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Immigration-Trade Links: the Impact of Recent Immigration on Portuguese Trade

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Abstract: This study analyzes Portuguese immigration during the period 1995-2006 and estimates the effects of an increase in the stock of immigrants and of the increased percentage of highly-skilled immigrants employed in manufacturing industry. Furthermore, the effects are estimated of immigrant entrepreneurs active in manufacturing industry on Portugal's bilateral trade with 38 countries. The latter group includes, in addition to the member-countries of the EU27, five African countries with Portuguese as their official language, and known as PALOPs. In 2006, these two blocs combined accounted for 83% of Portugal's trade in goods and 89% of its immigrant stock. Panel data is used to conduct an econometric analysis. The study finds that a 10% increase in the immigrant stock will produce the following effects on Portugal's bilateral trade with these countries: an increase of 2.8% in exports, an increase of 2.66% in imports, an increase of 1.87% in IIT, an increase of 4.01% in HIIT and an increase of 1.48% in VIIT. In addition, we conclude that higher percentages both of highly skilled immigrant workers and immigrant employers in manufacturing industry have a positive effect on exports, IIT and VIIT.

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Keywords: Immigration; trade; skills; entrepreneurship; panel data; Portugal.

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I. Introduction

The globalization phenomenon is related to the expanding economic integration among countries and regions, to the free movement of goods, capital and people and to sharing of technology and science. Globalization has generated increased opportunities for international trade between countries, not only as a result of the roles played by immigrants as vehicles of information and as consumers, but also due to the entrepreneurial initiatives of immigrants in the host societies.

Studies into the impact of immigration on the bilateral trade of the host country are relatively recent. Nevertheless, evidence of the positive influence of immigration on the host country's exports and imports, with different effects depending on the country, has been presented by various authors. Most of these works have focused on the experience of certain countries viewed traditionally as receivers of immigrants, namely the USA, Canada, some northern and central European countries and Australia. One of the common traits of these countries is their experience of a sedimentary immigration, in which processes of cultural integration co-exist with the maintenance of ethnic identity. However, little research has been concentrated as yet on countries that are new to the experience of immigration, such as those of southern Europe (see, among others, King et al. (2000) and Bonifazi et al. (2008)).

The present study analyzes immigration into Portugal between 1995 and 2006, estimating the effect of the increasing stock of immigrants and some of its characteristics, on Portugal's bilateral trade with 38 countries. These comprise all the partner-states of the EU27, the five African countries with Portuguese as their official language (PALOP) i.e. Angola, Cape Verde, Guinea-Bissau, Mozambique and São Tomé and Príncipe, the BRICs (Brazil, Russia, India and China), the USA, Moldova and Ukraine. In 2006, these countries accounted for 89% of the immigrants in Portugal and 83% of the country's trade in goods.

With reference to methodology, the characterization of immigration is elaborated on the basis of data from INE (the Portuguese National Institute of Statistics), SEF (Foreigners and Frontiers Administration Agency) and the Personnel Statistics (micro data) compiled by the Ministry of Employment and Social Security. This data contains various limitations, which at times impedes detailed evaluation of the characteristics of immigration (see Peixoto (2008)). The source for the data on trade is INE, while the data source on the other variables in the

econometric models is the World Bank (*World Development Indicators*). The econometric analysis of the panel data was conducted by means of the OLS estimator with time dummies.

The remainder of the paper is organized as follows: Section II, examines the theoretic relationship between immigration and trade; in Section III, we present the gravitational model to be used to explain the bilateral trade flows; in Section IV, the econometric model is presented, together with definitions of the independent and explanatory variables; the results are displayed and discussed in Section V and our concluding remarks made in Section VI.

II. The Relationship between Immigration and Trade

Research into the impact of immigration on the bilateral trade of the host country has revealed the positive influence of immigration on the country's exports and imports. Gould (1994) applied a gravitational model to evaluate the impact of immigration on the trade of the USA with 47 partner-countries. He found evidence of the positive relationship between immigration and trade, principally with regard to exports. Head and Ries (1998) investigated the impact of immigration on the bilateral trade of Canada, taking into account 136 trading partners across a 10-year period. They observed that a 10% increase in the immigrant population gave rise to increases in the exports and imports to and from the immigrants' countries of origin. More recently, White (2007b) has shown evidence of the positive influence of immigration on Danish exports and imports to and from immigrants' respective countries of origin. White (2007a) also uses the gravitational equation to measure the effect of the stock of immigrants from low-income countries and finds a positive influence. White (2008) estimates the effects of immigration on the various types of intra-sector trade, producing results that show a positive correlation.

