interestingly, these results would suggest that transaction costs in countries where Italy recognises equivalency in organic standards would be as low as in European countries. The performance of the model expressed by the R^2 index (0.75) is not strongly higher than in the BGM model (0.73). However the omitted variable/redundancy F-tests (Annex 1, table 6) show that the introduction of the two dummy *DEU* and *DEO* variables is statistically significant (see Appendix 1 table 2). Moreover the low increase of the R^2 index could be explained by the fact that countries included in the European Union and organic standards equivalency groups represent only a small sub-sample. For this reason *DEU* and *DEO* would be significant but they would not explain a high portion of the model variance.

Results are robust to normality tests (Jarque-Bera) and misspecification tests (Ramsey test)[2]. We only find heteroscedasticity (Appendix 1, Table 7), but adjusting the estimation procedure to correct heteroscedasticity, we do not find particular results differences in the significance of the coefficients. The value of each coefficient by a White correction does not vary.

TABLE 3 ABOUT HERE

The panel data analysis does not significantly change our conclusions. We set up an *ABGM* model by a introducing time period effects as in Frenkel and Rose (2002). An F test confirms that fixed time period effects are not redundant in the *ABGM* model. As second step we run an Hausmann test to choose between the fixed effects and the random effects

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[2]   See the table 3, Appendix 1.

model. Results suggest that the random effects framework is the most appropriate model set up (Appendix 1, Table 8). The suitability of the random effects approach shows that the explanatory variables are not correlated with idiosyncratic errors and that they represent exogenous variables. However results from the Hausmann test do not represent conclusive and unambiguous proof of this finding.

As the reader can see from the table 4 results are similar to those concerning the cross country analysis . The panel analysis confirms the sign and the significance of our previous estimations[3]. Interestingly again, coefficients associated to the dummy variables *DEU* and *DEO* are not statistically different by a F-test (see Appendix 1, Table 8). From these results we have more robust evidence that the magnitude of the impact of equivalency in importing procedures is comparable to the one deriving from the inclusion to the European Union. We deem that this result could be of great interest for policy makers and who are interested in developing and expanding international trading in agricultural produce.

<div style="text-align:center">

TABLE 4 ABOUT HERE

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4.   Conclusions

In this paper we focus on the application of the empirical gravitational for bilateral trade flows between Italy and other world countries by a cross country and a panel analysis for agricultural produce. Whereas the traditional variables designed by the previous literature to explain the mass of trade are significant and the statistically robustness of the model is quite reliable for this specific case study the novelty of our paper is that we introduce a variable explaining the perception of affinity in trading between Italy and other non European Union Countries. The crucial concept of our paper is that we analyse the impact of the country 's acknowledgement of equivalence among organic standards on the whole mass of trading of agricultural produce (imports plus exports). Our intuition is that if a country specifically recognises equivalence in organic standards the whole agricultural produce trading would benefit. This intuition is confirmed by empirical results for the Italian case. Equivalency in organic standards and the acknowledgement of common conformity assessment mechanisms could represent the signal of lower transaction costs in bilateral trading. The important policy implication of our contribution is that "unilateral" equivalence in organic standards could be considered as expression of the awareness for a country of a more general cultural, social and political affinity in trading of agricultural produce. Policy maker aimed at reducing (without of course eliminating) contrasts and different habits in the international relationships would work also for more harmonised organic standards and for more intense trading relationships.

5.   References

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[3]   Intercept and time effects are not reported.

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Tables

Table 1.   Cross country analysis. 2003. BGM model.

Dependent Variable: V

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-19.01587	3.210352	-5.923296	0.0000
PROD Y	0.799991	0.062435	12.81313	0.0000
PROD YPC	0.038697	0.086343	0.448174	0.6548
D	-0.811694	0.150553	-5.391419	0.0000
R-squared	0.735473	Mean dependent var		16.70109
Adjusted R-squared	0.729174	S.D. dependent var		2.563739

Table 2.   **Cross country analysis. 2003. ABGM model.**

Dependent Variable: V
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.28720	3.171807	-5.450270	0.0000
PROD Y	0.769765	0.061588	12.49870	0.0000
PROD YPC	-0.059669	0.090318	-0.660649	0.5101
D	-0.634896	0.164173	-3.867234	0.0002
DEU	1.192956	0.499297	2.389272	0.0184
DEO	1.276640	0.508601	2.510100	0.0134
R-squared	0.754018	Mean dependent var		16.70109
Adjusted R-squared	0.744100	S.D. dependent var		2.563739

