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Non-tariff measures in international coffee trade

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Non-tariff measures in international coffee trade

Abstract: This paper is focused on analyzing notification effects on TBT and SPS Agreements of worldwide green coffee exports. A gravity model was used to estimate Poisson Pseudo Maximum Likelihood (PPML) panel data, which considered the trade flow to be zero. Results indicated that notifications TBT would negatively affect coffee exports during the period from 1996 to 2010, but SPS notifications not.

Keywords: Coffee; international trade; non-tariff measures; gravity model.

Jel: F10; Q17.

1. Introduction

Coffee, especially green coffee is among the most important agricultural commodities in international markets. This is important for both the product's high value as well as the large number of importing countries. The high product's marketability in the international markets has great relevance in the producing and exporting countries' economies, the most prominent one is Brazil. According to the United Nations Commodity Trade Statistics Database - UNCOMTRADE (2011), Brazilian exports grew at a rate of 15.7% per annum during 2000 to 2008 and the latter year amounted to over four billion dollars. During that same period, other major producers and exporters were: Colombia, Vietnam, Guatemala and Indonesia.

However, in addition to challenges related to high transport costs, green coffee trade as well as many other agricultural products, is subject to a number of technical requirements, sanitary and phytosanitary measures. The use of these types of non-tariff measures (NTMs) by the importing countries may be due to corrections of asymmetric information, market failures or even protectionist objectives.

Although several studies have assessed the impacts of distortions to agricultural exports (Krissoff, Calvin and Gray, 1997; Schlueter, Weick and Heckel, 2009), whether tariff or non tariff measures, little research exist about the coffee market, maybe because coffee is a product that faces fewer tariffs and also because most of the world's consumption occurs in non-producing countries.

However, coffee exports technical and sanitary requirements have increased in recent years. Since the establishment of the World Trade Organization (WTO), mostly used by member countries to impose NTMs has been through notifications about agreements on technical (TBT) and sanitary measures (SPS).

Notifications to the TBT and SPS agreements are documents that importing countries send to the WTO normalizing or regulating the domestic market, with objectives to protect human, animal and plant health, and the environment from the risks associated with product coming from other countries.

Standards (voluntary) and regulations (mandatory) determine the characteristics that products must possess to enable them to enter the importing markets. In the case of green coffee, the majority of notices issued are related to risks associated with pesticides, chemical residues, food safety and protection of plants against pests and diseases.

When the rules and regulations contained in the notifications of SPS and TBT agreements go beyond the requirements needed, the coffee producers costs may become excessively high, which is characterized as protectionism and generating a negative effect on trade. If, on the other hand, compliance requirements contained in the notifications are met, so that possible asymmetries and market failures are reduced, trade can be expanded and the effects of NTMs are positive.

Thus, the purpose of this research is to quantify and analyze the effect of such notifications on green coffee exports of the main exporting countries. The knowledge of the effects of TBT notifications and SPS agreements allow both importing and exporting countries, to decide on trade and market strategies that may increase the gains from trade.

Beyond this introduction, this research is organized as follows. The next section introduces and reviews some major studies that have used gravity models to analyze the effect of NTMs on trade. The subsequent section presents and discusses the results while the last section discusses the research's conclusion.

2. Methodology

The effects of non-tariff measures (NTMs) on distinct economic and social variables of countries are contextualized in different studies, which to aimed to quantify their impacts on international trade (ANDERSON and van WINCOOP, 2003 and 2004; BOÛET *et al.*, 2004; WINCHESTER, 2007). In of all these studies, the increased importance of NTMs in international trade is emphasized, given the numerous elevated increases of new norms and regulations.

In Bureau and Beghin's paper (2001) a synthesis of methods that have been used to measure the effects of the NTMs in agricultural trade can be found. Among several methods, the authors describe the gravity model as adequate to measure the implications of a mix of trade factors, among which can be found, in addition to the NTMs, preferences linked to internal trade as "domestic bias" and "frontier-effect". For these authors, gravity models, in addition to quantitative variables, allow the use of binary variables, which are often used to characterize contiguity among common countries, languages and cultures, accessions to preferential agreements and NTMs, among other qualitative characteristics that affect trade.