Other recently published studies on immigration and trade have been conducted by Blanes and Martin-Montaner (2006), Greenaway et al. (2007), Herander and Saavedra (2008) and White and Tadesse (2007).

There is a heterogeneous set of variables that determines the influence of immigrants on international trade, not only in respect of the country of origin, but also the host country, or even the immigrant community itself, particularly its social networks.

Taking as the point of departure those variables related to the country of origin, its participation in international trade assumes particular importance, with specific regard to the degree of its economic openness and the political and social conditions prevalent, to the extent to which the creation of trading opportunities can be facilitated. Head and Ries (1998) called attention to the fact that the effects of immigrants on bilateral trade vary according to the type of immigration and the country of origin. Refugees, given the reduced opportunities for contact with their countries of origin due to fear of persecution, present the lowest level of influence, in contrast with the group consisting of independent immigrants, who exert the strongest impact. As Blanes and Martín-Montaner (2006) explain, immigrants tend to stimulate international trade when they have the opportunity to take advantage of their networks of contacts and acquaintances in their home countries, thereby reducing transaction costs, with the aim of commercial activities.

From the perspective of the host country, immigration policies (Head and Ries 1998) and incentives to encourage immigrants' entrepreneurial initiatives may also play important roles in influencing the immigrants' business strategies. In addition, the social structures and networks into which the immigrants are integrated, together with the means of their incorporation into the labor market, are crucial determinants of the immigration-trade link.

There are two mechanisms by which immigrants can exert influence on bilateral trade flows: first, their preference for products from their countries of origin and second, the role of cultural ties and social networks in creating opportunities between the host country and their home countries. The preference for determined products connected with the immigrant's ethnicity, which are not initially available in the host country's market, can lead to an increase of imports to the host country from the respective country of origin. Similarly, cultural and linguistic ties, being associated to the information in the possession of immigrants about markets in their countries of origin, as well as the social networks into which they are integrated, can prove advantageous to the reduction of transaction costs. Rauch (2001) emphasizes the role of social networks in removing certain barriers to trade, asserting that access to information on business and trading opportunities, through the social networks and the flexibility of relationships between economic agents, based more on the building of mutual trust than on formal contracts, have positive implications in terms of economic efficiency.

In addition, the process of immigrants' adaptation to the host society, in particular their integration into the labor market, is a variable of vital importance, to the extent that it can influence the development of an entrepreneurial-commercial class among immigrants. Several authors have sought to explain the causes and effects of entrepreneurship among immigrants, attempting to understand why some groups are more enterprising than others and how entrepreneurial strategies can be a vehicle for upward social mobility. Within the scope of the present paper, another issue is to verify whether the impact of immigrant entrepreneurs on bilateral trade is greater or less than the impact made by non-entrepreneurs. Light et al. (2002) tested this hypothesis in relation to Chinese immigrants in the USA. They concluded that the immigrant entrepreneurs had a positive effect on US exports, whereas no influence was found on imports. It should be noted that the present study does not seek to test the explanatory hypotheses of immigrant entrepreneurship, nor to analyze the measures that might stimulate it. Our intention is merely to evaluate its impact on trade.

From a different perspective, as Borjasi (1989) and Blanes (2005) highlight, both the theory of international trade and empirical research have, until recently, ignored the effects of the labor migration factor on trade flows. The Heckscher-Ohlin model and theorem consider that labor is mobile at the national level, but immobile internationally. *When countries open up to trade and as long as the hypothesis of incomplete specialization is verified (countries will continue to produce, for the purpose of trading, the goods that they previously produced only for their own consumption), the equalization of absolute and relative price factors will tend to occur. Thus, trade will function as a perfect substitute for international factor mobility*. The Heckscher-Ohlin model explains inter-industry trade, considering that the markets function in perfect competition and that information circulates without costs and is symmetrical for all economic agents.