Table 3.   **Cross section analysis. 2003. ABGM model.**

Dependent Variable: V
Method: Least Squares
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.28720	2.926786	-5.906549	0.0000
PROD Y	0.769765	0.056822	13.54704	0.0000
PROD YPC	-0.059669	0.091811	-0.649908	0.5170
D	-0.634896	0.143805	-4.414964	0.0000
DEU	1.192956	0.317079	3.762329	0.0003
DEO	1.276640	0.403152	3.166648	0.0019
R-squared	0.754018	Mean dependent var		16.70109
Adjusted R-squared	0.744100	S.D. dependent var		2.563739

Table 4.   **Panel analysis. 1997 - 2003. ABGM model.**

Dependent Variable: V
Method: Panel EGLS (Period random effects)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PROD Y	0.752168	0.025800	29.15408	0.0000
PROD YPC	-0.012072	0.033845	-0.356678	0.7214
D	-0.647331	0.068491	-9.451336	0.0000
DEU	1.057688	0.204495	5.172195	0.0000
DEO	0.843219	0.240815	3.501520	0.0005

Table 5.   **Wald test on the dummy coefficients restriction $\beta_4 = \beta_5$.**

Test Statistic	Value	df	Probability
F-statistic	0.019285	(1, 124)	0.8898
Chi-square	0.019285	1	0.8896

Table 6.   Redundant variables, omitted variables tests: DEU, DEO.

Redundant Variables: DEU, DEO

F-statistic	4.674517	Prob. F(2,124)	0.011035
Log likelihood ratio	9.449497	Prob. Chi-Square(2)	0.008873

Omitted Variables: DEU, DEO

F-statistic	4.674517	Prob. F(2,124)	0.011035
Log likelihood ratio	9.449497	Prob. Chi-Square(2)	0.008873

Table 7.   Jarque Bera test, Ramsey's test, White test for heteroschedasticity.
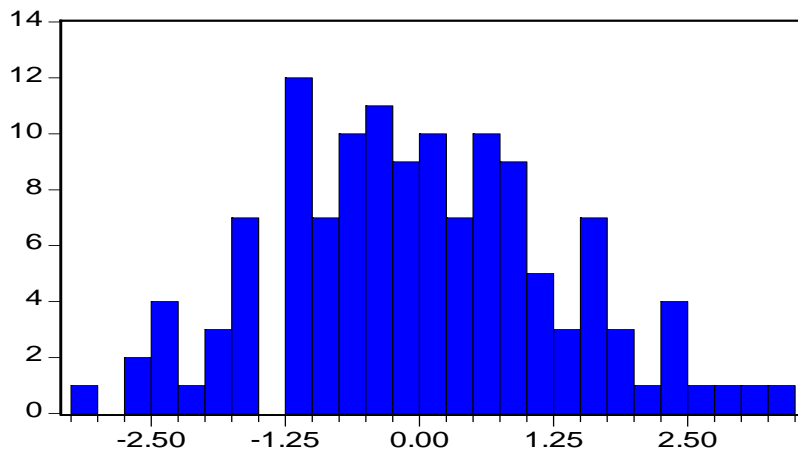
Series: Residuals	
Sample 1 130	
Observations 130	
Mean	3.24e-15
Median	-0.051177
Maximum	3.467888
Minimum	-3.101374
Std. Dev.	1.318588
Skewness	0.157219
Kurtosis	2.774908
Jarque-Bera	0.809992
Probability	0.666979

Ramsey RESET Test:

F-statistic	1.125750	Prob. F(2,124)	0.327701
Log likelihood ratio	2.339271	Prob. Chi-Square(2)	0.310480

White Heteroskedasticity Test:

F-statistic	2.324100	Prob. F(9,120)	0.018977
Obs*R-squared	19.29646	Prob. Chi-Square(9)	0.022787

Table 8. **Redundant fixed effects test, Hausmann test and Wald test on the dummy coefficients restriction $\beta_4 = \beta_5$.**

Redundant Fixed Effects Tests

Test period fixed effects

Effects Test	Statistic	d.f.	Prob.
Period F	11.245565	(6,842)	0.0000
Period Chi-square	65.831211	6	0.0000

Hausmann Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	3.000930	5	0.6998

Wald Test:

Test Statistic	Value	df	Probabilità
F-statistic	0.653326	(1, 848)	0.4192
Chi-square	0.653326	1	0.4189

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