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IMMIGRATION AND TRADE

Abstract

This paper investigates the relationship between intra-industry trade (IIT), horizontal IIT, vertical IIT (VIIT) and immigration flows using a gravity model for the period 1995-2008 amongst Portugal and European Union's Member States (EU-27). Using a panel data approach, the results show a positive correlation between immigration and IIT. These outcomes indicate that the immigration can reduce transaction costs between home and host country. We also consider the economic dimension which appears to exercise a positive effect on trade. Our research confirms the hypothesis that there is a negative effect of transportation costs on trade.

Keywords*: Intra-industry trade, Horizontal intra-industry trade, Vertical intra-industry trade, Immigration and Panel Data.*

JEL Classification*: C20, C30, F12, L10.*

1. INTRODUCTION

The intra-industry trade (IIT) literature began in the 1960's, when Balassa (1966) pointed out that most of the growth in manufacturing followed the formation of customs' union in Europe. The initial theoretical models of IIT were synthesized in Helpman and Krugman's model - representing a Chamberlin-Heckscher-Ohlin model – which combines monopolistic competition with the Heckscher-Ohlin (HO) theory, incorporating factor endowments' differences, horizontal product differentiation and increasing returns to scale.

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 considered two regions (North and South) and introduced the mobility amid these regions. 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.

Girma and Yu (2002) argue that immigration is typically positively correlated to bilateral trade. Immigrants bring with them a preference for home-country products. In other words, immigration can reduce transaction costs between home and host country.

Based on this stream of literature, the present article analyses the impact of immigration on Portuguese intra-industry trade. Our study uses a panel data between Portugal and European

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Union for the period 1995-2008.

Following Hummels and Levinshon (1995) the manuscript applies a logistic transformation to IIT, horizontal (HIIT) and vertical intra-industry trade (VIIT).

The paper is organized as follows: the next section presents the theoretical background; Section 3 presents the indexes of intra-industry trade. In the Section 4 we develop the methodology and the econometric model. Section 5 analyses the econometric results. Section 6 concludes.

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).

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). The neo-Chamberlinian models, such as the Krugman model, assume that all varieties enter the utility function symmetrically. By contrast, the neo-Hotelling model, such as the Lancaster model, assumes asymmetry. In these models, each variety is produced under decreasing costs and when the countries engage in trading, the similarity of demands explains IIT.

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

The link between intra-industry trade and immigration

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) found 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), Leitão (2011), 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 intra-industry trade.

The study of Blanes (2005) provides evidence of immigrants in Spain having a positive effect on the share of its intra-industry trade. According to Blanes' findings, immigration contributes to trade transaction costs' reduction and this benefit the trade in differentiated products (IIT).

The article of Leitão (2011) examines the relationship between IIT and immigration using

a gravity model for the period 1995-2008 between United States and NAFTA, and ASEAN. The author applies a static and a dynamic panel data analysis. The results of Leitão (2011) show that economic dimension, and stocks of immigration are positively correlated with IIT. The trade imbalance is negatively correlated with IIT.

The studies of Faustino and Leitão (2008), White (2009) consider not only IIT, but also horizontal intra-industry trade (HIIT) and vertical intra-industry trade (VIIT).

Faustino and Leitão (2008) test the relationship between immigration and Portuguese bilateral trade. The results show that the stock of immigrants has a positive effect on Portuguese exports, imports and bilateral intra-industry trade. According to Faustino and Leitão (2008) the findings suggest that when immigrants to Portugal originate from a Latin partner-country, the effects on trade are stronger than in the case of immigrants from non-Latin countries.

The study of White (2009) demonstrates the importance of immigrants' connections to business and social networks. The author concludes that the effects of state, regional and national levels affect the immigration from developing countries.

3. MEASUREMENT OF INTRA-INDUSTRY TRADE

In this section we develop the argument of the indexes of intra-industry trade (IIT), horizontal (HIIT) and vertical intra-industry trade (VIIT) as previously defined.

In addition, Grubel and Lloyd (1975) define IIT as the difference between the trades balances of industry i and the total trades of the same industry. In order to simplify the comparisons between industries or countries, the index is presented as a ratio, where the denominator is total trade.

$$IIT_{it} = 1 - \frac{\left|X_i - M_i\right|}{\left(X_i + M_i\right)} \tag{1}$$

The index is equal to 1 if all trade is intra-industry. If IIT_{it} is equal to 0, all trade is inter-industry trade. Grubel and Lloyd (1975:22) propose an adjustment measure to country's IIT index (IIT calculated for all individual industries), introducing the aggregate trade imbalance.

Furthermore, Aquino (1978:280) considered that an adjustment measure is required, at a more disaggregated level. However, the Grubel and Lloyd method is inadequate for this purpose. Thus, following Aquino (1978), it is require an appropriate imbalance effect. The unbalancing effect must be equi-proportional in all industries in order to highlight "what the values of exports and imports of each commodity would have been if total exports had been equal to total imports" (Aquino, 1978:280).

