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# IMMIGRATION-TRADE LINKS: EVIDENCE FROM PORTUGAL

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ABSTRACT

This article tests the relation between immigration and Portuguese bilateral trade, considering the twenty-seven European partners (EU27). Using a static and dynamic panel data analysis, the results show that the stock of immigrants has a positive effect on Portuguese exports, imports and bilateral intra-industry trade (IIT). These results suggest that immigration affects all types of trade in a positive way. The findings also suggest that the increase of immigrant entrepreneurs reinforce the positive effect on exports and on IIT. The dynamic results confirm the positive effect of the immigration stock on horizontal and vertical IIT.

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## I. INTRODUCTION

Globalization today offers diaspora communities new opportunities for international business, by exploiting their international social networks. Due to these social and ethnic networks, the transaction costs have decreased and immigration has contributed to the increase of both types of international trade: inter-industry trade and intra-industry trade (IIT). The immigrants' preferences for products from their country of origin may also result in increased trade, primarily in host-country imports, and the trade in differentiated products. According to the trade theory, the reduction in transaction costs increases trade. However, the link between migration and trade has not been formalized by the trade theory.The factor proportions theory (Heckscher-Ohlin model) considers that factors are immobile between countries and that international trade is a perfect substitute for international factor immobility (Samuelson theorem for factor prices equalization). According to this theory, immigration and trade are substitutes. The new trade theory, based on monopolistic competition and product differentiation (Helpman and Krugman, 1985), provides arguments for a complementary relationship between immigration and IIT through the trade transaction costs reduction and immigrants' preferences. Despite these theoretical problems, the empirical studies that test the hypothesis of a positive correlation between immigration and trade have increased in the last decade, using ad hoc processes as a gravitational approach extended to include explanatory variables arising from the traditional and the new trade theories. These empirical studies provide empirical evidence of the links between inter- and intra-industry trade and immigration, proposing new hypotheses to the trade theory (see, for example, Gould,1994; Helliwell, 1997; Rauch, 1999,2001; Girma and Yu, 2002; Blanes and Martin-Montaner,2006;White 2007;White and Tadesse,2008; Tadesse and White 2010; Prettner and Kunst, 2009; Vobecká, 2010; Karagoz, 2011).

In Portugal the econometric studies relating the effects of immigration on trade are also very recent (see, for example, Faustino and Leitão, 2008a, 2008b; Faustino and Peixoto, 2009; Leitão et al., 2010; Faustino and Proença, 2011). Other economic effects of immigration have also been studied, using different methodologies. The available studies respect to the impact of immigration over the Portuguese economy, firms, entrepreneurship, labour market, national accounts and social security, among others ( Almeida and Silva, 2007; Oliveira, 2008; Peixoto, 2008; Peixoto et al., 2011; Cabral and Duarte, 2011).

Research on immigration in Portugal was vast in recent decades, following the surge in inflows that the country witnessed after the mid-1970s. In a few years Portugal went from residual immigration to a considerable immigrant stock. In 2010 oficial statistics registered a total of 457,306 foreigners living in the country, corresponding to 4.3% of the total population, and 793,314 foreign-born individuals, corresponding to 7.5% of the total population (Statistical National Institute). The largest proportions came from the Portuguese ex-colonies in Africa (maninly Cape Verde, Angola and Guinea Bissau), Brazil, Eastern Europe (mainly Ukraine and Moldova) and the European Union (United Kingdom and, recently, Romania). The bulk of the inflows occurred until the mid-2000s, before the impact of the recent world economic crisis and Portuguese economic woes, which apparently inverted the migratory balance (Peixoto, 2011; Peixoto and Iorio, 2011).

In this paper, we analyze the impact of immigration on Portuguese trade, making the distinction between inter- and intra-industry trade. The purpose of this paper is to test for the impact of the immigration stock, as well as other immigration-related variables, on Portuguese exports (X) and imports (M) and on Portuguese IIT by types (horizontal IIT and vertical IIT), controlling the effects of other socio-economic factors, like economic dimensions, price indexes,

distance and regional integration. Since we do not seek to estimate the determinants of inter-industry or intra-industry trade, only applied trade theory is required in order to gain an understanding of the link between immigration and trade flows and to justify the expected sign of the explanatory variables' coefficients.

