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The Impact of Immigration on Portuguese Intra-Industry Trade

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Abstract

This paper investigates the relationship between intra-industry trade (IIT) and immigration flows using a gravity model for the period 2000-2010 between Portugal and European Union's Member States (EU-27). The present study uses the methodology of Kandogan (2003) for separating IIT into its components horizontal (HIIT) and vertical intra-industry trade (VIIT).Using a panel data approach, our study find that immigration has a positive influence on Portuguese intra-industry trade. These results indicate that the immigration can reduce transaction costs between home and host country. We also consider in econometric model, the economic dimension which appears to exercise a positive effect on IIT. Our results confirm the hypothesis that there is a negative effect of transportation costs on trade.

Keywords: Gravity model, Horizontal and Vertical Intra-industry trade Immigration and Panel Data.

JEL Classification: C20, C30, F12, L10.

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1. Introduction

In recent years, the link between immigration and intra-industry trade has become an important issue in the economics literature. We examine this link between Portugal and European Union (EU-27). The period 2000-2010 was chosen on the basis of its providing a sufficient number of observations. The methodology uses a panel data approach. The panel is unbalanced due to the lack of information on some countries in all of the years analyzed. The motivation of this article reports on analyzing the relationship between immigration and Portuguese intra-industry trade.

Blanes (2005) shows that immigration is positively correlated with bilateral intra-industry trade in Spain for the period 1991 to 1998. The econometric results demonstrate that the stock of immigrations has a positive effect on the share of intra-industry trade. The study of Blanes (2005) demonstrates that immigration contributes to trade transactions costs reduction and this effect is associated with differentiated products.

White (2008) analyses the determinants of intra-industry trade (IIT) and the effect of immigration on trade flows. The author uses data for US trade for the period 1989-2001. White (2008) finds a positive correlation between immigration and IIT. The immigration also promotes a positive effect on horizontal and vertical intra-industry trade.

White (2009) uses US trade data for the period 1980-1997. This study find that immigration have a positive influence on US imports and exports respectively.

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Peri and Requena (2009) use a micro data from Spanish provinces for the period 1995 to 2008. Using a OLS and 2SLS estimator the authors concluded that immigration have a positive impact on Spanish exports.

Tadesse and White (2010) introduce the cultural distance and immigration to explain US international trade. This study shows that immigrants are found to exert a pro-export effect that partially offsets the trade-inhibiting effects of cultural distance.

The study of Leitão et al. (2010) examines the link between trade and migration flows using a gravity model for the period 1995-2007 between Portugal and European Union countries. The authors also include in sample the Portuguese speaking countries (PALOPS), i.e., ex-colonies. The econometric results show evidence that immigration has a positive influence in bilateral trade. Leitão et al. (2010) also introduce economic size and regional trade agreements (RTA); these proxies confirming a positive impact of bilateral trade.

The study of Coughlin and Wall (2011) demonstrates that migration and ethnic networks promote international trade. The empirical model shows that ethnic networks increase international trade on the intensive margin but not on the extensive margin.

Faustino and Proença (2011) use a Logit regression model to intra-industry trade. The empirical model shows that there is strong empirical evidence that the stock of immigrants has a positive impact in all intra-industry trade indexes.

The results presented in this manuscript are generally consistent with the expectations of gravity model. Our results show that immigration reduces the transaction cost. The remainder of the paper is organized as follows: Section 2 presents the theoretical background; Section 3 shows the methodology and data

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description; Section 5 present the econometric model used in this study. Section 5 displays the empirical results; and the final section provides the conclusions.

2. Literature Review

In this section we present a survey of the theoretical models of intra-industry trade and their relationship with immigration. The empirical models of mid 80s and beginning of 90s introduced two types of products differentiation (horizontal and vertical intra-industry trade).

The intra-industry trade (IIT) or two-way trade is defined as simultaneous exports and imports of a product within a country or a particular industry.

The link between immigration and intra-industry trade was explained in the 1990s by Krugman (1993). The author considers two regions (North and South). Krugman (1993) introduced the mobility within the North and South. This practice involves the phenomena of migration. Some authors as Blanes (2005), Leitão (2011) and White (2009) demonstrate that, the immigrants can induce the intra-industry trade. The idea consents to the explanation that transactions costs and geographical distances contributes to a decrease in IIT, whereas immigration usually leads to an increase in IIT.

