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TRADE FACILITATION, THE AUTHORIZED ECONOMIC OPERATOR AND THE SINGLE WINDOW: A GRAVITY MODEL APPROACH

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Abstract

This paper was presented at the Inaugural INCU Global Conference "Trade Facilitation Post-Bali: Putting Policy into Practice" 21–23 May 2014 in Baku, Republic of Azerbaijan. The authors analyze the impact of trade facilitation measures on international trade flows. For that purpose a gravity model such as in Wilson, Mann and Otsuki (2005) was used. The authors used a more recent dataset, a panel that included trade data from 2011 and 2012 for 75 countries. In order to measure the impacts of trade facilitation measures, the authors included dummy variables for the presence of an Authorized Economic Operator program, for the existence of a Single Window program in the countries of the sample and for the existence of a Mutual Recognition Arrangement between pairs of countries in analyzed sample. Those three variables were used as a proxy for trade facilitation.

The authors discuss the results which show that the presence of an Authorized Economic Operator program and the existence of a Single Window program will improve countries' trade performance. By contrast, the existence of a Mutual Recognition Arrangement will not necessarily improve the countries' trade performance. These results suggest that in general trade facilitation measures as a whole will help countries improve their trade performance.

Keywords: trade facilitation; Authorized Economic Operator; Single Window; Mutual Recognition Arrangement; gravity model.

Introduction

Recently, the World Trade Organization (WTO) has chosen its new General Director, the Brazilian Roberto Azevêdo. This took place in a context of significant challenges for the organization. Although its mechanism of dispute settlement is working rather smoothly, the WTO has failed for more than a decade in getting its members to agree on sewing a new agreement on liberalizing global trade, amid deep divisions between developed and developing countries. In the meantime, many of the traditional engines of global commerce moved to hold bilateral and regional trade agreements outside the WTO.

The great challenge of WTO's new Director-General is to revive the Doha Round or at least break the deadlock formed over twenty years and convince both developed and developing countries to resume multilateral negotiations to liberalize international trade (Sá Porto et al., 2013, p. 7). However, one theme is indeed thriving at the WTO discussions, trade facilitation. Indeed, it was the only topic discussed in the latest WTO conference at Bali in December 2013 that was able to close a deal.

Defined as the "simplification, harmonization, standardization and modernization of procedures of international trade, trade facilitation measures help countries reduce its barriers and transaction costs, which will in turn help ensure the predictability of operations and contribute to the competitiveness of countries that engage on international trade" (Macedo and Sá Porto, 2011, p.162). Moreover, as protectionist tariff rates have fallen, assessing how other factors (nontariff measures as trade facilitation measures) affect trade has increasing policy relevance (Wilson, Mann and Otsuki, 2005, p. 841).

The objective of this paper is to analyze the impacts of selected trade facilitation measures on international trade flows. For that we used a gravity model, such as in Wilson, Mann and Otsuki (2005). However, we used a more recent dataset, a panel that included trade data from 2011 and 2012 for 75 countries. Moreover, to measure the impacts of trade facilitation measures, we included dummy variables for the presence of a Authorized Economic Operator program, for the existence of a Single Window program in the countries of our sample and for the existence of a mutual recognition arrangements between pairs of countries in our sample. Those three variables were used as a proxy for trade facilitation.

The paper is structured as follows. After this brief introduction, in Section 2 we review the recent literature on trade facilitation and on the gravity model, while in Section 3 we present the model and the data used in this article. In section 4 we present our main results, and in section 5 we present our conclusions and possible further research on this subject.

1. Literature review

In this section we will briefly review the existing literature on trade facilitation and on the gravity model. We will start with a discussion on the definition of trade facilitation, its use and role on fostering international trade. Then we will introduce the gravity equation and analyze its use on models that seek to evaluate the empirical literature that uses it to analyze different impacts on international trade, of regional agreements and of trade facilitation measures.

1.1 Trade facilitation

We will briefly review the existing literature on trade facilitation In this subsection. First, we start with a definition of trade facilitation, which is known as the set of measures that seek to simplify, harmonize, standardize, and modernize the international trade procedures. It comprises customs procedures, logistics, licensing procedures and documentation, insurance and other financial requirements that are imposed on the entry or exit of goods from countries (Behar at al. 2011).