3.1 THE HIIT AND VIIT INDEXES

To determine the horizontal ($HIIT_{it}$) and vertical intra-industry trade ($VIIT_{it}$), Grubel and Lloyd indexes and the methodology of Abd-el-Rahaman (1991) and Greenaway et al. (1994) are used, i.e the relative unit values of exports (UV_{it}^{X}), and imports (UV_{it}^{m}).

Where $HIIT_{it}$:

$$1-\alpha \leq \frac{UV_{it}^{X}}{UV_{it}^{m}} \leq 1+\alpha \tag{2}$$

and $VIIT_{it}$ is :

$$\frac{UV_{it}^{X}}{UV_{it}^{m}} \leq 1-\alpha \quad \text{or} \quad \frac{UV_{it}^{X}}{UV_{it}^{m}} \succ 1+\alpha \tag{3}$$

Where α = 0.15. When the relative unit values of exports and imports are less than 15% the trade flows are horizontally differentiated (HIIT).

The HIIT and VIIT indexes are also calculated with desegregation at 5-digit Portuguese Economic Activity Classification from INE-Trade Statisitcs.

4. ECONOMETRICAL MODEL

The sources of the data regarding the explanatory variables are the World Bank Development Indicators (2011) and Serviços de Fronteiras, Ministério da Administração Interna (Border Services Administration, Portugal). The source used for dependent variables was INE - the Portuguese National Institute of Statistics (Trade Statistics). There are no cases of missing data.

4.1 DEPENDENT VARIABLES

The dependent variables used are IIT, HIIT and VIIT computed according to the methodology of Grubel and Lloyd (1974). Because the IIT is an index varying between zero and one, we apply a logistic transformation to IIT, HIIT and VIIT (see Hummels and Levinshon (1995) Logistic IIT=LN[IIT/(1-IIT)]. The same is carried out for HIIT and VIIT.

Explanatory Variables

The paper uses the following explanatory variables in logs:

- Electric Power Consumption: (EP): It is the absolute difference in electric power consumption (Kwh per capita) between Portugal and European partners. Helpman (1987) and Hummels and Levisnhon (1995) considered a negative correlation between IIT and differences in factor endowments. According to Helpman and Krugman (1985), we expect a positive sign for the VIIT model and negative sign for the HIIT model.
- DIM: This is the average of GDP per capita between Portugal and the partner country. According to Gross and Helpmam (2005), White (2009), Leitão (2011) a positive sign should be expected. The economic size is important to differentiated products.
- IMI: This is the stock of immigration in Portugal by partner-country. The expected effect on IIT, HIIT and VIIT is positive. Blanes (2005), White (2009), and Leitão (2011) found a positive sign.
- DIST (Geographical Distance): This is the geographical distance between Portugal and partner country. According to the gravity model, a negative sign is expected for all models.
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4.2 MODEL SPECIFICATION

In order to test for the links between the intra-industry trade and its considered determinants, we adopt a formal model specification such as:

$$y_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it} \quad (4)$$

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 (IID) with E (ε_{it})=0; Var (ε_{it}) = $\sigma^2 \succ 0$.

5. EMPIRICAL STUDY

Before estimating the panel regression model, we have conducted a test for unit root of the variable. The table 1 presents the results of panel unit root test (ADF-Fisher Chi square).

Table 1. Panel unit root test results

Intercept and trend		
LogIIT	**Statistic**	**Probability**
ADF- Fischer Chi-square	220,0561	0,0000
LogHIIT		
ADF- Fischer Chi-square	508,6382	0,0000
LogVIIT		
ADF- Fischer Chi-square	171,4537	0,0000
LogEP		
ADF- Fischer Chi-square	135,2113	0,0000
LogDIM		
ADF- Fischer Chi-square	65,6294	0,0682
LogImi		
ADF- Fischer Chi-square	41,0752	0,8117

Source: Author calculation

The most important variables such as the intra-industry trade (LogIIT), horizontal intra-industry trade (LogHIIT), vertical intra-industry trade (LogVIIT), electric power consumption (LogEP), economic dimension (LogDIM) do not have unit roots, i.e, are stationary with individual effects and individual specifications.

The model of intra-industry (IIT) is reported in Table 2. Our analysis evaluates the signs of the coefficients and their significances.

Table 2. Intra-industry trade and immigration

Variables	*OLS*	*Random Effects*	Tobit Model
LogEP	1,372	0,709	0,441
	(4,13)***	(2,420)**	(2,074)**
LogDIM	1,201	2,250	0,540
	(1,94)*	(3,37)***	(1,20)
LogImi	0,326	0,528	0,216
	(4,43)***	(5,87)***	(3,64)***
LogDIST	-3.112	-2,906	-1,732
	(-6,40)***	(-3,14)***	(-3,69)***
C	-1,364	-4,927	0,937
	(-0,64)	(-1,31)	(0,43)
N	325	325	325
$\overline{R^2}$	0,17	0,13	
SIGMA			1,338***
Likelihood			-317,71

T- Statistics (heteroskedasticity corrected) are in brackets.