Horizontal intra-industry trade (HIIT) occurs within similar quality products. The products are differentiated by attributes as in Krugman (1979), Lancaster (1980), Eaton and Kierzkowski (1984) and Helpman and Krugman (1985).

Vertical intra-industry trade (VIIT) is explained by different varieties of quality product; see Falvey (1981), Falvey and Kierzkowski (1987) and Shaked and Sutton (1984). On the demand side, we have consumers with different preferences, i.e, there is a correlation between quality and price. On supply side, it

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is assumed that varieties could be higher or low quality. The lower quality products are labour intensive and the higher quality are capital intensive.

2.1. The link between immigration and trade

A meta-analysis on the link between trade and immigration demonstrates that immigration reduces transaction costs (Girma and Yu, 2002, Leitão et al., 2012, Genc et al. 2011). In fact empirical studies are based on the assumptions in the model gravitational (Tinbergen 1962, Pöyhönen 1963, Anderson 1979, Pagoulatos and Sorensen 1975, Caves 1981, Toh 1982, and Krugman, 1997) that geographic distance has been an important determinant of trade. The distance can be analyzed in terms of geography, culture, language and adjacency (Border). Rauch (1999) and Eichengree and Irwin (1998) emphasize the importance of border and common language.

Anderson (1979) introduced the product differentiation by country of origin assumption. A few years later (Bergstrand 1985) used the income per capita to specify the supply side of economies.

Usually geographic distance measures the cost of transport. According to the literature there is an increase in trade flows if transportation cost decreases. The theoretical predictions show a negative correlation between distance and the trade. Balassa (1966), Balassa and Bauwens (1987), Stone and Lee (1995), and Clark and Stanley (2003) found a negative sign between geographical distance and trade.

The empirical model use dummy variables to the cultural distance, language and to the border. The similarities of the countries encourage bilateral trade. The study Frankel et al. (1998) demonstrates the importance of these qualitative

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variables to analyze the regional trading agreements (RTAs). Balassa (1966) and Balassa and Bauwens (1987) found a positive sign.

The pioneering studies (Gould, 1994, and Min, 1990) found a positive correlation between immigration and trade. The cultural, historical and geographical identities permit the decrease of transaction costs. Some authors as Gould (1994), Head and Ries (1998), Dunlevy and Hutchninson (2001) show a positive impact between immigration and bilateral trade. In medium or long run, when the immigrants become citizens of the host country, the transaction costs also decrease and we have a phenomenon of so-call acculturation.

Following the empirical models of Blanes (2005), Faustino and Leitão (2008) and White (2009) the immigration stock includes immigrants and immigrant entrepreneurs. According to the literature, the immigration can reduce transaction costs between foreign and host country, though ethnic networks or information mechanisms (transaction cost reduction channel). This explains the positive effect of immigration on trade.

According to the literature (Gould, 1994; Girma and Yu, 2002; Blanes 2005) immigrants influence positively trade thought two channels: the channel of preferences (the immigrants have a preference for products from countries of origin) and the channel of reduced transaction costs (due to the networks for immigrants).

In the Portuguese case (Faustino and Leitão, 2008, Faustino and Proença, 2011, Leitão et al. 2012) also observed a positive effect on the stock of immigrations on bilateral intra-industry trade.

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3. Measurement of Intra-industry trade

In this section we develop the argument of the I dexes of intra-industry trade (IIT), horizontal IIT and vertical intra-industry trade (VIIT) as previous defined.

It is usual to use the empirical studies using the unit prices of exports and imports to calculate the horizontal intra-industry trade (HIIT) and vertical intra-industry trade (VIIT). This criterion was developed by Greenaway Hine, and Milner (1994) and Abd-el-Rahman (1991). This technique has been criticized by several authors.