When intra-industry trade is examined (i.e. exports and imports belonging statistically to the same industry), we find a different situation and it is accepted that a relationship of complementarity may exist between trade and international factor mobility. The imperfection of markets, in particular the asymmetry of information and its effect on the preferences of consumers, may justify the relationship of complementarity between immigration and the increase of trade in differentiated products. According to the model of imperfect competition, when immigrants have fully legalized status, more information on their preferences is obtainable.

If the costs of acquiring information become similar to the transaction costs, it is possible to state that the relationship between immigration and trade is positive, since transaction costs are decreasing.

Gould (1994) argued that the effects of immigration are stronger on the trade of differentiated products (intra-sector trade). This is explained by the fact that the additional information brought by immigrants is of greater relevance for consumers than for producers, so that trade in such products is strongly demand-side driven (i.e. consumer preferences for the products' variety or characteristics). The increased trade in differentiated products satisfies the specific preferences of the consumers. Rauch (1999) stressed the role of the immigrants' networks in reducing the transaction costs of trade in differentiated products. He also called attention to the preference and network effects on intra-sector trade. White (2008: 254) finds that the final effect on intra-sector trade is ambiguous. In this author's view, the effect on the intra-sector trading of a given product will only be positive if the immigrants' host country is a net exporter of the product in question.

Therefore, the relationship between immigration and trade can be established on the basis of the transaction costs. The underlying hypothesis assumes that immigration contributes to the reduction of transaction costs, thus leading to increases of all trade flows.

According to Gould (1994), Rauch (1999), Girma and Yu (2002) and Blanes (2005), immigrants bring a positive influence to bear on trade through two channels: the preference channel (i.e., immigrants prefer products from their countries of origin) and the transaction-cost reduction channel (due to the immigrants' networks).

Gould (1994), Dunlevy and Hutchinson (1999) and Girma and Yu (2002) estimated a positive relationship between immigration and bilateral trade. Blanes (2005) concludes that immigration has a positive effect on intra-sector trade. White (2008) distinguishes between horizontal and vertical intra-sector trade, also concluding that immigration has a positive influence on intra-sector trade, aggregated and by type. Equally, among studies on Portugal, and only taking into consideration Portugal's bilateral trade with its partner-countries in the EU15 over the period 1995-2003, Faustino and Leitão (2008a, 2008b) obtain a positive effect from the stock of immigrants, both on exports and imports and on the intra-sector trade, aggregated and by type.

III. The Gravitational Model

In order to test the hypotheses of the effects of immigration on bilateral trade, the gravitational equation will be used. This has previously been applied to explain different types of bilateral flows. The explanatory variables that are fundamental to an explanation of variations in trade by means of the gravitational model are the economic dimensions of the trading partners (positive effect) and the geographic distance between them (negative effect). The gravitational equation may be viewed as a means of representing supply (the country's exports) and demand (the country's imports), taking into consideration that trade is not free, but has restrictions, such as tariff and non-tariff barriers, transportation costs (approximated by the variable, *distance*), cultural barriers and other socio-economic obstacles.

The gravitational model takes its inspiration from Newton's universal law of gravitation, which states that the force of gravity between two objects in the universe is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. Hence, and regarding the analysis of international trade, trade between two countries is directly related to the products or income per capita (the larger the economic dimension of the two countries, the more trade will there be between them) and inversely related to the geographic distance between them (the greater the distance, the lesser the trade).

Since Anderson (1979), it has been acknowledged that the gravitational model explains adequately the flows of bilateral trade and that the gravitational equation can be based on the various models of trade: those of Ricardo and Hechscher-Ohlin and the models of intra-sector trade. For example, Hummels and Levinsohn (1995) tested some of the hypotheses of the theoretical model of Helpman and Krugman (1985) and concluded that the results, using the gravitational equation, were good.

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:

$$T_{ij} = G\frac{Y_i^{\alpha} Y_j^{\beta}}{D_{ij}^{\delta}}$$

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[1]:

$$\text{Ln } T_{ij} = \ln G + \alpha \ln Y_i + \beta \ln Y_j - \delta \ln D_{ij}$$

Theoretically supported by the works of Anderson (1979), Bergstrand (1985, 1989, 1990), Helpman and Krugman (1985), Baier and Bergstrand (2001) and Feenstra et al. (2001), the gravitational model can include other explanatory hypotheses of trade, as well as GDP and distance. Feenstra et al. (2001) demonstrate that a large series of theories is consistent with the gravitational equation. In other words, different alternative theories of international trade can use the gravitational equation. According to Feenstra et al. (2001), in empirical studies, the differences in the alternative theories can be observed through the difference in the values estimated for the elasticities-income of the exports. Despite the theoretical issues concerning the variables to be included in the gravitational equation, the logarithmic form of the equation has permitted good results to be obtained in the explanation of the different flows of bilateral trade. Nevertheless, according to Helpman (1999), the gravitational equation yields better results when the countries are similar, with high levels of intra-sector trade, than when they differ widely in terms of the relative endowment factors and they are countries in which inter-sector trade is predominant.