Since the beginning, Tinbergen's papers (1962) and Linneman's (1966) demonstrated, the gravity model has often been used to explain bilateral trade flows. The basic idea expressed that structure predicts the trade between two countries will be greater, the greater their economic masses and the smaller the physical distance between them is. Thus, the basic equation of gravity can be presented as follows:

$$T_{ij} = a \frac{M_i M_j}{d_{ij}}, \quad (1)$$

where T_{ij} are the exports of country i for the importing country j ; a is a proportionality constant; M_i and M_j are the GDPs of the countries, which directly affect the trade among

them; and d_{ij} is the geographical distance between countries, considered as a proxy for all trade costs, including transportation.

Different variables have been added to this basic model and in a way, used as a tool to identify other international trade flow determinants. The factors that negatively affect trade are, many times, related to barriers imposed by international trade policy, as in the case of quotas, tariffs and also NTMs.

The use of gravity models to measure the impact of trade barriers (tariffs and NTMs) in international trade can be found in Lee and Swagel's (1997), Deardorff and Stern's (2001), Anderson and van Wincoop's (2004) and Winchester's (2007) research. The theoretical rationale of the model proposed by Anderson and van Wincoop (2004) considers that marketed products are differentiated by the place of origin and with preferences represented by a CES utility function. The gravity equation suggested by the mentioned authors can be represented by:

$$\ln X_{ij} = \alpha + \delta_1 \ln Y_i + \delta_2 \ln Y_j + \sum_{m=1}^M \lambda_m \ln Z_{mij} - (1 - \sigma) \ln \Pi_i - (1 - \sigma) \ln P_j + \mu_{ij}, \quad (2)$$

where X_{ij} are the exports of country i for the importing country j ; Y_i and Y_j are, respectively, GDP of the exporting country i and the importer j ; Z_{pij} , set of variables that represent trade barriers that comprehends variable $m=1$ until M ; σ , is the elasticity of substitution among all goods; Π_i and P_j , are variables of external and internal trade resistance, respectively; and μ_{ij} , error term.

Often, research that uses the gravity model use aggregate trade data between countries. However, Anderson and van Wincoop (2004) state that analyses with disaggregated trade data are also plausible and necessary, since there are great sector variations in terms of trade flows and costs. In this sense, this research focuses on analyzing the international trade of the five main countries that produce green coffee from

1996 to 2010 (Brazil, Colombia, Vietnam, Guatemala, Indonesia, Germany and Italy¹), by analyzing the cost effects of transportation and tariff and non-tariff measures on trade. Thus, the following functional form was adopted for the gravity model used in this research:

$$\ln X_{ijt} = \delta_0 + \delta_1 \ln Y_{it} + \delta_2 \ln Y_{jt} + \delta_3 \ln D_{ij} + \delta_4 DAdj_{ij} + \delta_5 \ln(1 + \tau_{ijt}) + \delta_6 Q_{ijt} + \mu_{ijt}, \quad (3)$$

where X_{ijt} are the coffee exports of each exporter (i) to the importing country j in the year t; Y_{it} , GDP of the exporter i and of the importing country j in the year t; D_{ij} , distance in km from country i to country j; $DAdj_{ij}$, dummy for adjacency, which is 1 if the importing country which has a common territorial border with the exporter; τ_{ijt} , tariff imposed by country j to i; Q_{ijt} , dummy that has value 1 if country j imposes any notification to the imported coffee, in the year t; δ 's, are the coefficients to be estimated, with expected positive signs, except δ_3 , δ_5 and δ_6 ; and μ_{ijt} , error term. Transportation costs are represented by the distance variables (D_{ij}) and by dummy for adjacency ($DAdj_{ij}$). Trade barriers are represented in the equation by tariffs ($1 + \tau_{ijt}$) and dummy for notifications to agreements on technical measures and health measures (Q_{ijt}).