General relationships between immigration and international trade require aggregated data and the use of econometric models. This paper uses a static and dynamic panel data analysis and considers the trade between Portugal and each European partner-country (EU-27) for the period 1995-2006. Data on Portuguese immigration respect to the same period (1995-2006), before the impact of the woldwide economic crisis. Given its wider availability, data on immigration is based on the criterion of country of citizenship, meaning that "immigrants" in this paper must be taken as foreigners living in the country (although for the most part having migrated recently.

In static panel data models, Pooled OLS, fixed -effects (FE) and random- effects (RE) estimators are used (see, for example, Surugiu et al., 2011 and Leitão 2011).The *F*-statistic tests the null hypothesis of the same specific effects for all countries. If this hypothesis is rejected, we could not use the OLS estimator. The Hausman test can be used to test the null hypothesis that random effects and fixed effects are both consistent, but only RE is efficient under the alternative hypothesis that only the FE estimator is consistent.Usually, the empirical studies apply the FE estimates for purposes of comparison with the dynamic model.

However, in the static models some problems can arise, namely, serial correlation, heteroskedasticity and endogeneity of some explanatory variables. The solution for these econometric problems was found by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998, 2000), who developed the first-differenced and the GMM system estimators (see, for example, Cameron and Tivedi, 2009; Roodman, 2006). This paper will apply the system GMM estimator because these estimates are more reliable than those obtained by the first-differenced estimator (see, Faustino and Leitão, 2007).

Following the previous studies, and considering that there is an immigrant preference for home-country products and that the additional information brought by immigrants is relevant to both consumer goods and producer goods, we expect to find a positive effect of immigration on imports and exports and on intra-industry trade (IIT). Furthermore, if we consider that the immigrant stock includes skilled immigrants and immigrant entrepreneurs, this may reinforce the positive effect on exports and on IIT.
Estimation results confirm the hypothesis that the immigration stock has a positive effect on Portugueseexports, imports and intra-industry trade. The dynamic estimates also confirm that immigration has a positive effect on all kinds of IIT. The remainder of the paper is organized as follows. The next section describes the theoretical background to the relationship between immigration and trade. Section 3 presents the empirical model. Section 4 reveals the econometric results. The final section concludes.

## II. THE RELATIONSHIP BETWEEN IMMIGRATION AND TRADE: THE GRAVITY EQUATION

There is a debate as to whether the migration of labor and international trade should be considered a substitute or a complement. In the Heckscher-Ohlin (HO) model, and under the assumption that specialization is incomplete, the factor price equalization theorem, also known as the Heckscher-Ohlin-Samuelson (HOS) theorem, provides strong evidence that trade in final goods essentially substitutes for movements of factors between countries, leading to an increase in the price of the abundant factor and a fall in the price of the scarce factor among the trading partners, until relative (and absolute) factor prices are equal. Thus, under the HO assumptions,

trade and labor mobility are substitutes. In other words, the trading of goods substitutes for the trading of people. When a country imports labor-intensive goods, it is equal to "importing" labor from these countries and this "mechanism" leads to the equalization of wage rates across countries, even if labor is internationally immobile. Immigration and imports of labor-intensive goods are substitutes. In the same way, exporting labor-intensive goods corresponds to "exporting" labor. The question is, what happens if the migration flows are introduced into the HO model? Unfortunately, as is mentioned by Borjas (1989) international trade theory and empirical studies have almost totally ignored the effects of labor migration on trade flows.The HO trade model is an inter-industry trade type model. When we consider IIT, the reality can be rather different and we can find a complementary, rather than a substitute relationship between trade and international factor movements. In this case, trade and immigration can complement each other. We can think about market imperfections, namely, information asymmetries and their effect on consumption preferences and intra-industry trade.

According to different authors, immigrants can influence bilateral trade flows in two ways. The first is associated with the notion that the immigrants bring with them a preference for home-country products (preference channel). The second expresses the idea that immigration can reduce transaction costs between the home and host countries, through social andethnic networks or information mechanisms (transaction cost reduction channel).

Rauch (1999) proposes a network view of trade in differentiated products, in which immigration can lead to a reduction in trade transaction costs. He uses a gravity model of international trade to test if proximity and common language/colonial ties are more important to differentiated products than to homogeneous products. The specialization in differentiated goods generates the force of gravity and this specialization can be a result of an Armington structure of demand.The core explanatory variables to explain bilateral trade in the gravity model are measures of the economic size of trading partners (positive or gravitational effects) and the distance between them (a negative effect or counter-force). The gravity equation can be thought of as a kind of short-hand representation of supply (exports of a country to the world market) and demand forces (imports of a country), with stimulating or restraining elements (tariff barriers, distance, culture, other socio-economic factors). Despite the theoretical problems, the gravity equation describes very well the bilateral trade flows as a function of the economic sizes and distance between trade partners, working successfully in the empirical studies on developed and developing countries.Feenstra et al. (2001) proved that a wide range of theories are consistent with a gravity-type equation.