Most studies show that vertical intra-industry trade is inflated, when using the criterion of Greenaway et al. (1994). The present study uses the methodology of Kandogan (2003) for separating IIT into its components (HIIT) and (VIIT) intra-industry trade. Grubel and Lloyd (1975) shows that the products are similar in HIIT and products with different types of quality are VIIT. A large part of total trade (*TT*) in industry is inter-industry trade (*INT*). Kandogan´s methodology is summarized below:

$$TT_i = X_i + M_i \tag{1}$$

Where X_i - is the monetary value of exports, and M_i - is the monetary value of imports.

$$IIT_i = TT_i - |X_i - M_i| \tag{2}$$

$$INT_i = TT_i - IIT_i \tag{3}$$

$$HIIT_i = \sum \left(X_{ik} + M_{ik} - |X_{ik} - M_{ik}| \right) \tag{4}$$

$$VIIT_i = IIT_i - HIIT_i$$

$$\tag{5}$$

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4. Econometric Model

Following the literature, our study applies a gravity equation with panel data. The dependent variable used is Portuguese all intra-industry trade. The data for the explanatory variables is sourced from the World Bank, and, the source used for the dependent variable is NIS (National Institute of Statistics) at five-digit level.

4.1. Explanatory variables and testing of hypotheses

Based on the literature, we formulate the following hypothesis:

Hypothesis 1: *Immigration reduces the transaction costs.*

Hypothesis 1 is supported in Tadesse and White (2010), and Faustino and Proença (2011). The empirical studies found a positive relationship between immigration and intra-industry trade. This proxy collected from the Border Services "Serviço de Fronteiras", (Ministry of Internal Affairs), corresponds to legal immigrants in Portugal.

IMI: This is the stock of immigration in Portugal by trading partner.

Hypothesis 2: *There is a negative (positive) relationship between differences in income per capita and IIT (VIIT).*

Economic differences between countries (DGDP): this is the difference in GDP (PPP, in current international dollars) between Portugal and the partner country:

$$\left| GDP^{Portugal} - GDP^{partner} \right| \qquad\qquad (6)$$

Regarding Hypothesis 2, Hummels and Levinsohn (1995), Helpman and Krugman (1985) suggest a positive effect of different income on intra-industry trade bilateral trade. According to Helpman and Krugman (1985), Falvey and Kierzkowski (1987) we expect a positive sign for the VIIT model.

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Hypothesis 3: *The larger economic dimension increases trade.*

DIM: This is the average of GDP per capita between Portugal and the partner country. According to Anderson, 2011, Leitão et al. 2012, Faustino and Proença 2011is expected a positive sign. The economic size is important to differentiated products.

Hypothesis 4: *Trade increases when partners are geographically close.*

DIST (Geographical Distance): This is the geographical distance between Portugal and trading partner. According to the gravity model, a negative sign is expected for all models.

4.2. Model Specification

The econometric model of Portuguese trade takes the following representation:

$$y_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it} \qquad (7)$$

Where y_{it} is the intra-industry trade (IIT$_{it}$) horizontal IIT (HIIT$_{it}$) and vertical IIT (VIIT$_{it}$), X is a set of explanatory variables. All variables are in the logarithm form; η_i is the unobserved time-invariant specific effects; δt captures a common deterministic trend; ε_{it} is a random disturbance assumed to be normal, and identically distributed with E (ε_{it})=0; Var (ε_{it})$=\sigma^2 \succ 0$.

5. Empirical Results

In Table 1 we can observe the impact of immigration on intra-industry trade using OLS, and Probit model. With Probit regression, all explanatory variables are statistically significant at 1 % level (LnIMI, LDGDP, LnDIM, and LnDIST).

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Table 1 – The impact of immigration on Intra-industry Trade: OLS, and Probit Model

Dependent Variable : LnIIT (Intra-industry trade)		
Independent Variables	**OLS with time dummies**	**Probit**
LnIMI	0.68 (10.76)***	1.76 (19.15)***
LnDGDP	-13.99 (-192)*	-4.04 (-6.14)***
LnDIM	1.00 (2.03)**	2.55 (7.55)***
LnDIST	-1.21 (-3.40)***	-30.7 (-8.11)***
C	5.94 (2.00)*	
N	309	309
Adj. R^2	0.20	
LR chi2(4)		542.72***
Pseudo R2		0.17
Log likelihood		-1325.43

Source: Own elaboration.
T- Statistics (heteroskedasticity corrected) are in brackets.
***/**/- statistically significant, at 1%, 5% and 10% levels.

The results are consistent with the hypothesis of positive correlation between immigration and intra-industry trade. The studies of Blanes (2005), White (2008), Faustino and Proença (2011) found a positive sign.

