LUND UNIVERSITY
School of Economics and Management

Bridging barriers

Pro-trade effects of immigration on Swedish exports

Axel Wijk Tegenrot

Abstract

This study examines the pro-trade effects of immigration on Swedish exports. Beginning in the theory that immigrants through their unique set of networks and knowledge can facilitate international trade and bridge informational barriers to trade this study will estimate the immigration effect on exports for Sweden. Unlike studies in similar settings, this paper applies a Pseudo poisson maximum likelihood estimation, which is preferential to the log-linear OLS, and have not before been applied in studies for Sweden. Further, this paper tests if institutional variables work as a good proxy for estimating informational barriers. The results show that immigration indeed have significant positive effects on Swedish exports; a 10 percent increase in immigration results in 1,4 to 3,7 percent increase in exports. However, the model fails to capture and estimate the theoretical mechanisms behind immigrants' network and information effect on Swedish exports.

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1. Introduction

The motive of this paper is to investigate the migration effect on Swedish exports. As the question of whether immigration economically pays off or not is getting more attention it is called for to study the implications of immigration. The theory suggests that migration is able to bridge barriers to trade, through networks and unique sets of information and knowledge migrants are able to facilitate trade between host country and their country of birth. Beginning in the theory that uncertainty, lack of information together with cultural and institutional differences constitutes barriers to trade of which migrants are able to bridge, I want to study the effects of migration on trade and if it is successful in breaking the barriers just mentioned. The study will not only focus on migration effect in general but further study through which channels and what theoretical mechanisms the migration effect on trade work through. The question that this study will answer thus is formulated as;

> *Does immigration to Sweden increase exports to the immigrants' home country? If so, what are the theoretical mechanisms at play?*

The aim will be to extend the study beyond general migration effect on trade and test if specific theoretical mechanisms can be seen in the empirics. I will in this paper test the theoretical assumptions about information and networks and see if it is able to detect and find proxies for these mechanisms in my model.

The study will apply a gravity model of trade, the conventional approach in estimating factors behind trade in international economics. The gravity model of trade has proven to be accurate in estimating effects on trade and will establish a solid ground in the empirical estimation. Also in the dataset and estimations

provided with this paper the standard gravity model holds in the case of Sweden. Migration will show to have a positive effect on Swedish exports while it however is unsuccessful in overcoming barriers to trade in terms of weak institutions. The concluding remarks will not reject the theory of information and networks as trade facilitators among migrants but with the data available this study does not succeed in estimating a model capturing these effects.

With a strong foundation in the research of migration and trade, this study will provide an updated view of the case of Sweden. With good coverage in the dataset, both in the time-dimension and trading partner-dimension, this paper offers a more extensive study of Swedish trade than previous studies. This involves the use of a more proper estimation technique when testing the gravity model of trade, the Pseudo poisson maximum likelihood model as opposed to traditional log-linearized least squares model. Also, the use of institutional variables as a proxy for uncertainty and information has not been done for the case of Sweden.

Following this introduction to the study, the relevant theoretical aspects of trade and migration that this paper begins in will be presented in chapter 2. Then, in chapter 3 will an overview of the literature on the field of trade and migration be briefly discussed including the most influential and relevant studies of the subject. For contextual purposes a background passage will be included covering the history of Swedish migration and policy as well as the current situation in chapter 4. In chapter 5 will the empirical methodology be presented and discussed including an overview of the dataset used in the study. Thereafter, in chapter 6, is the empirical results presented and interpreted, leading in to the final part, chapter 7, with a discussion of the findings and suggestions for future research.

2. The theoretical links between migration and trade

There are in the literature on migration and trade mainly three mechanisms through which migration may facilitate trade. Firstly, immigrants can promote trade through their knowledge about their home country market via the information channel. Secondly, having an international network, immigrants can promote business through their connections abroad. Thirdly, immigrants bring with them demand and preferences from their home country into the host country economy potentially increasing trade.