Designating as Tij the trade flows between countries i e j (exports from i to j and exports from j to i), or any trade index that depicts bilateral trade; Yi e Yj for the GDP of each of the two countries (Y can also be considered as per capita); D for the geographic distance, the gravitational equation can be expressed in economic terms as follows:

$$T_{ij} = G\frac{Y_i^{\propto} Y_j^{\beta}}{D_{ij}^{\partial}} \quad (1)$$

G is the gravitational constant, which will be represented by the constant in the econometric model.Applying logarithms, we obtain the following linear relation, in which the coefficients of the explanatory variables represent the elasticities:

$$LnT_{ij} = LnG + \propto LnY_i + \beta LnY_j - \partial LnD_{ij} \quad (2)$$

Based on Anderson (1979), Bergstrand (1985, 1989), and Feenstra et al. (2001) the empirical gravity model may include variables based on alternative theories of trade. The gravity model that will be specified and estimated is an extension of this basic gravity equation in log-linear form, augmented for a number of explanatory variables relevant for bilateral trade flows.

## III. THE EMPIRICAL MODEL AND DATA SOURCE

The sources of the data on the explanatory variables were the WorldBank, World DevelopmentIndicators and Serviços de Fronteiras, Ministério da Administração Interna (Portuguese Border Services Administration, Ministry of the Interior). The source used for the dependent variables was INE – the Portuguese National Institute of Statistics (Trade Statistics).

### A. Dependent variables

For trade, we use five alternative measures: the exports (X), the imports (M), the intra-industry trade index (IIT), the vertical IIT index (VIIT) and the horizontal IIT index (HIIT).

*The Grubel and Lloyd IIT index*

The Grubel and Lloyd (1975) index is employed as a measure for IIT between Portugal, given as country i, and European partner j. To avoid problems of statistical aggregation, the data is at the 5-digit level of the SITC classification.

$$IIT_i = \frac{\sum_{j=1}^{n} \left(X_{ij} + M_{ij}\right) - \sum_{j=1}^{n} \left|X_{ij} - M_{ij}\right|}{\sum_{j=1}^{n} \left(X_{ij} + M_{ij}\right)} \tag{3}$$

*The HIIT and VIIT indexes*

To separate horizontal from vertical intra-industry trade, the Grubel and Lloyd index and the methodology of Abd-el-Rahaman (1991), and Greenaway et al. (1994) are used. Relative unit values of exports and imports are used to disentangle total IIT into total HIIT (RH) vis-à-vis total VIIT (RV). We use a unit value dispersion of 15 per cent. Moreover, we must consider:

$$HII_i = \frac{RH_i}{\sum_{j=1}^{n} \left(X_{ij} + M_{ij}\right)} \tag{4}$$

$$VIIT_i = \frac{RV_i}{\sum_{j=1}^{n} \left(X_{ij} + M_{ij}\right)} \tag{5}$$

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

Because IIT is an index varying between zero and one, we apply a logistic transformation to IIT, HIIT and VIIT (see Hummels and Levinsohn, 1995)Logistic IIT = Ln IIT/ (1-IIT). The same formula is applied for HIIT and VIIT.

## B. Explanatory variables and expected signs

The explanatory variables set in most empirical models that use the gravity equation includes home and host countries' Gross Domestic Product (GDP), geodesic distance between the capital cities of home and host countries, factor endowments differences and immigration related variables.

The paper uses the following explanatory variables in logs:[a]

