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Institutions and bilateral agricultural trade

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Abstract

This study aimed to investigate the effect of institutional differences between countries on trade flows of agricultural products. The analysis was carried out by estimating the gravity model as proposed by Anderson and van Wincoop (2003) and Anderson and van Wincoop (2004). The sample covered a total of 59 countries for the period from 2005 to 2010. The results showed that the institutional differences between countries have a significant and negative effect on agricultural trade. Furthermore, the greater is the difference in the quality of institutions between countries, the higher its restrictive effect on trade.

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1. Introduction

International trade allows many gains to countries linked to it. Efficiency gains, economies of scale, increasing competition and consequent reduction of prices, besides the increase in the variety of products at consumers' disposal, can be cited as main benefits of commercial insertion.

According to Linders (2006), the growth of the international trade in the second half of twentieth century was characterized by intensive liberalization (reduction of tariff and non-tariff barriers), promoted by multilateral agreements in the sphere of the General Agreement on Tariffs and Trade (GATT) and, since 1995, of the World Trade Organization (WTO). According to the author, regional liberalization agreements and technological advances in communications and transport, also contributed to this growth.

Although the configuration of trade policy and technological advances in transport and communications has influence on trade flows, it is increasing in the literature the perception that these are not the only relevant elements.

According to Anderson (2000), costs of transport and tariffs are not sufficient to explain the resistance to trade, especially after the reduction of these barriers. For the author, the enforcement of contracts, costs of information and property rights, defined by Linders (2006) as examples of intangible barriers, need to be considered in the evaluation of trade pattern.

The perception that intangible barriers have significant effect on the trade flows allowed the appearance of many works aiming at discussing and measuring its restrictive effect. In this context questions arise concerning the role of institutions and its heterogeneity on bilateral trade flows.

The institutions include a set of restrictions created by the society in order to regulate human interaction (NORTH, 1990). According to the author, they can be formal (rules created by the society) or informal (conventions and codes of behavior), being the formal institutions subject to alterations in lesser time compared to informal ones.

According to Rodrik (2000), international trade are subject to a large variety of transaction costs introduced by discontinuities of political and legal systems, which are institutional aspects. These costs segment the market in the same way as do the costs of transportation or the tariffs and come from several sources, being the enforcement of contracts the main one.

Anderson and Marcouiller (2002) emphasized the importance of "hidden" transaction costs, being the enforcement of contracts its main source. The impartiality and the transparency with which government elaborates and implements its economic policy also affects these costs (ANDERSON and MARCOUILLER, 2002; DE GROOT et al, 2004).

The growing perception of the importance assumed by institutions motivated many empirical works aiming at measuring the effect of dissimilarity or institutional heterogeneity on trade that, according to De Groot et al. (2004), would represent additional transaction costs and would function as significant restriction to commercial transactions.

In the works of Anderson and Marcouiller (2002) and François and Manchin (2007), the authors have continued the estimation of gravity equations using different proxies to represent the institutional environment. The results indicate significant and direct effect between quality of institutional environment and aggregate commercial flows.

De Groot et al (2004, 2005) measured the effect of institutional environment and of its heterogeneity on trade flows by means of estimation of gravity equations using the same proxies to represent the institutions. The results showed significant and positive effect between institutional environment and trade. The institutional heterogeneity acted in the sense of increasing transaction costs, reducing trade.

Linders (2006), based in the classification of products proposed by Rauch (1999), investigated the effect of institutions and of its heterogeneity on trade flows. According to Linders (2006), the differentiation of the product increases the research costs and the specificity of investments in which two agents would have to incur to turn commercial transactions operational. The research costs refer to those related to the search for new commercial partners in case of renounce or rupture of trade relations with previous partners. This mutual dependency situation increases the incentive for opportunistic behavior, which does not occur in the same intensity in the commercialization of homogeneous products.

To verify this question, the author estimated gravity equations to differentiate products, commodities and products that have price reference. The results showed that institutional effect on differentiated products was significantly greater. The institutional heterogeneity affected negatively and in the same way the three classes of products.

In fact, the uncertainty inherent to international transactions, in the form of opportunistic behavior and hold-up problem, coming from the specificity of factors, is especially relevant in this kind of transaction, as emphasized by Rodrik (2000).

The efforts made to verify the relationship between institutions and international trade made possible the perception that countries with solid institutions have better conditions of insertion on international trade and in more sustainable form. Furthermore, the studies available allow the understanding that institutional disparity between countries acted in the sense to reduce trade. Considering the beneficial effects of international trade, any factor restricting or favoring it deserves analysis, either in the aggregate or sectorial level.