IV. The Empirical Model

The econometric model that will be specified is based on the general gravitational equation, in order to capture other independent variables besides geographic distance and economic dimension. The general model assumes the following pattern:

[1] When the dependent variable is the exports of each country, the coefficients of Yi and Yj represent the elasticity – income of the exports of each of the partners.

$$Tijt = \beta o + \beta 1\ Xijt + \delta t + Uijt$$

where Tijt is the dependent variable related to the trade between Portugal (country i) and the trading partner (country j) during the time period t (year), assuming five different values: exports in euros (X), imports in euros (M), intra-industry trade index (IIT), horizontal intra-industry trade index (HIIT) and vertical intra-industry trade index (VIIT). Xijt is a vector with independent variables, which includes the immigration-related variables and the dummy variables. δt, which is a specific element of the panel data analysis **,** is the component of the model that groups the factors which affect all the sectional units (countries) in a given year. Uit is the random residual term, with $U \sim N(0; \sigma^2)$, with $\sigma^2 > 0$. All variables are in a logarithmic format, except dummy variables, allowing for the calculation of elasticities. As the indexes IIT, HIIT and VIIT vary between zero and one, their logistical transformation (LOGI), which is also a logarithmic transformation, is usually conducted under LOGI IIT= ln[IIT/(1-II/)] (see Hummels and Levinsohn (1995)). As the model uses as the independent variable the geographic distance, which is constant along the time, we cannot use the fixed-effects estimator since it removes this type of variable. One alternative to the fixed-effects estimator is the use of the *ordinary least squares* (OLS) with time dummies. The consideration of these dummies allows for the control of effects along the time for all sectional units (countries).

In order to measure trade, five alternative measures are considered: exports (X), imports (M), the intra-industry trade index (IIT), the vertical intra-industry trade index (VIIT) and the horizontal intra-industry trade index (HIIT). These will be the five variables to be explained.

IV.1 The Grubel and Lloyd IIT index (1975)

The Grubel and Lloyd index (1975) is used as the measure of the intra-industry trade between country i and the trading partner, country j. In order to avoid the problems of statistical aggregation, the index is calculated with the maximum of statistical disaggregation allowed by INE (five digits).

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

IV.2 The HIIT and VIIT indexes

The methodology of Abd-el-Rahaman (1991) and Greenaway et al. (1994) is used to separate the horizontal from the vertical intra-industry trade. The unit prices of exports related to the unit prices of imports are used to distinguish between VIIT and HIIT. We use, as is common practice, a dispersion value of 15%.

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

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

The HIIT and VIIT indexes are also calculated with a five-digit disaggregation from the CAE – the Classification of Economic Activities.

Since the index varies between zero and one, we have applied the logistical transformation, following Hummels and Levinsohn (1995):

$$\text{Logistic IIT} = \ln\left[IIT/(1-IIT)\right].$$

The same procedure is carried out for the HIIT and VIIT indexes.

The fundamental *independent variables* are those related to immigration. However, since there are other determinants for trade, both at the inter-industry trade (exports and imports) and the intra-industry trade levels (IIT, HIIT, VII), these variables must be included in the model in order to control the effects, improve the quality of the adjustment and avoid the problems of bad specification. As control variables, we chose: the minimum and maximum values of per-capita GDP (in purchasing power parity), which are commonly used in the empirical studies on intra-industry trade; the prices index of the trading partner of Portugal (another option was the ratio of the prices indexes between Portugal and each of its trading partners, but this did not prove to be statistically robust); and the variable, geographic distance, measured in kilometers (we also used