- IPK is the price index of the European partner-country k. It is expected that an increase in IPK increases (decreases) Portuguese exports (imports). The effect of this explanatory variable on IIT is ambiguous. It is expected that the changes in IPK do not have any influence on the HIIT index because this type of trade is more determined by other product characteristics than price. The effect on VIIT is ambiguous because we have differentiated products of high and low quality. So, in the three intra-industry equations, the expected sign is a matter of empirical evidence;
- DIST is the geographical distance between Portugal and the partner-country. Distance serves to proxy for transport costs. According to the gravitational model, a negative signis expected for all models (see Greenaway et al., 1994;
- MinGDP is the lower value of GDP per capita (PPP, in current international dollars) between Portugal and the European partner. This variable is included to control for relative size effects. According to Helpman (1987) and Hummels and Levinshon (1995), a positive sign is expected;
- MaxGDP is the higher value of GDP per capita (PPP, in current international dollars) between Portugal and the European partner. This variable is also included to control for relative size effects. A negative sign is expected (Helpman, 1987; Hummels and Levinshon, 1995);
- STOCK is the stock of immigrants in Portugal by partner-country. A positive effect of immigration is expected on imports and on exports. The expected effect on IIT, HIIT and VIT is positive. Blanes (2005) found a positive sign for the IIT model;
- -MIHQW is the percentage of highly qualified immigrants employed in manufacturing industry (MI). A positive sign is expected for the coefficient of this variable, on the basis of the hypothesis that an increase in the level of qualification of immigrant workers will increase the products' quality and differentiation, and hence will boost all types of intra-industry trade, as well as exports. With regard to imports, the positive effect may be the result of increased purchasing power of these immigrants, combined with their preferences from their country of origin;
- MIENT is the percentage of immigrant employers (entrepreneurs) operating in manufacturing industry. A positive sign is expected for the coefficient of this variable, based on the hypothesis

[a]We also considered the variables "absolute difference in per-capita GDP, PPP, between Portugal and the European trading partner" and "absolute differences in physical capital endowments, proxied by the absolute difference in electric power consumption, between Portugal and the partner country", but these variables were not statistically significant. So, we replaced them by two other control variables: MINGDP and MAXGDP. These results are available from the authors upon request. BedassaTadesse and Roger White (2011) also considered as explanatory variables the changes in the terms os trade, the home and host country population sizes and home and host country economic remoteness.

that increases in the number of immigrant employers will reinforce the ethnic and commercial networks, thereby contributing to the reduction of transaction costs;

- EU15 is a dummy variable that equals 1 if the partner-countrybelongs to the EU15 and 0 otherwise (i.e. if the partner-country is one of the 12 countries that became members of the European Union in 2004, thus forming the EU27). The expected sign is a matter of empirical evidence.

## C. EMPIRICAL SPECIFICATION

To analyze the changes in Portuguese exports, imports and IIT indexes as a function of change in immigration variables, we utilize five regression equations with identical predictors. The models test our main hypothesis of a positive effect of the immigration stock on imports, exports and IIT indexes. The general econometric model can be specified as follows:

*The Static Model*

$$F_{ijt} = \beta_0 + X'_{ijt}\beta_1 + \eta_j + \delta_t + \varepsilon_{ijt} \quad j = 1, \dots, n \;\; t = 1, \dots, T \tag{6}$$

Where $F_{ijt}$ stands either for Portuguese exports, imports and IIT indexes; X is a set of country-specific explanatory variables. It includes a dummy variable and variables that measure the stock of immigrants from country j residing in Portugal (country i) during year t as well as the weight of immigrants that are qualified and entrepreneurs in manufacturing industry; $\eta_j$ corresponds to a country´s effect; $\delta t$ captures a common deterministic trend; $\varepsilon_{jt}$ is a random disturbance assumed to be normal, independent and identically distributed (IID) with E ($\varepsilon_{ijt}$) =0 and Var ($\varepsilon_{ijt}$ ) = $\sigma^2$ >0 .

In a situation in which the set of explanatory variables includes a constant variable, as distance and dummy variables, we can not use the fixed-effects estimator because the process of transformation of variables eliminates the variables that are constant. An alternative would be to use the OLS plus time dummies estimator (see, Wooldridge, 2006).

All variables except the dummy variable enter the equation in natural logarithms. In this way, we are able to estimate the elasticities. The coefficients of the immigration variables capture all channels through which the immigrants affect trade. We do not include the unobserved time-invariant country-specific effects, since this would remove some relevant variables that do not vary along the time and that are important to the robustness of the results. We control for time effects by including a time dummy variable (year).

*The Dynamic Model*

The econometric model (1) can be rewritten in the following dynamic representation:

$$F_{ijt} = \beta_0 + \rho F_{ij,t-1} + X'_{ijt}\beta_1 + \eta_j + \delta_t + \varepsilon_{ijt} \tag{7}$$

Where $X_{ijt}$ is a vector of current and lagged values of additional explanatory variables.

## IV. ESTIMATION RESULTS

### A. Static analysis

To examine the relationship between trade and immigration, controlling for other explanatory factors, we estimated five OLS regressions, with time dummies. We used the same explanatory variables in all equations.