Trade facilitation (TF) seeks to harmonize the several rules between countries in order to promote greater efficiency, transparency and predictability based on norms, standards, and internationally accepted practices. In this sense, TF is a tool that can potentially reduce barriers and transaction costs, in order to help ensure the predictability of operations and to thus contribute

to the competitiveness of a country (Scorza 2007; Macedo & Sá Porto 2011).

There are some TF measures that could be used as a proxy for their effect on the national economies. One such measure is the Authorized Economic Operator (AEO) program, which is defined as a "party involved in the international movement of goods in whatever function that has been approved by or on behalf of a national Customs administration as complying with WCO or equivalent supply chain security standards" (WCO 2014a, p.3). Another common TF measure is the Single Window (SW) program, which is defined as "a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once" (UN/CEFAT, 2005, p.3). Yet another important TF measure is the Mutual Recognition Arrangement (MRA), which is an international arrangement based on an agreement by which two or more countries agree to recognize one another's conformity assessments regarding TF measure. "The objective of Mutual Recognition of AEO is that one Customs administration recognizes the validation findings and AEO authorizations by the other Customs administration issued under the other programme and agrees to provide substantial, comparable and – where possible – reciprocal benefits/facilitation to the mutually recognized AEOs. This recognition is generally premised on the existence or creation of both relevant legislation and operational compatibility of both or more programmes" (WCO 2014b, p.127).

One interesting issue is how to measure TF and how countries are positioned amongst themselves in the adoption of trade facilitation measures. The Enabling Trade Index was created by the World Economic Forum, and measures the extent to which individual economies have developed institutions, policies, and services facilitating the free flow of goods over borders and to destination (WEF 2014). It includes four areas: market access; border administration; transport and communication infrastrucuture; and business envirionment. Each of the these four subindexes in turn is composed of a number of pillars of enabling trade, such as domestic and foreign market access; efficiency of customs administration; efficiency of import-export procedures; transparency of border administration; availability and quality of transport infrastructure; availability and quality of transport services; availability and use of ICTs; regulatory environment; and physical security.

Another important topic within the TF literature is the evaluation of the measures that countries adopt in order to implement a TF environment. For example, in the case of Brazil, CAMEX (2012) evaluated the various TF measures adopted by the country until 2012. And Sá Porto et al. (2013a) presented the country's achievements by adopting Trade Facilitation measures. They also pointed out what were the key challenges related to the implementation of such measures in the country.

Still on Brazil's experience on the implementation of TF measures, Morini (2013) analyzes the implementation of Blue Line, the customs compliance program, a type of Authorized Economic Operator (AEO) program that was implemented in the country. Macedo and Scorza (2013) in turn approach the country's Single Window (SW) program, and discussed the issues that relate to its implementation such as technical standards, data harmonization and information exchange. Finally, Sá Porto et al. (2013b) evaluate Brazil's AEO and SW implementation challenges in the light of Europe's experiences in the implementation of these measures.

1.2 The Gravity Model

The Gravity model has been extensively used in international economics. It was first proposed in order to account for the factors that explained the size of trade flows between two countries. These factors were of three types: one type includes the factors related to the total potential supply of the exporting country. A second type includes the factors related to the total potential demand of the importing country. And a third set of factors was the resistance to trade, be it natural or artificial trade resistance (Sá Porto 2002, p.8). These three types of factors are represented in the original gravity model, proposed independently by Tinbergen (1962) and Pöyhönen (1963), and later refined by Linnemann (1966):

$$X_{ij} = a_0 (Y_i)^{a1} (Y_j)^{a2} (N_i)^{a3} (N_j)^{a4} (Dist_{ij})^{a5} e^{(Pref)\,a6} (e_{ij}), \quad (1)$$

where X_{ij} is the dollar value of exports from country i to country j; Y_i is the nominal value of country i's Gross Domestic Product (GDP); Y_j is the nominal value of country j's GDP; N_i is the population of country i; N_j is the population of country j; $Dist_{ij}$ is the distance between the commercial centers of the two countries, and is used as a proxy for the trade resistance variables; Pref is a dummy variable which equals to 1 if both countries belong to a specific preferential trade area and zero otherwise; and e_{ij} is the error term. The coefficients a_0 through a_6 are to be estimated by the regression.