In this sense, this work aims at contributing to the understanding and the verification of institutional heterogeneity effects on international trade flows of agricultural products. This questioning has its origin based on three aspects, namely, the importance of agricultural products as export items of developing and less developed countries, the low institutional quality observed in these countries compared to developed countries and the scarcity of empirical verifications of the relation between institutional disparity and trade flows in sectorial level.

The verification of the influence of institutions focusing agricultural sector is of great importance in the international trade, mainly for developing and less developed countries, as it responds for significant part of total export values.

To assess the importance or the magnitude of restrictions imposed to agricultural sector by institutional environment, it is necessary to know the effect of institutions on the trade flows of this sector. The understanding of these relations would allow foreseeing the gains, in terms of commercial flows, arising from the efforts in promoting improvements in the institutional environment of developing and less developed countries.

The relevance of the questioning proposed in this research becomes even more evident when recent alterations occurred in the production and commercialization of agricultural products are observed. According to Silva (2005), the growth of population, of urbanization and of income, the liberalization of the trade and the mobility of capital flows, the advances in transportation, logistics, information, communication and biotechnology have favored the specificity of assets employed in the production, processing and commercialization of agricultural products, increasing uncertainties in transactions and generating the need to adopt contracts as response of supply chains intended to minimize their transaction costs.

Therefore, as highlighted by the author, for growing adoption of contracts in supply chains to be translated into improvements in the performance of agricultural sector, in the form of regularity of supply of raw-materials, better quality inputs, better access to credit, among others, it is necessary the existence of favorable institutional environment if problems related to contractual hold-ups are to be avoided.

Thus, the existence of an adequate institutional infrastructure would be relevant in the sense of allowing contractual mechanisms adopted by agents linked to the sector to be effective and actually reduce uncertainties inherent to their relations reflecting on the competitiveness of the sector.

It is important to consider that even if the countries reduce its barriers to trade, commercial flows with partners cannot rise if they do not believe that contracts will be complied with or the payments done. So, the institutional quality is important for trade to happen (WORLD TRADE ORGANIZATION – WTO, 2004).

Lastly, as highlighted, most of empirical works that evaluated the effect of institutions on trade are based on aggregate flows. The main empirical verifications at sectorial level were conducted by separating products in manufactured and non-manufactured (MÉON, SEKKAT, 2008) or following the classification proposed by Rauch (1999) as done by Linders (2006) and Ranjan and Lee (2007).

Regarding the institutional effects on trade of agricultural products, the only studies in the literature were those of Bojnec and Ferto (2009) and of Huchet-Bourdon and Cheptea (2009) the firsts estimated gravity equations with the purpose of verifying the effect of institutional environment on the trade of agricultural and food products. The results confirmed that the institutional determinants have significant impacts on the trade of agricultural products and, in lesser extent, on flows of food. The institutional heterogeneity reduced trade in the sense that they increased transaction costs. Huchet-Bourdon and Cheptea (2009) estimated gravity equations and performed the equality of means test with the purpose of verifying if the creation of the European Monetary Union (EMU) has contributed to reduce the effects of informal barriers, one of them being institutional environment, on agricultural trade. According to the authors, the creation of the EMU should promote the convergence of institutions, reducing its effect on trade. Although the authors had found significant effect of institutions on agricultural trade, evidences of institutional convergence using means test were not found.

It is important to consider that the cited works used aggregate institutional variables, that is, indicators that described the actual institutional environment for the whole economy. However, in this research, it is intended to avoid this limitation by using specific institutional variables for the agricultural sector as described in the methodology.

So, the main question to be answered with this research refers to the effects exerted by the heterogeneity of agricultural institutional environment on trade flows of agricultural products.

2. Theoretical Reference

The theoretical foundation that supported the analysis proposed in this research referred to the theory of gravity model. These theoretical aspects was proposed by Anderson and van Wincoop (2003) and Anderson and van Wincoop (2004).

3. Methodology

Based on the purpose of this work and in the theoretical considerations raised in the previous section, this one is intended to describe the empirical approach to be used. Reference is made to specifications and methods of estimation to be employed to obtain empirical gravity equations and to the method used for the elaboration of indexes that represented the institutional quality of the agricultural sector in sampled countries.