It is important to say that, applying the gravity equation logic to trade flows of a particular good is not entirely straightforward. The idea that trade flows between countries i and j increase the GDP in country i is not necessarily true, since it could trade more goods instead of a higher volume of each good.

The notifications came from the Central Registry of Notifications from WTO, which provides access to information related to food safety, animal and plant health (sanitary and phytosanitary or SPS measures) and/or regulations, standards and certification procedures (TBT measures).

Regarding the data period under analysis, it is emphasized that it includes the period 1996 to 2010, totaling 12105 observations. This period was chosen because of the availability of existing information about notifications and trade.

In the specific case of analyzed product, the absence of coffee export flows of exporting countries to some consumer countries had to be considered, in some of the years. Limão and Venables (2001) research similarly chose to consider zero values for such observations, which made the variable dependent on the equation (3), censored in part of the sample.

In this case, the parameters were obtained from the PPML panel data model, with fixed effects for time, exporters and importers. The use of PPML, as suggested by Santos Silva, eliminates problems of bias and inconsistency caused by zero trade flows. In addition, the use of fixed effects control variables and the effects of non-observable characteristics, as proposed by Baldwin and Taglioni (2006).

Data

Table 1 presents the source and description of the variables used in the analysis.

Table 1. Data description and source of variables used in this paper

| Variable | Description | Source |
|--------------|--|---|
| X_{ijt} | FOB value of green coffee exports of the exporting country (i) for each of the importing countries (j), in the year t, in dollars. | UNCOMTRADE (2011) |
| Y_{nt} | GDP of exporting and importing countries, in the year t, in dollars. | International Monetary Fund (IMF, 2011) |
| D_{ij} | Variable distance, in km, which uses latitude and longitude of the most important cities in terms of population; | CEPII (2008) |
| τ_{ijt} | Tariff imposed by the importing country (j) of the coffee exporting country (i), in%, in the year t | ITC – International Trade Centre (2011) |
| Q_{ijt} | Dummy variable that assumes values 1 if the country j issued notifications (TBT and/or SPS) to the coffee imported from country i, in the year t, and zero for the others. | WTO – World Trade Organization (Documents online, 2011) |

Source: Author's elaboration.

3. Results

The results for estimating the proposed model with the variables discussed above are presented in Table 2. The model was estimated using two separate equations, M1 and M2, and used 12105 observations. The M1 equation was estimated with the basic gravitational variables plus one non-tariff measures variable (TBT plus SPS notifications) on coffee exports. The M2 equation was estimated with two dummy variables for NTMs, one for TBT notifications and one for SPS notifications.

The logic of gravity models when used to explain aggregate trade flows is that the higher the income or GDP of the exporting country, the greater its capacity, and thus increased the level of trade. In the case of exports of green coffee, there was an inverse relationship between changes in countries' GDP and exports. Negative signs and no significant coefficients can be found when analyzing a specific product or sector of an economy. The explanation would come from the possibility of substituting one product for another in relative production and exports.

Regarding the GDP of coffee importing countries ($\ln Y_{jt}$), a direct and significant relationship with the exported quantities was noted. These variables, in the M1 and M2 equations, suggest that an increase in GDP of importing countries generate increases in expected coffee exports.

Table 2. Results obtained in the estimation of gravity model by the PPML method

| Variable | Model 1 (M1) | Model 2 (M2) |
|-----------------------|----------------------|----------------------|
| | Coefficient | Coefficient |
| $\ln Y_{it}$ | -0.003ns (0.047) | -0.002ns (0.047) |
| $\ln Y_{jt}$ | 0.060*** (0.009) | 0.060*** (0.009) |
| $\ln D_{ij}$ | -0.221*** (0.015) | -0.221*** (0.015) |
| $DAdj_{ij}$ | -0.069ns (0.044) | -0.069ns (0.044) |
| DAL_j | -5.591*** (1.014) | -5.592*** (1.014) |
| $\ln(1 + \tau_{jit})$ | -0.169ns (0.225) | -0.167ns (0.225) |
| $(TBT+SPS)_{jit}$ | -0.412** (0.205) | - |
| TBT_{jit} | - | -0.413** (0.205) |
| SPS_{jit} | - | -0.113ns (0.079) |
| Pseudo log-likelihood | 2969.79 | 3040.53 |
| R-squared | 0.670 | 0.670 |

Numbers in parentheses are semi-robust standard errors; ***, ** e ns correspond to the significance levels of 1%, 5% and not significant, respectively.