The results in Table 1 are consistent with the hypothesis of a positive correlation between immigration and trade. The explanatory variable, IMI (stock of immigrants in logs) is highly statistically significant (1% level) in the five equations. The results are very robust to different measures of the dependent variable. The trade-immigration elasticities are all positive: 0.624 for the export equation, 0.560 for the import equation, 0.435 for the IIT equation, 0.756 for the HIIT equation and 0.346 for the VIIT equation. The only result that is unexpected is the magnitude of the IMI coefficient in the export equation. We found a stronger impact of immigration volume upon exports than upon imports. Comparing export-immigration and import-immigration elasticities, we can conclude that the immigration coming from the EU27 has led to increased trade and a positive trade balance. Therefore, we must hypothesize that the Portuguese manufactured goods had alreadyincorporated specific tastes originating in the immigrants' home countries. So, the additional information provided by immigrants was relevant to consumer and producer goods and this led to an increase in exports and imports between immigrants' host and home countries. However, this merits further investigation, using a dynamic analysis to avoid endogeneity problems.When we consider intra-industry trade (IIT) as a dependent variable, the results are in accordance with expectations. The effect of the stock of immigrants on IIT is positive and remains positive when we consider IIT by types (HIIT and VIIT). These results confirm the hypothesis that the immigrants' information mechanism reduces the trade transaction costs in differentiated products and has a positive effect on all types of intra-industry trade, but the effect on HIIT is stronger than the effect on VIIT. When the stock of immigrants increases by 10%, this induces an increase of 4.35% in IIT, an increase of 7.56% in HIIT and an increase of 3.46% in VIIT. With regard to the other two immigrant-related variables, the results show that the increase of MIHQW (highly qualified immigrants in manufacturing industry, in per cent) has a positive effect on IIT and VIIT and the increase in MIENT (immigrant entrepeneurs in manufacturing industry, in per cent) has a positive effect on Portuguese exports and IIT. The results suggest that an increase of 10% in MIHQW increases the IIT by 23.62% and the VIIT by 25.83%, whereas an increase of 10% in MIENT induces an 11.13% increase in Portuguese exports and a 10.54% increase in IIT.Considering that the variable DIST (distance in logs) can be used as a proxy for trade transaction costs and capture part of these costs, the introduction of this variable in all regressions controls for this effect. The results demonstrate that this variable has the correct sign in all equations and is statistically insignificant in all five equations. When we have controlled for per-capita income differences and factor-endowment differences, these variables are revealed to be statistically insignificant. Therefore, we did not incorporate these country-specific characteristics in the estimated equations. The dummy variable EU15 is statistically significant and the coefficient is negative for the three intra-industry equations, providing evidence that the effect of immigration on Portuguese intra-industry trade is greater for the trade between Portugal and its12 new European partner-countries than for the trade with the other countries, i.e., the older EU partners.

TABLE 1 - STATIC ESTIMATES

| **Variables** | Exports | Imports | IIT | HIIT | VIIT | Expected Sign |
|---|---|---|---|---|---|---|
| IPK | -0.0008 | -0.005 | 0.0008 | 0.003 | 0.0009 | (+) ; (-) |
| | (-0.57) | (-2.87)*** | (0.41) | (1.21) | (0.44) | |
| DIST | -1.44 | -0.43 | -0.564 | -0.20 | -0.28 | (-) |
| | (-1.42) | (-0.29) | (-0.43) | (-0.12) | (-0.17) | |
| MINGDP | 3.18 | 2.32 | 3.37 | 5.29 | 2.91 | (+) |
| | (5.57)*** | (3.27)*** | (4.67)*** | (4.98)*** | (3.79)*** | |
| MAXGDP | -0.95 | 1.74 | -1.58 | -4.99 | -0.99 | (-) |
| | (-1.4) | (1.69)* | (-2.53)** | (-5.0)*** | (-1.4) | |
| STOCK | 0.64 | 0.56 | 0.435 | 0.756 | 0.346 | (+) |
| | (6.64)*** | (4.93)*** | (4.78)*** | (5.11)*** | (3.37)*** | |
| MIHQW | 1.192 | 0.819 | 2.362 | 0.465 | 2.583 | (+) |
| | (1.28) | (0.76) | (2.61)** | (0.34) | (2.5)** | |
| MIENT | 1.113 | -0.698 | 1.054 | 2.822 | 0.565 | (+) |
| | (1.88)* | (-0.78) | (1.67)* | (0.34) | (0.76) | |
| EU15 | 0.13 | -0.47 | -1.24 | -1.2 | -1.0 | (+) ; (-) |
| | (0.24) | (-0.78) | (-2.63)** | (-2.61)** | (-1.73)* | |
| C | -1.1 | -21.4 | -18.2 | -14.9 | -20.5 | |
| Adj. $R^2$ | 0.89 | 0.86 | 0.58 | 0.54 | 0.47 | |
| N | 67 | 67 | 67 | 67 | 67 | |