2.1 The information channel

Hatzigeorgiou (2010a) mentions that migration primarily can promote trade through the information channel. Immigrants possess unique knowledge and information about markets in their country of origin, through which they can act to significantly reduce trade costs for exporting and importing firms. Foreign born migrants have better knowledge of history, politics and business norms in the country of origin, they can facilitate negotiations, provide knowledge about common business procedures and know what expectations of what a business partnership implies. Further, immigrants have better prospects of having knowledge about consumer preferences and trends in their country of origin, hence, immigration potentially generates great reduction of uncertainty in foreign trade and provides possibilities of better resource allocation for exporting firms (Hatzigeorgiou, 2010a). Halliwell (1997) suggest that trade is more intense within borders than across, more than can be explained by border and transportation cost, this would be due to that individuals prefer to interact and be part of shared knowledge and common norms and institutions. Migration can then create shared

knowledge across borders and countries and in that way create possibilities for and facilitate trade (Halliwell, 1997 p.175-176).

2.2 Networks

Two ways of describing the migration effect on trade is to divide it in universal non-individual specific effects and individual specific effects. Girma and Yu (2002) specifies these two effects where the non-individual specific effects is connected to the more general and universal effects that migration causes. When individuals migrate they expand their networks, creating new connections and building bridges of connectedness across the globe. These connections build a universal network with migrants connecting their host country market with the market in their country of origin. This is what is called the universal specific effects on trade of migration (Girma & Yu, 2002 p.116). The networks created from migration helps exporters to get in contact with new markets through the immigrants' networks and will thus reduce uncertainty in the investment decision of exporting to new markets. This effect also builds on the reasoning above that migration through their networks bridges informational and cultural barriers to trade and have access to preferential information about unfamiliar markets (Girma & Yu, 2002 p.116).

2.3 Increased demand

Individual specific effects to trade of migration is when immigrants bring specific preferences for home-country products when settling in a new country. Thus, the demand for foreign products rises and there are incentives for imports to increase (Girma & Yu, 2002, p.116). Here, the concept of transplanted demand is relevant, Konečný (2009) mentions this concept regarding when immigrants imports demand of specific home-country products. This effect of transplanted demand is found to be strongest with migration between countries of different levels of development. This strengthen the theory of the importance of immigrant networks when there are significant differences between countries in terms of culture,

institutions and development. However, Girma and Yu (2002) acknowledges that this increased demand through the individual specific effect encourages domestic firms to produce these products and reap profits from migrants' preferences. In this case, migrants' demand and domestic firm production will work as an import substituting activity potentially decreasing imports (Girma & Yu, 2002 p.117). Researchers will therefore mainly focus on the universal specific effects of migration as an engine for increased international trade. I will follow this approach as well focusing on migrants' information and network effects on export rather than imports as the exports is more relevant for domestic policy and national economic performance.

2.4 Trade complements

In traditional Heckscher-Ohlin settings the theory of migration and trade suggests that they are substitutes. The flow of labor or goods would depend on labor or capital intensities in each country. According to the Heckscher-Ohlin-Vanek theorem, the trade in goods would be equal to be trading factors. Thus, labor abundant countries will export labor services (export labor) and import capital inputs (import capital) (Zimring, 2014 p.16-17). In the Heckscher-Ohlin world, trade results from relative endowment differences; labor will flow to capital-intensive economies where relative domestic wage is high, this will continue until we have factor price equalization where commodity prices and wages equalizes across countries weakening the incentives for trade (Mundell, 1957 p.321). However, when allowing for different technologies across countries and externalities of migration there are reasons to believe that trade and migration are complements rather than substitutes. This has also been confirmed in previous studies showing complementary effects rather than opposing (Schiff, 2007 p.16). Also, the Heckscher-Ohlin theorem have performed poorly empirically suggesting that the strong assumptions of the HO model; identical technology and preferences

does not hold and we have significant differences between countries. These differences create potentials for migration to become a trade facilitating factor.