the distance measured in nautical miles, but the results did not improve with respect to the theoretically expected signal), as proxy for transportation costs. In addition to these quantitative variables, we also introduced qualitative dummy variables to reflect the impact of countries belonging to the European Union before the last enlargements (EU15), the impact of the 12 new member-states (NEU)[2] and of the five African Countries having Portuguese as the official language (PALOPS). It should be noted that further control variables that are commonly used in empirical studies were added, namely: the economic dimensions of the trading partners (measured by the average per-capita GDP), the absolute difference between the per-capita incomes of the trading partners, the difference in electrical energy consumption between the trading partners (as proxy of the differences in physical capital endowments), the degree of openness and the weight of the trade balance on the GDP for each trading partner. However, these independent variables did not prove to be statistically significant, or did not improve the models' adjustment. The calculation of the correlation matrix between variables allowed the strongly-correlated independent variables to be removed. In any case, the different specifications, in order to conduct the sensitivity analysis, always produced very similar results regarding the immigrant STOCK variable, mainly with regard to the positive signal of this variable's coefficient.

Regarding the immigration-related variables, in addition to the immigrant stock (STOCK), we considered the percentage of highly-skilled immigrants in manufacturing industry (ITPAQ) and the percentage of immigrant employers in manufacturing industry (ITEMPG). We also considered other immigration-related variables that were revealed to be statistically insignificant, or that had to be eliminated due to problems of multicolinearity or insufficient data. These variables included the different skill levels of immigrants, both in overall employment and in the specific case of manufacturing industry (IT); the male/female ratio, both in employment generally and in the specific case of IT; the educational level of immigrants from basic to higher education; the employment duration regime; type of employment contract; and occupation.

The selected independent variables were the following:

- MINGDP: i.e. the minimum value of the per-capita GDP (in ppp - purchasing power parity) between Portugal and the trading partner. This is a control variable related to dimension,

[2] These 12 countries are: Cyprus, Slovenia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Czech Republic, Slovakia, Bulgaria and Romania.

used in the intra-industry trade models, the expected sign for the coefficient of this variable being positive in the three equations related to intra-industry trade (IIT, HIIT and VIIT). It is represents the hypothesis that the larger, in economic terms, is the smaller of the two countries, the smaller is the difference between the countries and the larger the intra-industry trade (see Hummels and Levinshon (1995)). With regard to the exports and imports equations, a positive signal is also to be expected;

- MAXGDP: i.e. the maximum value of the per-capita GDP (ppp) between Portugal and the trading partner. This is the other control variable related to dimension used in the intra-sector trade models; the signal for the coefficient of this variable is expected to be negative. The same hypothesis is assumed in this case: consequently, the smaller, in economic terms, is the larger of the two countries, the smaller is the difference between the countries and the larger the intra-sector trade (see Hummels and Levinshon (1995)). With reference to the exports and imports, a positive correlation is to be expected;

- IPK: i.e. the prices index for Portugal's trading partner. It is expected that the increase of this prices index in the trading partner-country will favor the competitiveness of the Portuguese exports (hence a positive signal for this variable's coefficient in the exports equation) and produce a negative effect on Portugal's imports from that country. Regarding the effect on the intra-industry trade indexes, we cannot assume *a priori* what the expected effect will be. The horizontal intra-industry trade is determined more by other characteristics than the price itself and the vertical intra-industry trade, although determined by price (considered equivalent to quality), is not homogeneous (there are low-quality products on which the impact of price modification can be relevant and high-quality products on which the impact of price modification can be less relevant). Consequently, we assume that the sign of the estimated coefficient in these equations is more a matter of empirical evidence and we note an interrogation mark (?). It must also be noted that since the ITT includes both the VIIT and the HIIT, the sign of the IPK coefficient for the IIT equation is always an ambiguous one;

- DIST: i.e. the geographic distance, measured in kilometers, between the capital cities of the trading partners. It is used as a proxy variable for transportation costs. Hence a negative sign is expected for the coefficient of this variable. The same notion of the negative effect is reinforced with the use of the gravitational equation to explain bilateral trade;

- STOCK: i.e. the immigrant stock in Portugal. Until 2000, the stock is equivalent to the stock of residence permits (AR). From 2000 to 2004, the stock is equivalent to the sum of AR and permits to stay (AP). From 2004 to 2006, the stock is equivalent to the sum of AR, renewed AP and renewed long-term visas (VL). A positive sign for the coefficient of this variable in all equations is expected, according to the hypothesis that migrant networks decrease transaction costs, facilitate the spread of information and, as a result, promote the increase in all types of trade;