OLS estimations including time dummy variables.T-statistics (heteroskedasticity corrected) are in round brackets. ***/**/* are statistically significant, respectively at the 1%, 5% and 10% levels. The variables X, M, MINGDP, MAXGDP, DIST and STOCK are in logs. The variables IIT, HIIT and VIIT are in the logistic form.

Source: Research results.

## B. Dynamic analysis

Table 2 presents the dynamic estimations for exports, imports and IIT by types.[b] The immigration stock variable now appears to have a lesser effect on trade. The trade-immigration elasticities remain positive, but the values of these elasticities are statistically significant only for differentiated products. The effect of immigration on exports and imports is not statistically significant. The immigration still has a positive effect on IIT, HIIT and VIIT. A 10% increase in immigration induces a 6.02% increase in IIT, whereas HIIT increases by 13.71% and VIIT increases by 4.08% .This is in accordance with the expectations and confirms the traditional static panel data analysis. The first and largest impact is on HIIT, as in the static analysis. These results suggest

[b]The GMM system estimates that we report were computed using DPD for Ox (see, Jurgen Doornik, M. Arellano and S. Bond , 2002; Doornik, 2009)

that the immigrants' networks are more likely to increase trade in horizontal differentiated products: products that are closed substitutes and have great substitution elasticity. Thus, we can say that immigration and trade in differentiated products is still a positive sum game: the export industries of differentiated products and immigrants both win. Regarding the other two immigrant-related variables, the results show that the MIHQW variable (highly-qualified immigrants in manufacturing industry) has a positive and significant effect on exports, IIT and VIIT, while MIENT (immigrant entrepeneurs in manufacturing industry, in per cent) has no statistically significant effect on any type of trade. When MIHQW increases by 10%, this induces an 8.49% increase in Portuguese exports, an increase of 28.94% in IIT and of 28.2% in VIIT.As in the static model, we control for country size, distance and price index effects and introduce a dummy variable to separate the effect of the older EU15 partners from the 12 newer EU partners. The main difference in relation to the static model is the absolute values of the trade-immigration elasticities in intra-industry equations. Comparing with the static results, we note that on dealing with endogeneity concerns, the dynamic results present higher trade-immigration elasticities in all three intra-industry equations. The sign of the coefficients remains positive. Comparing the static values with the dynamic values we have, respectively, 0.435 versus 0.602 in IIT equation; 0.752 versus 1.371 in the HIIT equation and 0.346 versus 0.408 in the VIIT equation. The dynamic models, export–immigration elasticity and import-immigration elasticity are not statistically significant. These results were not expected and suggest that we need further empirical studies in order to compare the results.