We incorporate the economic differences between countries (LnDGDP) to analyze the difference in endowment between Portugal and its trade partners. Hummels and Levinshon (1995) found a negative sign. Our result is according to the hypothesis formulated. As expected, the variable economic dimension (LnIM) has a significant and a positive effect on IIT. This result confirms the importance of scale economy and product differentiation. Tadesee and White (2010), Anderson (2011), and Faustino and Proença (2011) consider a positive impact between economic dimension and trade. Our result is according to previous studies. Considering that the variable, DIST (distance in logs) can be used as proxy for trade transaction costs for this effect. The results demonstrate that this variable has the correct sign.

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In Table 2 we can observe that the impact of immigration on HIIT, using OLS, and Probit regression. For the estimates of the HIIT model, all explanatory are according to the hypothesis formulated. With Probit regression, all explanatory variables are statistically significant at 1 % level (LnIMI, LDGDP, LnDIM, and LnDIST).

Table 2 – The impact of immigration on Horizontal intra-industry Trade: OLS, and Probit Model

Dependent Variable : LnHIIT (Horizontal intra -industry trade)		
Independent Variables	**OLS with time dummies**	**Probit**
LnIMI	0.66 (8.17)***	1.50 (17.56)***
LnDGDP	-8.87 (-1.03)	-5.41 (-8.05)***
LnDIM	1.1.0 (2.61)***	2.46 (7.61)***
LnDIST	-1.07 (-2.39)**	-2.14 (-6.23)***
C	3.81 (1.02)	
N	309	309
Adj. R^2	0.13	
LR chi2(4)		454.14***
Pseudo R2		0.22
Log likelihood		-823.59

Source: Own elaboration.
T- Statistics (heteroskedasticity corrected) are in brackets.
***/**/- statistically significant, at 1%, and 5% levels.

The results in table 3 are consistent with the hypothesis of the positive correlation between immigration and VIIT.

With Probit model we can conclude that the economic differences between countries (LnDGDP) have a positive influence on the total VIIT.

The variable, economic dimension (LnDIM) presents a positive sign, confirming the dominant paradigm.

The geographical distance represents a negative correlation as in the results of Blanes (2005), White (2008), Faustino and Proença (2011).

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Table 3 – The impact of immigration on Vertical intra-industry Trade: OLS, and Probit Model

Dependent Variable : LnVIT (Vertical intra-industry trade)		
Independent Variables	OLS	Probit
LnIMI	0.66 (8.04)***	1.48 (17.66)***
LnDGDP	8.71 (0.99)	5.72 (8.55)***
LnDIM	1.11 (2.58)***	2.41 (7.51)***
LnDIST	-1.78 (-4.46)***	-2.11 (-6.15)***
C	9.56 (6.91)***	
N	309	309
Adj. R^2	0.18	
LR chi2(4)		449.97***
Pseudo R2		0.13
Log likelihood		-1480.05

Source: Own elaboration.
T- Statistics are in brackets. ***- statistically significant, at 1% level.

6. Conclusions

This paper investigates the relationship between intra-industry trade and immigration flows using a gravity model for the period 2000-2010 between Portugal and European Union countries. There appears to be a positive and statistically significant impact of immigration on intra-industry trade. The general performance of the considered models is satisfactory. The regressors are strongly statistically significant.

This study tests the impact of immigration in Portuguese trade. Immigrants express knowledge spillovers that can reduce information costs to economic agents. Our findings suggest that immigration permits the reduction of trade transaction cost and trade increases.

This manuscript contributes in several ways. Firstly, the paper examines the impact of immigration on all intra-industry trade. Secondly, the results allow us to view immigration as a vehicle that contributes to the decrease of trade transaction costs and could stimulate Portuguese economy.

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However, there are some clear limitations of the present study. Thus, further research should be carried out into this subject, especially in what it concerns the relation between economic theory and international migration, by taking into account the immigrants' skills, and the "ethnic network".

We consider that such empirical studies can serve to the construction of a more robust explanatory framework for coping with the complex issues raised by the analysis of trade and immigration. The main gnoseological stake is in our view the formulation of a sounder model of the various effects of immigration for the host countries including the informational as well as cultural and behavioral spillovers. Such outcome is important for a more realistic theory of the international trade based on a paradigm where not only the economic determinants but also culture, information and behaviors matter in explaining the international trade flows.

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