- ITPAQ: i.e. the percentage of highly-skilled immigrants in manufacturing industry (IT). A positive sign for the coefficient of this variable is to be expected, under the assumption that the increase of the skill level of immigrants increases the product quality and differentiation, leading to the increase of all types of intra-industry trade and exports. As regards imports, the positive effect can be explained by the increase in the purchasing power of these immigrants, together with their preference for products coming from their home country;

- ITEMPG: i.e. the percentage of immigrants who are employers (entrepreneurs) in IT. A positive signal for the coefficient of this variable is to be expected, under the assumption that an increase of immigrant employers reinforces ethnic and trade networks, contributing to the decrease of transaction costs;

- EU15: i.e. a dummy variable that assumes the value 1 if the trading partner is a member of the EU15 and zero otherwise. The signal for the coefficient of this variable is a question of empirical evidence, although *a priori,* it can be expected that the effect on exports and imports will be larger for this group of countries. Regarding the intra-industry trade index (IIT) and the index by types (HIIT and VIIT), we do not know *a priori* what the effect on these indexes will be;

- NEU: i.e. another of the dummy variables that assumes the value 1 if the country is one of the 12 countries that joined the European Union (EU27) after 2004 and zero otherwise;

- PALOPS: i.e. another dummy variable that assumes the value 1 if the trading partner is one of the five African countries considered in this study with Portuguese as its official language, and zero in the opposite case/otherwise.[3]

[3] It must be noted that when the dummy variable EU15 is only in one equation, the base group considered consists of all the other countries that are not part of the EU15. When the dummy variables EU15 and NEU are in one equation, the base group considered comprises all the countries that do not belong to the EU27. When the variables EU15 and PALOPS are in one equation, the base group considered comprises all the countries that do not belong to

V. Analysis of the Results

In these models we introduced two dummy variables, PALOPS and EU15, in the first two equations (equation of exports and imports) and two dummy variables, EU15 and NEU (the 12 newest European Union member-countries) in the IIT, HIIT and VIIT equations. Thus, in the first two equations, the base group consists only of countries that do not belong to either the EU15 or the PALOPs. For the last three equations, the base group is composed of countries outside the EU27.[4]

The econometric results are given in Table 1. In all estimated models, the variable STOCK (stock of immigrants) is statistically significant and the estimated positive sign corresponds to the theoretically expected sign. Specifically, if the stock of immigrants increases by 10%, the effect on exports of goods is 2.8%, the effect on imports is 2.66%, the effect on the IIT is 1.87%, the effect on HIIT is 4.01% and the effect on VIIT is 1.48%. The effect on the trade balance is positive. The other two variables related to immigration (ITPAQ and ITEMPG), proved to be statistically significant in almost all equations and with a positive coefficient sign, as was expected. The only exceptions are the variable ITPAQ in the HIIT equation and the variable ITEMPG in the equation of imports, which are not statistically significant. Nevertheless, in general terms, we can conclude that when the percentage of highly-skilled immigrants in manufacturing increases, this has a positive effect on exports and on IIT and VIIT. The same result is obtained when the percentage of immigrant employees in manufacturing increases. Regarding the variable DIST (distance), this explanatory variable is statistically significant, except for the equation of HIIT, but the estimated sign (positive) is not as theoretically expected. Considering the dummy variables EU15 and PALOPS, related to the first two equations, we can conclude that the result is according to the expectation: the effect on exports and imports is much greater in the EU15, and the PALOPS influence positively the exports. Considering now the equations relating to intra-industry trade, the base group is represented by the countries that are not part of the EU27. The estimation results for the three equations (IIT, HIIT and VIIT) suggest that compared with the base group , the effects of bilateral EU15 trade on these intra-industry

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the EU15 or PALOPS. As a result, the value assumed by the coefficient of the dummy variable measures the difference of the effect in relation to the base group.

[4] The dummy variable coefficient for a particular group represents the estimated difference in intercepts between that group and the base group.

trade indexes are 167.8% higher for IIT, 189.5% higher for HIIT and 162.6% higher for VIIT. Making the same analysis for the NEU, the results are as follows, compared to the base group: 1789.4% higher for IIT, 169.9% higher for HIIT and 159.5% higher for VIIT. When comparing the effects of trade on IIT indexes, considering the older members of European Union (EU15) and the new members of European Union (NEU), we found that the difference to the base group is higher in the EU15 (NEU) for HIIT and VIIT (IIT).