The gravity equation has been very successful in explaining trade empirically; the estimation of the equation above applied to the trade of 80 countries, explained some 80 percent of the variance of the data (Sá Porto 2002, p.10). It has also been used pervasively in models that try to assess the welfare effects of economic integration. Some studies have tried to evaluate the impacts of economic integration on the different regions of participating countries, such as Bröcker (1988), Sá Porto (2002), Sá Porto and Canuto (2002), Sá Porto and Canuto (2004), Sá Porto and Azzoni (2007), among others.

With respect to the use of gravity models on trade facilitation issues, the main contributions come from Wilson, Mann and Otsuki (2003) and Wilson, Mann and Otsuki (2005). In the first article, the authors use a gravity model to evaluate the relationship between trade facilitation and trade flows in the Asia-Pacific region. They used four different indicators for measuring trade facilitation: port efficiency, customs environment, regulatory environment, and e-business usage. Besides the variables used in traditional gravity model such as the one in equation (1) above, they included other variables such as tarrifs. They found that regulatory barriers and port inefficiency deter trade and improvements in customs and greater e-business use significantly expand trade, but to a lesser degree than the effect of ports or regulations.

Wilson, Mann and Otsuki (2005) continued that study; they also used a gravity model and four TF indicators: port efficiency, customs environment, regulatory environment, and service sector infrastructure. But they expanded significantly the sample of countries to 75 in the period 2000-2001. Moreover, they designed a simulation to estimate the effect of improved trade facilitation on trade flows. They found that increased trade in manufacturing goods from trade facilitation improvements in all four areas yields increases in both exports and imports. Most regions increase exports more than imports in large part by increasing exports to the OECD market. The South Asia region has the greatest potential for both export and import growth, with export gains greater than import gains. In the simulation side, they found that improvement in all

four forms of trade facilitation of the 'below-average' countries 'halfway' to global average yields an increase in global trade of $377 billion.

2. Model and data

In this section we will present our model designed to evaluate the impacts of trade facilitation measures on international trade flows. We use a standard gravity model, such as the one in Wilson, Mann and Otsuki (2005) or the one in Sá Porto and Azzoni (2007). We use traditional variables to explain trade, such as importer's and exporter's GDP, importer's and exporter's population, distance between the capital of the importer to the capital of the exporter, and dummy variables for preferential trade agreements: Asean, APEC, FTAA, NAFTA, LAIA, AUNZ, Comesa, Mercosur, EU and SADC.[1] We also used dummy variables for adjacent countries and for eight different languages: English, French, Spanish, Arabic, Chinese, German, Portuguese and Russian.

But, unlike Wilson, Mann and Otsuki (2005), instead of using their four indicators to measure the impacts of trade facilitation measures, we chose three different dummy variables: one for the presence of a Authorized Economic Operator (AEO) program in the importer country, one for the existence of a Single Window (SW) program in the importer country, and one for the existence of a mutual recognition arrangement (MRA) between the pairs of countries in our sample. Those three variables were used as a proxy for trade facilitation.

Moreover, we used a more recent dataset, a panel that includes trade data for 75 countries for the years 2011 and 2012. Thus, our chosen model is as follows:

$$\ln X_{ij} = \ln a_0 + a_1 \ln Y_i + a_2 \ln Y_j + a_3 \ln N_i + a_4 \ln N_j + a_5 \ln Dist_{ij} + a_6 Adjacent + a_7 English + a_8 French + a_9 Spanish + a_{10} Arabic + a_{11} Chinese + a_{12} German + a_{13} Portuguese + a_{14} Russian + a_{15} Asean + a_{16} APEC + a_{17} FTAA + a_{18} Nafta + a_{19} LAIA + a_{20} AUNZ + a_{21} Comesa + a_{22} Mercosur + a_{23} EU + a_{24} SADC + a_{25} AEO + a_{26} MRA + a_{27} SW + \log e_{ij} \quad (2),$$

where X_{ij} is the dollar value of exports from the country i to country j; Y_i is the nominal value of country i's Gross Domestic Product (GRP); Y_j is the nominal value of country j's GDP; N_i is the population of country i; N_j is the population of country j; $Dist_{ij}$ is the distance between the commercial centers of country i and country j; Adjacent is a dummy variable equal to 1 if both countries are adjacent (share borders); English, French, Spanish, Arabic, Chinese, German, Portuguese, Russian are dummy variables equal to 1 if both countries speak that language, and zero otherwise; Asean, APEC, FTAA, Nafta, LAIA, AUNZ, Comesa, Mercosur, EU, and SADC are dummy variables equal to 1 if both countries belongs to that bloc, and zero otherwise; AEO and SW are dummy variables equal to 1 if the importing country has implemented a Authorized Economic Operator or a Single Window program, respectively, and zero otherwise; MRA is a dummy variable equal to 1 if both countries have implemented a mutual recognition arrangement between themselves. The function of the last three variables is to capture the impact of trade facilitation measures on international trade flows, thus acting as a proxy for trade facilitation.