The implications of institutional heterogeneity on the flows of agricultural products can be measured through the equation

$$X_{ij,t} = \sum \phi_i + \sum \varphi_j + \sum \theta_t + \beta_1 \ln(Y_{i,t}) + \beta_2 \ln(E_{j,t}) + \beta_3 \ln(dist)_{ij} + \beta_4 front_{ij} + \beta_5 ling_{ij} + \beta_6 arc_{ij} + \beta_7 mc_{ij} + \beta_8 acp_{ij} + \beta_9 hi_{ij,t} + \varepsilon_{ij,t} \quad (4)$$

in which $\sum \phi_i$ and $\sum \varphi_j$ are invariant fixed effects in time for the exporter and importer countries; $\sum \theta_t$, the fixed effects for years of the sample; $Y_{i,t}$ and $E_{j,t}$, the agricultural production of exporter country and the consumption of agricultural products in importer country in time t ; $dist$, the distance between exporter and importer countries; $front_{ij}$, dummy variable that assumes value one if they are two border countries and zero in opposite case; $ling_{ij}$, dummy variable that assumes value one if the two countries speak the same language and zero in opposite case; arc_{ij} , dummy variable that assumes the value one when countries are in the same regional trade agreement; mc_{ij} , dummy variable for countries that adopt the same currency; acp_{ij} , dummy variable for African, Caribbean and Pacific countries that have preferential access to European Union; $hi_{ij,t}$, the institutional heterogeneity measure in a way described below.

Adopting the same procedure as Bojnec and Ferto (2009) and Linders (2006) to measure institutional

heterogeneity, this work used a dummy variable that assumed value one if the difference of the composed index that measures the institutional quality between importer and exporter countries was greater than the standard deviation and zero in opposite case. Additionally, dummies were defined considering two and three deviations with the purpose of measuring if commercial partners with institutions significantly discrepant would be subject to major transaction costs.

The composed institutional index that measure the quality of institutional environment for the agricultural sector was built by means of a orthogonal factorial model, using public sector, security of rights, collective property in agricultural sector, part of informal employment in rural sector, adoption of international norms and pattern, adoption of national norms and patterns as variables. These variables are indicators of the quality of relevant institutional environment for the agricultural sector according to the *Centre D'Études Prospectives et d'Informations Internationales* (CEPII).

The gravity equation (4) is based on the theoretical equation given by (1) which can be estimated by different methods. In this work, the option was for the estimation of a Fixed Effects model using the non-linear Poisson Pseudo-Maximum-Likelihood (PPML) model, as suggested by Santos Silva and Tenreiro (2006), which allow the inclusion of null trade flows and avoid possible heteroscedasticity problems.

The elaboration of indexes representing adequately the agricultural institutional environment quality in the sample, based on variables proposed by the *Centre d'Études Prospectives et d'Informations Internationales* (CEPII), can be implemented through an orthogonal factorial model as described by Johnson and Wichern (2007).

The motivation for this procedure is that the institutional variables used are highly correlated, not allowing the inclusion in an econometric model without incurring in multicollinearity problems.

The estimation of orthogonal factorial model resulted in only one factor or score (which was already expected in function of the small number of original institutional variables and of the correlation between them) which represented an institutional index that encompassed different aspects of institutional quality in the agricultural sector. Therefore, the resulting index of factorial analysis was considered as a measure of global quality of institutions in the rural area of each country of the sample. This index was used to build up dummies of institutional heterogeneity, included in the equations as part of transaction costs function.

Given these considerations, in this study, a gravity model with data in panel for the period 2005 and 2010 was estimated, using 59 country data of trade flows of agricultural products. The period of choice took into consideration the availability of data of institutional variables, main subject of this study. The countries included in the sample represent a significant part of the world agricultural trade. It is important to highlight that were considered as agricultural products, all those defined in the Agricultural Agreement negotiated during the Uruguay Round among WTO country members. Trade flows of these products were added, originating the aggregate trade flow. The country codes included in the sample are: ARG, BGD, BOL, BRA, CAN, CHL, CHN, CIV, COL, CZE, DEU, DZA, EGY, ESP, EST, ETH, GAB, GBR, GHA, GRC, GTM, HUN, IDN, IND, IRL, ITA, JOR, JPN, KAZ, KEN, LBN, LKA, LTU, MAR, MDG, MEX, MLI, MUS, MYS, NGA, NOR, NZL, PER, PHL, POL, PRT, RUS, SAU, SEN, SGP, SWE, THA, TUN, TUR, UGA, UKR, USA, VEN, ZAF.

3.3 Data source

The data related to trade flows were obtained from *United Nations Commodity Trade Statistics Database*

(COMTRADE). The agricultural added values were obtained from the World Bank. The data base for variables related to distance, adjacency, common language and quality of institutional environment in agricultural area were obtained from the *Centre D'Études Prospectives et d'Informations Internationales* (CEPII).

4. Results

The results presented in this section are based in the estimation of theoretical gravity equations, that is, they considered the theoretical development of gravity model proposed by Anderson and van Wincoop (2003, 2004).

The estimated empirical model presented high value for the Pseudo R². In all specifications the value presented was over 0.80, indicating high level of adjustment of the models (Table 1).