2.5 Causality

There are questions raised about the direction of causation in the trade migration nexus. There are fears about whether the migration and trade variables are codetermined and that there are specific bilateral country characteristics that determines trade and migration simultaneously making the model suffer from endogeneity. Alternatively, that trade cause migration through the relationship build by trade partnership. This fear has not been able to be proven empirically though, studies show that individuals will migrate to where they maximize utility (Brettell and Hollifield, 2014 p.8) (Hatzigeorgiou, 2010b p.385). This is further confirmed by sociological studies and surveys, where migrants claim that host countries were chosen mainly because of being places where migrants would significantly raise their standard of living and where there exist a community of countrymen (Hatzigeorgiou, 2010b p.385). Dunlevy and Hutchinson (1999) further did a causality analysis for US trade and migration with results showing no signs of a causal relationship. There are reasons to believe that this holds for Swedish immigration as well, also, recent surge of refugees of war and oppression further supports this hypothesis., Hence, it is unlikely that existing trade relations will factor in on the decision of the destination of war refugees or migrants in general. Moreover, the fixed effects approach described in the next section will capture country specific relationships causing migration and trade to be co-determined. Further, there are also arguments for binding quotas of immigration making migration exogenous to trade (Hatzigeorgiou, 2010b p.386). Even if migration would follow trade flows, putting limitations or restrictions of immigration will weaken the relationship between the two. For the case of Sweden, with liberal migration policies, the binding quota-arguments is not as strong however, but recent policy changes have shown that there are limitations or upper limits of how many immigrants that are politically acceptable to receive in Sweden.

3. Previous research

The literature on subject of migration and trade generally indicates that an increased amount of inward migration has a positive effect on bilateral trade and international trade in general. In the previous research the positive effect of migration on trade ranges from 0,7 percent to 9 percent increased trade for a 10 percent increase in migration. Pioneering in the migration-trade research Gould (1994) developed a model examining the effect of immigrants' information on international trade. With a microeconomic foundation gravity equation, the author found that for the US, migrants had a positive trade effect between host and origin country. With information spillovers migrants reduce uncertainty for firms to trade internationally where the pro-trade effects are strongest in the exporting sector (Gould, 1994 p.314). Confirming these findings, Head and Ries (1998) found similar effects in Canadas international trade with migrants' countries of birth. The authors apply an augmented gravity model and find that an increased immigration by 10% leads to an increased export by 1 percent and a 3 percent increase in imports. The authors also test for immigrant heterogeneity and find that skilled migrants have the strongest trade effect and refugees have the weakest (Head & Ries, 1998 p.53, 58)

The research mainly defines two factors where migration has a positive effect on international trade; firstly, migrants will raise the domestic demand of foreign goods, especially from their country of origin. Secondly, migrants have a unique information advantage about the markets in their home country of which they can use in trade promoting activities. The question about whether exports or imports is the dominating part of migrants' positive effect on international trade is ambiguous over different cases and varies over the research field. Girma and Yu (2002) identifies cases where migration works as an import substituting activity. Migrants will increase the domestic demand of products from the migrants' origin country and rather than that these products will be imported there will instead be an increased domestic production of these kind of products. The authors thus see

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the studies on exports to be more prone to show pro-trade effects of immigration. The Girma and Yu (2002) findings show that for UK exports, a 10 percent increase in immigration results in an increased trade with non-commonwealth countries by 1.6 percent. For migration from commonwealth countries results on trade are negligible and insignificant. Hence, migration from culturally similar countries seem to do little to promote increased trade flows between countries while when there is significant cultural differences migration enhances exports to migrants' countries of origin (Girma & Yu, 2002 p.129). Further, Parsons (2005) continues with these findings showing how immigration from eastern Europe into western European countries with the 2004 EU enlargement increased bilateral trade. Immigration from east to west increased trade of western countries with migrants' country of origin, for a 10 percent increase in immigration imports increased by 1,4 percent and exports by 1,2 percent (Parsons, 2005 p.19). This is another sign of migration working as a lubricate for international trade when there exists cultural differences and informational barriers.

According to a study by Genc et al. (2011) migration also tend to have diminishing effects on trade as the migration stock in the home country grows large. The first flow of immigrants from a new country will have a relatively larger effect on trade, results that are confirmed by Egger et al. (2011) that suggests diminishing returns to trade when the migrant stock rises above 4000. These studies propose significant positive effects on trade when there is no already existing strong migrant community in the host country, but this effect diminishes as there is satiation of the migrant community in the host country. The findings suggest that there is not a log-linear relationship between migration and trade. Genc et al. (2011) further finds that in a large sample including estimates from 48 studies, the elasticities of trade on migration is 1.5 percent for a 10 percent increase in migration. They also find, as Hatzigeorgiou (2010b), that migration will have greater effects on trade in heterogeneous goods than homogenous as the information advantage migrants have will reduce uncertainty and strengthen the extensive margin. A reduction of information barriers to trade will promote

export/import enhancing investments for a wider range of products in the host country. Generally, studies find that trade facilitating policies such as currency unions or FTAs reduce uncertainty and increases the extensive margin as the export decision for firms become less risky, the migration effect on trade would work in a similar manner.