[1] Asean = Association of Southeast Asian Nations; APEC = Asia-Pacific Economic Cooperation; FTAA = Free Trade Area of the Americas; NAFTA = North America Free Trade Area; LAIA = Latin American Integration Association; AUNZ = Australia - New Zealand; Comesa = Common Market for Eastern and Southern Africa; Mercosur = Southern Common Market; EU = European Union; SADC = Southern Africa Development Community.
For a complete and updated list of regional trade arrangements and its comprising countries, go to the WTO's site: http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx

We estimated three different equations[2]: a Cross Section 2011 (CS11) model, with cross section data for the year 2011; a Cross Section 2012 (CS12) model, with cross section data for the year 2012; and a Pooled Cross Section (PCS) model, a panel data with pooled cross section data for the years 2011 and 2012.[3]

3. Results

The results of the three models are displayed in Table 1. The coefficients for GDP and for distance have the expected signs and are significant in the three models. The coefficients for population are significant only in one case (for the CS12 model), but had the wrong sign (it should have been positive. Thus, GDP and distance are important to explain trade between countries in our sample of 75 countries in the 2011-2012 period. These results are similar to the ones obtained in other studies by the authors cited in the literature review section.

Regarding the role of the dummy variables, the adjacency dummy was significant in all models, indicating that even when we control for distance, countries tend to trade more with neighbouring countries. As for the language dummies, the only languages that were significant and had the right sign for the coefficient in all models were English, Spanish, Chinese and Russian, indicating that, *ceteris paribus*, the countries in which those languages are spoken tend to trade more than the rest of the countries in the sample.

As for the regional economic integration dummies, the only blocs that were significant and had the right sign for the coefficient in all models were APEC and SADC. This means that, *ceteris paribus,* countries that participate in these blocs tend to trade more than the rest of the countries in the sample. Note that the coefficients for the European Union and for Nafta (except for one model) were significant in all models but had the wrong sign (negative sign), which were unexpected results. Note also that the coefficient for Mercosur was not significant, unlike previous results of other authors (e.g., Sá Porto and Canuto 2004, Sá Porto 2002), showing that the trade within that bloc has lost relevance over time, due to political problems in Argentina and the resulting protecionist policies adopted by that country.

Finally, regarding the results for the trade facilitation dummies, we notice that all three variables were significant in all models; however, only AEO and SW have the expected signs, whereas MRA does not. This means that, controlling for all other variables in our model, the role of an Authorized Economic Operator program and the the role of a Single Window program is positive for world trade. That is, the presence of a AEO program and a SW program will improve countries' trade performance. By contrast, the coefficient for MRA was negative, whereas we expected a positive coefficient (the presence of a MRA was supposed to improved international trade). This shows that, *ceteris paribus*, the existence of a Mutual Recognition Arrangement will not improve the countries' trade performance. These results suggest that in general trade facilitation measures as a whole will help countries improve their trade performance.

[2] The source of the trade data is UNCTAD (2014). The GDP and the population data for the countries in the sample was obtained from the World Bank (2014). The distance, adjacency and language information were extracted from the World Atlas MPC CD-ROM. The information on regional blocs comes from WTO (2014). The information on the Authorized Economic Operator (AEO) programs and on the Mutual Recognition Arrangements (MRA) comes from WCO (2014b). Finally, the information on the Single Window (SW) programs comes from WCO (2011).

[3] The three equations were estimated using the Gretl software.