The model estimates, generally presented as significant and with the expected signal. It deserves considering that these models, as described in the methodology, adopted different variables representing the institutional disparities between countries. Were considered as pairs of countries with distinct institutions those who possessed different quality of agricultural institutional environment in more than one (HI > 1 dp), two (HI > 2 dp) or three standard deviations (HI > 3 dp). The option for these variables aimed at determining whether countries with more accentuated institutional differences would be subject to greater transaction costs and, therefore, lesser trade flows.

Table 1 – Estimates of the gravity model through PPML model

Variables	HI > 1 dp	HI > 2 dp	HI > 3 dp
<i>ln(Y)</i>	0.2668* (0.1536)	0.592* (0.1532)	0.2626* (0.1529)
<i>ln(E)</i>	0.4794** (0.1937)	0.4749** (0.1934)	0.4769** (0.1925)
<i>ln(dist)</i>	-0.5744*** (0.0316)	-0.5696*** (0.0315)	-0.5645*** (0.0314)
<i>Ling</i>	0.2124*** (0.0707)	0.1986*** (0.0704)	0.1979*** (0.0703)
<i>Front</i>	0.6952*** (0.0733)	0.6556*** (0.0763)	0.6823*** (0.0745)
<i>Arc</i>	0.7090*** (0.0601)	0.7085*** (0.0602)	0.7147*** (0.0600)
<i>Mc</i>	0.7477*** (0.0713)	0.7327*** (0.0723)	0.7337*** (0.0719)
<i>Acp</i>	0.6374*** (0.0939)	0.7562*** (0.0977)	0.7069*** (0.0897)
<i>Hi</i>	0.1012** (0.0509)	-0.1317* (0.0729)	-0.3284** (0.1564)
Observations	17,110	17,110	17,110
Pseudo R ²	0.8003	0.8003	0.8013

Source: Research results.

Note: *** denote significance at 1%; ** denote significance at 5%; * denote significance at 10%; ns non-significant.

Before evaluating the results found for variable of major interest it is necessary to highlight that the other

gravity variables were significant, considering the standard levels of significance, and presented the expected sign. Furthermore, the magnitude of the coefficients were consistent with the literature.

The effect exerted by the main variable of interest in this research, presented the expected direction, except for institutional disparity represented by more than one deviation. In the first column, it can be observed that the coefficient of the variable institutional difference was significant and presented a signal opposite than expected. In its turn, the institutional disparity higher than two deviations was responsible for the reduction of trade flows by around 13%. The institutional heterogeneity higher than three deviations acted in the sense to reduce trade. According to the results, trade between countries with institutions disparate in more than three deviations is 32.84% lesser.

These results suggest that the difference of agricultural institutional environment quality between countries reduce trade flows. Moreover, the results indicate that the bigger the difference, the lesser the trade flows. Therefore, transaction costs between countries with unequal institutional arrangements are higher, affecting negatively the agricultural sector products trade.

In this sense, joint efforts between countries and also coordinated by international organisms promoter of trade integration in order to promote the improvement of the quality of agricultural institutional environment in emergent and less developed countries would increase trade, in the sense that it would contribute to reduce institutional disparities. The increase of resulting agricultural products trade flows would be important for the process of integration of these countries to the international trade, as the sector is relevant for its exports. Nevertheless, the effects exerted by other factors, such as regional trade agreements and the adoption of same currency seem outdo the effect exerted by institutional disparity.

5. Conclusions

The perception of the existence and the growing importance of intangible barriers to trade favored the emergence of questionings about the intensity of their effects. In this context come to light studies about relations between institutions and trade.

However, there is little empirical verification for the agricultural products sector, which is of great importance for the trade insertion in many developing and less developed countries.

In this sense, this work aims at contributing for the verification and the understanding of effects of institutional heterogeneity on agricultural international trade flows. It is important to stress that the study considered institutional indicators that represent adequately the relevant institutional environment for the agricultural sector.

According to the results, the effects exerted by the main variable of interest in this research, presented the expected course, except for the institutional disparity represented by more than one deviation, which presented positive signal and significant coefficient.

These results suggest that improvements in the agricultural institutional environment could promote trade. In this sense, issues such as property rights, quality of rural employment and adoption of national and international norms in agricultural activity are essential to enlarge trade flows between countries.

Lastly, it is important to stress that these improvements involve not only government action but also producers' action in the sense of organizing themselves and look for information about the market in which

they are in. The commercialization of agricultural products at international level requires the adhesion of producers to norms and rules involving not only the primary production but also the processing and the distribution of agricultural products. In general, such norms lead producers in the direction of environmental and social issues involving agricultural production. Examples of such norms are the Eurepgap and the Integrated Production (IP). Equally, government actions of incentive to the adoption of food security management systems such as Hazard Analysis and Critical Control Point (HACCP) could act in the sense of raising consumers' security on production quality enlarging international trade flows.

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