TABLE 2 - DYNAMIC ESTIMATES

| **Variables** | Exports | Imports | IIT | HIIT | VIIT | Expected |
|---|---|---|---|---|---|---|
| Xt-1,Mt-1,IITt- | 0.79 (8.92)*** | 0.44 (3.14)*** | 0.06 (0.62) | -0.40 (4.57)*** | 0.17 (1.33) | (+) |
| IPK | 5.0 e-07 | -0.0005 | 0.0007 | 0.0082 | 0.165 | (+);(-) |
| | (0.002) | (-0.78) | (1.89)* | (7.75)*** | (1.33) | |
| IPKt-1 | -0.00046 | -0.0017 | -0.18 | -0.78 | -0.0002 | (+); (-) |
| DIST | 0.475 | 1.30 | 1.25 | 5.82 | 0.76 | (-) |
| | (0.78) | (0.66) | (0.64) | (1.53) | (0.36) | |
| MINGDP | -0.10 | -0.38 | 11.69 | -19.51 | -5.60 | (+) |
| | (-0.04) | (-0.07) | (-2.13)** | (-3.2)*** | (-0.99) | |
| MINGDPt-1 | 0.14 | -0.38 | -11.69 | -19.51 | -5.60 | (+) |
| | (0.06) | (-0.77) | (-2.13)** | (-3.2)*** | (-0.99) | |
| MAXGDP | 1.61 | -2.21 | -9.33 | -24.9 | -8.77 | (-) |
| | (0.38) | (-0.23) | (-1.05) | (-1.22) | (-0.78) | |
| MAXGDPt-1 | -1.80 | 4.12 | 7.90 | 18.0 | 8.16 | (-) |
| | (-0.45) | (0.42) | (0.82) | (0.82) | (0.69) | |
| STOCK | 0.079 | 0.09 | 0.602 | 1.371 | 0.408 | (+) |
| | (1.24) | (0.658) | (6.03)*** | (9.95)*** | (3.70)*** | |
| MIHQW | 0.849 | 0.023 | 2.89 | 1.69 | 2.82 | (+) |
| | (3.02)*** | (0.026) | (3.75)*** | (0.92) | (3.85)*** | |
| MIENT | 0.40 | -0.102 | 0.254 | 1.04 | 0.402 | (+) |
| | (1.15) | (-0.31) | (0.212) | (0.327) | (0.35) | |
| EU15 | 0.27 | 0.034 | -0.93 | -1.28 | -0.24 | (+) ; (-) |
| | (0.75) | (0.038) | (-1.45) | (-1.12) | (-0.25) | |
| C | 3.22 | -17.34 | -14.38 | -34.72 | -11.26 | |
| Yr2002 | -0.06 | -0.58 | -0.83 | -2.09 | -0.63 | |
| | (-0.31) | (-1.51) | (-1.75) | (-2.51) | (-1.16) | |
| Yr2003 | -0.10 | -0.80 | -1.07 | -2.30 | -0.80 | |
| | (-0.56) | (-1.63) | (-1.94) | (-2.48) | (-1.36) | |
| Yr2004 | -0.15 | -0.66 | -0.84 | -1.45 | -0.62 | |
| | (-1.07) | (-2.05) | (-2.34) | (-2.15) | (-1.64) | |
| Yr2005 | -0.07 | -0.65 | -0.79 | -0.87 | -0.82 | |
| | (-0.44) | (-1.47) | (-1.76) | (-1.27) | (-1.69) | |
| WALD(JS) | 5.52[0.0] | 2.3[0.0] | 497[0.0] | 3032[0.0] | 1538[0.0] | |
| M1 | -1.745 | -0.783 | -1.145 | 0.379 | -0.937 | |
| | [0.081] | [0.433] | [0.252] | [0.704] | [0.349] | |
| M2 | 0.212 | -0.587 | -0.098 | -0.371 | -0.357 | |
| | [0.081] | [0.557] | [0.992] | [0.71] | [0.721] | |
| SARGAN | 9.9[1.0] | 0.97[1.0] | -9.6[1.0] | 3.07[1.0] | 7.2[1.0] | |
| | Df=62 | Df=62 | Df=62 | Df=62 | Df=62 | |
| N | 67 | 67 | 67 | 67 | 67 | |
| PARAMETERS | 17 | 17 | 17 | 17 | 17 | |

T-statistics (heteroskedasticity corrected) are in round brackets. ***/**/*- are statistically significant, respectively, at the 1%, 5% and 10% levels. P-values are in square brackets..M1 and M2 are tests for first-order and second–order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null hypothesis of no serial correlation (based on the efficient two-step GMM estimator). $W_{JS}$ is the Wald statistic of joint significance of independent variables. Sargan is a test of the over-identifying restrictions, asymptotically distributed as $\chi^2$ under the null of instruments' validity (with two-step estimator). As the instruments are valid and there are no second-order serial correlations, all of the five models are valid. Instruments for differenced equation: Gmm (Dependent variable,3,5), Gmm (IPK,3,5), Gmm (MaxGDP,3,5). Instruments for level equation: GmmLevel (Dependent variable,2,1), GmmLevel (IPK,2,1), GmmLevel (MaxGDP,2,1). Number of groups = 25. Number of instruments=51.
Source: Research results