***/**/-statistically significant, at 1%, and 5% levels.

Source: Author calculation

The results are similar with OLS and Random effects. All explanatory variables are statistically significant. Thus, it can be argued that this outcome is robust in respect to the changes in estimation methodology.

We incorporate the difference in electric consumption per capita to analyze the difference in endowment between Portugal and its trade partners.The results are somehow different from other findings in literature. For instance, Hummels and Levinshon (1995), Zhan et al. (2005) found a negative sign. In our estimation, the coefficient LogEP presents a positive sign for the three estimators (OLS, RE, and tobit model). As Portuguese IIT is mainly vertical intra-industry trade (VIIT), this is consistent with the neo-Heckscher-Ohlin trade theory, i.e, the differences in physical endowments promote the IIT.

As expected, the variable economic dimension (LogDIM) has a significant and a positive effect on IIT, with the exception of the tobit model. This result confirms the importance of scale economy and product differentiation. We can conclude that economic dimension influences the volume of intra-industry trade. The results are consistent with the hypothesis of the positive correlation between immigration and intra-industry trade. The Studies of Blanes (2005), White (2009), Faustino and Leitão (2008) and Leitão (2011) found a positive sign.

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 in all equations and it is statistically significant in three of these, i.e intra-industry trade increases when partners are geographically close.

In Table 3 we observe that the determinants of HIIT using OLS, Random effects and Tobit model. For the estimates of the HIIT model only the geographical distance are according to the hypothesis formulated.

Table 3. Horizontal intra-industry trade and immigration

Variables	*OLS*	*Random Effects*	Tobit Model
LogEP	2,068	2,283	0,055
	(4,381)***	(3,781)***	(0,09)
LogDIM	-5,924	-12,684	-0,077
	(-5,99)***	(-8,95)***	(-0,058)
LogImi	-0,196	-0,222	0,293
	(-1,592)	(-1,29)	(1,55)
LogDIST	-2,64	-0,481	-2,071
	(-2,03)**	(-,269)	(-1,83)*
C	23,02	44,075	3,802
	(4,89)***	(5,81)***	(0,78)
N	139	139	139
$\overline{R^2}$	0,15	0,11	
SIGMA			1,647***
Likelihood			-69,195

T- Statistics (heteroskedasticity corrected) are in brackets.

***/**/-statistically significant, at 1%, and 5% levels.

Source: Author calculation

The results in table 4 are consistent with the hypothesis of the positive correlation between and VIIT. The variable, electric power (LogEP) presents a positive sign, confirming the dominant paradigm. VIIT occurs more frequently among countries that are dissimilar in terms of factor endowments. With Random effect estimator we can conclude that the economic dimension (LogDIM) has a positive influence on the total VIIT is confirmed. The geographical distance represents a negative correlation confirming the results of Badinger and Breuss (2008), Clark (2006), Faustino and Leitão (2008).

Table 4.Vertical intra-industry trade and immigration

Variables	*OLS*	*Random Effects*	Tobit Model
LogEP	0,547	0,289	0,187
	(3,95)***	(2,16)**	(1,59)
LogDIM	0,209	0,627	-0,251
	(0,778)	(2,06)**	(-0,98)
LogImi	0,138	0,172	0,058
	(4,49)***	(4,27)***	(1,72)*
LogDIST	-0,590	-0,744	0,033
	(-2,38)**	(-1.76)*	(0,12)
C	-1,94	-2,460	-0,364
	(-2,05)**	(-1,41)	(-0,27)
N	312	312	312
$\overline{R^2}$	0,11	0,10	
SIGMA			0,656***
Likelihood			-364,97

T- Statistics (heteroskedasticity corrected) are in brackets.

***/**/*/-statistically significant, at 1%, 5% and 10% levels.

Source: Author calculation

6. CONCLUSIONS

This paper investigates the relationship between intra-industry trade, horizontal and vertical intra-industry trade and immigration flows using a gravity model for the period 1995-2008 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 intra-industry 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 intra-industry 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.

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". Also, other proxies than the consumption of electricity can be considered for the endowments and a more detailed analysis is necessary in order to describe the structure of capital, natural resources and labor force in the selected countries.

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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IMIGRACIJA I TRGOVINA

Sažetak

Rad istražuje odnos između intraindustrijske trgovine (IIT), horizontalne IIT, vertikalne IIT (VIIT) i imigracijskih tokova koristeći gravitacijski model za period od 1995. do 2008. u Portugalu i zemljama članicama EU (EU-27). Koristeći pristup panelnih podataka, rezultati pokazuju pozitivnu korelaciju između imigracije i IIT. Takvi rezultati upućuju na to da imigracija može umanjiti transakcijske troškove između zemlje porijekla i zemlje domaćina. Također smo razmotrili ekonomsku dimenziju koja izgleda da ima pozitivan učinak na trgovinu. Naše istraživanje potvrđuje hipotezu da troškovi prijevoza imaju negativan učinak na trgovinu.

Ključne riječi: *intraindustrijska trgovina, horizontalna intraindustrijska trgovina, vertikalna intraindustrijska trgovina, imigracija i panelni podaci*

JEL Classification*: C20, C30, F12, L10.*