Source: Author's elaboration.

The coefficients of variable distance are consistent with those expected, that is, the greater the distance between exporters and importers, the lower the trading of green coffee. This result shows that the cost of transporting the product is still an important factor in international trade.

The coefficient of dummy variable for adjacency in both equations (M1 and M2) an expectedly demonstrated an opposite result, indicating no effect of neighborhood on the coffee trade. The fact that Brazil, for example, has common borders with Argentina, Paraguay and Uruguay does not affect trade between them. This result is contradictory when looking in terms of transportation costs. Theoretically, neighboring countries are geographically close and, in consequence, the costs of transport would be lower. However, the fact product transport between neighboring countries be done via highways, costs can possibly being too high.

To capture the effect of tariffs on exports of green coffee, the variable $\ln(1 + \tau_{jit})$ was used in this study. The incidence of tariffs on international trade in green coffee can be considered low when compared to other products, since most consumer countries are not producing. Of the 156 different countries considered in this research, 53 don't have adopted *ad valorem* tariffs on product imports and 34 use rates between 0.1% and 5%. For this reason, the results showed that the tariffs aren't a trade policy with broad impact on international exports. The coefficient found for this variable was not statistically significant and thus it appears that international trade in green coffee not affected by it.

In addition to tariff barriers, the effect of notifications to TBT and SPS agreements, as possible non-tariff barriers applied to the product during the analysis period, was also considered. Between 1996 and 2010, the green coffee international trade had 235 notifications, being 79.57% SPS and 20.43% TBT². The main objectives were used in the SPS, in order of importance: food security, protection of human health or safety and plant protection. The TBT measures, the main objectives were food security and protection of human health or safety.

In the model M1, which uses an aggregate measure to capture the effects of TBT and SPS requirements, it was found negative effects on trade in green coffee. In the model

M2, which uses a dummy TBT and one for SPS, it was found that only measures affecting trade TBT and these effects were negative. These results may suggest that the adaptation cost of producers, for SPS measures, were not large enough to restrict the sale of grain. On the other hand, the costs of compliance with the TBT requirements were large and thus these measures restricted trade.

4. Summary and conclusions

This research highlights the analyzed effects of notifications on TBT and SPS agreements specifically on international green coffee trade between 1996 and 2010. For such, a widely used gravity model was used, to explain trade flows between countries. The estimation of a PPML model with panel data, which considers the occurrence of zero trade flows, commonly found in specific product analysis or sectors.

The results showed that, in aggregate, the SPS and TBT measures have restricted the trading of green coffee over time. Separately, it was found that only TBT measures affect the trade and this effect was negative. These results can be justified by the high cost of adequacy of the exporting countries. On the other hand, the effects of tariffs were not significant for trade, importing countries also may be using the MNT as a form of protectionism.

It is important to consider that notifications to TBT and SPS agreements have been used frequently in the news, but not always as negative factors for trade, since they often serve to establish standards and norms that facilitate it. In this study case, it was confirmed that the green coffee notices issued had negative product export effects. However, such effects would only be found in countries that constantly demanded meeting these notification requirements.

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¹ It should be emphasized the fact that the types of coffee produced and marketed by the countries that make up the model are different. Those who produce both Arabica and the Conilon, for example, are Brazil, Indonesia and Guatemala. Colombia is dedicated to the production of Arabic and Vietnam to the Conilon. However, due to the unavailability of specific data on international trade in each of these types of coffees, this paper is restricted to the analysis of green coffee as a whole.

² It was considered the notifications issued for ratings in 2, 4 and 6 digits of Harmonized System (HS). This is because a notification intended to HS2 affects the trade classification of green coffee, which is HS6.