## V. CONCLUSION

This paper has tested the impact of the immigration stock and immigrant characteristics on Portuguese exports and imports and Portuguese intra-industry trade. The estimated effects of the immigration stock on exports and imports are both positive. A 10% increase in immigration stock induces a 6.24% increase in exports, a 5.6% increase in imports and an increase of 4.35% in intra-industry trade. These findings suggest that immigration leads to the reduction of trade transaction costs and increases all types of intra-industry trade. Comparing our static results with those of Blanes (2005), we note that both found a positive relationship between immigration and IIT. Our results also show that this positive effect applied for the two types of IIT (HIIT and VIIT). A 10% increase in the immigration stock induces a 7.56% increase in HIIT and an increase of 3.46% in VIIT. The dynamic panel data analysis also confirmed this positive relationship between the immigration stock and all types of IIT. In the dynamic analysis a 10% increase in the immigration stock induces an increase of 6.02% in IIT, an increase of 13.71% in HIIT and an increase of 4.08% in VIIT. These findings are in line with other empirical studies conducted in Portugal (see, Faustino and Leitão, 2008; Leitão et al., 2010) and in other countries (see, for example, Mundra, 2005; White, 2007).

In the static panel data analysis, when we consider the variables MIHQW (the weight of highly-qualified immigrants in manufacturing industry) and MIENT (the weight of immigrants who are entrepreneurs in manufacturing industry), the paper concludes that the increase in MIHQW has a positive and significant effect on IIT and VIIT and the increase in MIENT has a significant and positive effect on IIT. In the dynamic panel data models, only the MIHQW variable is statistically significant and an increase in this variable has a positive effect on exports, IIT and VIIT.

Although the consideration of various other immigrant skills and characteristics did not provide significant results, it is important to stress some aspects of this paper. First, the paper examines the impact of immigration on all trade flows: exports, imports and intra-industry trade, by types.Second, the dynamic panel data analysis, providing more reliable results, confirms the main static panel data findings, in particular, the positive effect on Portuguese intra-industry trade. Third, the results permit us to conclude that immigrant entrepreneurs could be a vehicle that contributes to the decrease of trade transaction costs and could stimulate Portuguese exports and intra-industry trade. Fourth, the results suggest that the additional information brought by immigrants is equally relevant to consumer goods and producer goods. The positive effect on exports and imports confirms this hypothesis.In the static model, we concluded that immigration strengthens exports more than imports. In the dynamic model, the effect of immigration on exports and imports is not statistically significant. Fifth, some of the control variables, such as relative factor economic dimension and price index, are found to be statistically significant and the results are more robust with the introduction of these country-specific characteristics variables.Sixth, the paper introduces a dummy variable for the 15 oldest European Union member-countries (EU15). The introduction of this control variable also improved the specification model. The results suggest that when immigrants to Portugal come from an EU15 partner-country, the effects on intra-industry trade are lower than they are in relation to those from other EU countries (the 12 newer countries that make up the EU27). Finally, our findings suggest that Portuguese industries need not fear a liberal immigration policy: both host and source countries can gain. Free trade and freedom of labor migration do not constitute a zero sum game. What is of most relevance for immigration policy is the immigrants' skills and immigrant entrepreneurship.The immigration policy should guarantee a sustained inflow, support immigrants' entrepreneurship and be more open to accepting immigrants' qualifications.

The consideration of the other immigrant-related variables, such asgender ratio, education, immigrant professional status and other information from micro data, was not found to be statistically significant. In future research, the analysis may alsobe extended to include immigrants arriving from less-developed countries. Cultural or historic colonial ties and common language are important determinants proposed by various authors.

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## VEZE IMIGRACIJE I TRGOVINE: DOKAZI IZ PORTUGALA

**Sažetak:** Ovaj članak testira vezu između imigracije i portugalske bilateralne trgovine, razmatrajući 27 europskih partnera (EU27). Koristeći statičku i dinamičku analizu panelnih podataka, rezultati pokazuju da ukupan broj imigranata ima pozitivni učinak na portugalski izvoz, uvoz i bilateralnu unutar-industrijsku trgovinu (IIT). Rezultati sugeriraju da imigracija utječe na sve vrste trgovine na pozitivan način. U statičkom modelu, 10% povećanja imigracije dovodi do 6,24% povećanja izvoza, 5,6% povećanja uvoza i 4,35% povećanja IIT. Rezultati također upućuju na to da povećanje broja imigranata poduzetnika osnažuje pozitivni učinak na izvoz i IIT. Dinamički rezultati potvrđuju pozitivni učinak ukupne imigracije na horizontalnu i vertikalnu IIT.

**Ključne riječi**: izvoz, uvoz, unutar-industrijska trgovina, imigracija, vještina imigranata, poduzetnici imigranti, gravitacijski model