Table 1 - Gravity Equation Coefficients Estimates for the Trade Flows between 75 Countries, CS11, CS12 and PCS models, 2011 – 2012

Variable	CS11	CS12	PCS
$Constant_{a_0 ij}$	-24,83*** (0,74)	-25,05*** (0,69)	-24,89*** (0,51)
Y_i	1.04*** (0.02)	1.19*** (0.02)	1.11*** (0.02)
Y_j	0.97*** (0.02)	0.96*** (0.02)	0.97*** (0.02)
N_i	-0.01 (0.02)	-0.13*** (0.02)	-0.07 (0.02)
N_j	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
$Dist_{ij}$	-1.06*** (0.03)	-1.20*** (0.03)	-1.13*** (0.02)
Adjacency	0.54*** (0.28)	0.41*** (0.15)	0.48*** (0.11)
English	0.62*** (0.17)	0.51*** (0.11)	0.57*** (0.08)
French	-0.81 (0.77)	-1.16 (0.73)	-0.98 (0.54)
Spanish	1.00*** (0.17)	1.39*** (0.16)	1.19*** (0.12)
Arabic	0.80 (1.39)	0.78 (1.26)	0.79 (0.94)
Chinese	1.30** (0.57)	1.20** (0.52)	1.25** (0.39)
German	0.08 (0.81)	-0.16 (0.74)	-0.03 (0.55)
Portuguese	1.16 (1.38)	-1.32 (1.25)	-0.58 (0.93)
Russian	1.27*** (0.45)	2.34*** (0.41)	1.80*** (0.30)
Asean	0.72 (0.46)	0.76* (0.42)	0.74 (0.31)
APEC	1.07*** (0.12)	1.11*** (0.11)	1.10*** (0.08)
FTAA	0.11 (0.15)	-0.17 (0.14)	-0.17* (0.10)

NAFTA	-1.61* (0.82)	-1.20 (0.75)	-1.41** (0.56)
LAIA	0.31 (0.24)	0.38 (0.23)	0.35** (0.17)
AUNZ	0.59 (1.39)	0.22 (1.26)	0.41 (0.94)
Comesa	0.24 (0.84)	-0.51 (0.77)	-0.14 (0.57)
Mercosur	0.78 (0.48)	0.01 (0.44)	0.39 (0.33)
EU	-0.35** (0.16)	-0.67*** (0.14)	-0.51*** (0.11)
SADC	3.04*** (0.85)	2.63*** (0.78)	2.83*** (0.58)
AEO	0.41*** (0.07)	0.25*** (0.06)	0.33*** (0.05)
SW	0.46*** (0.06)	0.63*** (0.06)	0.54*** (0.04)
MRA	-0.51*** (0.19)	-0.57*** (0.18)	-0.54*** (0.13)
R^2	0.67	0.73	0.70
Number of observations	5,166	4,998	10,164

Note: The significance levels at 10%, 5% and 1% levels are denoted by *, ** and ***, respectively, one-tail test. X_{ij} (trade) is the dependent variable. Standard errors are given in parentheses. All variables except dummies are expressed in natural logarithms for all models. Estimation by OLS.

Summary and concluding remarks

Trade Facilitation is a key theme of the Doha Round of World Trade Organization multilateral negotiations. Whereas negotiations on signing an agreement on liberalizing global trade are stalled, an agreement on trade facilitation was reached at last year's WTO meeting in Bali. This shows the importance of this theme on today's trade arena and for multilateral trade liberalization, in a time where many countries are "going regional", that is, adopting regional (rather than multilateral) trade agreements.

In this article, we analyzed the impact of trade facilitation measures on international trade flows by means of a gravity model, using data from 2011 and 2012 for 75 countries. We included three dummy variables as a proxy for trade facilitation measures, the presence of a Authorized Economic Operator program, the existence of a Single Window program, and the existence of a Mutual Recognition Arrangement between pairs of countries in our sample.

We found that the presence of an Authorized Economic Operator program and the existence of a Single Window program will improve countries' trade performance. By contrast, the existence of a Mutual Recognition Arrangement will not necessarily improve the countries' trade performance. These results suggest that in general trade facilitation measures as a whole will help

countries improve their trade performance.

This study can be extended in several ways. First, other variables could be included to control for the presence of other effects on trade that could be otherwise attributed to our TF variables, such as tariffs, inflation and exchange rate. Second, other TF measures besides ours could be included, such as the ones included in Wilson, Mann and Otsuki (2005), in order to evaluate whether those programs (AEO, SW and MRA) play a larger role in trade facilitation. Finally, to account for possible econometric problems (such as the ones pointed by Cheng and Wall 1999) in the data, this study could be replicated using a fixed effects model and a first differences model, as in Sá Porto and Canuto (2004).

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