Table1: *The effects of immigration on trade: Static models*

Variables	Exports X	Imports M	IIT	HIIT	VIIT	Expected Sign
						X,(+),M(-)
IPK	3.3e-005	-2.55e-006	-3.7e-005	-2.75e-005	-3.77e-005	IIT, HIIT
	(6.11)***	(-0.90)	(-7.78)***	(-3.34)***	(-9.13)***	VIIT, (?)
DIST	2.20	3.794	2.67	2.288	2.794	(-)
	(3.51)***	(3.49)***	(2.85)***	(1.45)	(3.05)***	
MINGDP	1.412	1.017	0.697	1.576	0.656	(+)
	(10.1)***	(3.59)***	(2.68)***	(3.61)***	(2.62)***	
MAXGDP	1.75	1.13	0.228	-1.923	0.176	(-)
	(3.10)***	(0.864)	(0.346)	(-1.82)*	(0.267)	
STOCK	0.280	0.266	0.187	0.401	0.148	(+)
	(4.10)***	(2.87)***	(3.17)***	(3.63)***	(2.54)**	
ITPAQ	3.64	3.03	4.70	3.473	4.52	(+)
	(3.94)***	(1.88)*	(4.03)***	(1.57)	(3.76)**	
ITEMPG	2.21	0.45	2.33	4.27	1.906	(+)
	(1.84)*	(0.343)	(2.45)**	(2.43)**	(2.27)**	
EU15	0.994	1.494	1.678	1.895	1.626	(?)
	(2.75)***	(1.83)*	(3.31)***	(2.49)**	(3.13)***	
PALOPS	1.772	-2.17				
	(4.04)***	(-2.51)**				
NEU			1.794	1.699	1.595	
			(2.72)***	(1.83)**	(2.26)**	
C	-22.33	-17.08	-22.77	-12.31	-22.16	
Adj.R^2	0.834	0.771	0.678	0.515	0.641	
N	127	127	125	115	125	

Note: OLS estimations including time dummies variables. T-statistics (heteroskedasticity corrected) are in round

brackets. ***, **, * denote significance at the level of 1, 5 and 10 percent respectively.
The variables X, M, MINGDP, MAXGDP, DIST and STOCK are in logs. The variables IIT, HIIT and VIIT are in the logistic form.

Source: Own calculations.

VI. Concluding remarks

This study estimates the effect of the immigrant stock and other characteristics of immigration on the bilateral trade of Portugal with the main immigration-source countries. With regard to the 38 countries considered in the study, a 10% increase in the immigrants stock will have the following effects on the bilateral trade of Portugal with those countries: exports increase by 2.8%, imports increase by 2.66%, the intra-industry trade index (IIT) increases by 1.87%, the horizontal intra-industry trade index (HIIT) increases by 4.01% and the vertical intra-industry trade index (VIIT) increases by 1.48%.

When the observation is expanded and two other independent variables related to immigration are considered (the percentage of highly-skilled immigrants in manufacturing industry and the percentage of immigrant employers in manufacturing industry), we reach the following conclusion, with regard to the trade with the 38 countries: when both the percentage of highly-skilled immigrants in manufacturing industry and the percentage of immigrant employers in manufacturing industry increase, there is a positive effect on exports, on the aggregated intra-industry trade (IIT) and on the vertical intra-industry trade (VIIT).

The consequences for immigration policy and economic policy are clear. When viewed as a whole, immigration brings beneficial effects to the Portuguese economy in terms of international trade. These effects are reinforced when two characteristics of the immigrants come under consideration: skills and entrepreneurship in the context of manufacturing industry. What the data suggests is that immigration policies that facilitate the admission of immigrants, favor its skills-upgrading and promote its entrepreneurship are beneficial for Portugal, in terms of the trade balance and the trade pattern.

It is also noteworthy that this study has not attained robust results regarding the effects of other immigrant characteristics on bilateral trade. These included variables such as gender, educational level, occupation, skill levels (other than the percentage of highly-skilled immigrants in manufacturing industry) and type of employment contract. As statistical databases on

immigration become more numerous and reliable, we expect to estimate again these models in order to evaluate whether the results for these variables will be confirmed or not.

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