The composition of migrants is also important in how they will affect the host country's international trade. Bowen and Wu (2012) has studied the character of migrants into OECD countries and what effect they will have on trade. They find that most migrants are inter-sectoral immobile and are to a majority employed in the non-tradable sector. This means that empirics oppose traditional Heckscher-Ohlin settings where trade and migration are substitutes, migrants will instead complement the existing trade between host and home country. Therefore, sectoral pattern of migration will to a great extent affect international trade, the more skilled or sector-mobile laborers there are among migrants, the more will they positively affect international trade. With non-skilled migration the main effect will be pro-output in the non-trade sector (Bowen & Wu, 2012 p.24-25). Schiff (2000) continues to discard perfects substitutability between trade and migration as a result of factor price equalization (FPE). The fact that individuals are heterogeneous and not directly substitutable makes it preferable to trade in goods rather than individuals. Migration comes with externalities in the form of social capital differences that makes the FPE/perfect substitutability inconsistent. Individuals and societies differs across countries in terms of culture, customs, norms and language creating costs for individuals in settling in new geographical places (Schiff, 2000 p.22-23). In discussing the composition of migrants entering an economy and what it entails in economic performance, Zimmerman (2005) studies the case of Europe. The author finds that immigration in form of asylum seekers and family reunification will add less to the economy than labor migrants and will together with low skilled immigrants have difficulties in finding employment (Zimmerman, 2005)

On the topic of informational barriers to trade and other behind-the-border trade effects, Hatzigeorgiou (2010a) studies the trade effects of migration among 75 developing and developed countries on a global level. Hatzigeorgiou mentions the unique set of networks, trust and information that migrants bring into the economy to potentially accelerating a positive effect on international trade. The author finds positive significant effects of immigration on trade with migrants' countries of origin. A 10 percent increase in total number of immigrants raise imports with 0,7-0,8 percent according to the study. This effect stems from the reduction of behind-the-border trade barriers that migrants bring through their networks and information channels that brings trust and reduce uncertainty among trading partners (Hatzigeorgiou, 2010a p.25). Hatzigeorgiou also studies the migration-trade connection for the case of Sweden. In a study that tangent the one in this paper, Hatzigeorgiou find strong positive effects of immigration on trade. The effects are significantly greater for the case of Sweden than on the aggregate level; a 10 percent increase in immigration results in a 6 percent increase of exports and 9 percent of imports. The migration effect on trade is close to a 1-to-1 relationship for imports, about ten times greater than on the aggregate level. According to the author, a small open economy like Sweden, that is very dependent on its imports and exports, has a lot to gain in increased market and information access through immigration. Additionally, the effects on differentiated goods is even stronger, which is the main sort of exporting goods of Sweden (Hatzigeorgiou, 2010b p.399).

4. Background

4.1 Immigration and exports

It may be worthwhile to put this study into context, what is the relevance of this study applied to recent political-economical events? Current political trends and rhetoric points towards more conservative or restrictive migration policies, at least in the European Union. For Sweden, immigration in 2015 spiked with a yearly immigration of 134 240 compared to 98 801 in 2010 and 65 229 in 2005, that is, yearly immigration more than doubled in ten years. And of these 134 240 immigrants of 2015, almost one quarter (about 30 000) were migrants from Syria (Statistics Sweden, 2016a), the amount of immigrants that is war refugees is thus substantial. The number of asylum applications to Sweden is graphed in table 1 showing a somewhat irregular pattern with spiking numbers in 1992 with the Balkan war and in the recent years with the Syrian war. However, to be counted as an immigrant according to the statistics, individuals have to report to the Swedish tax agency that they intend to stay in Sweden for at least 12 months, they have to be granted a residence permit and they have to be registered as a resident.
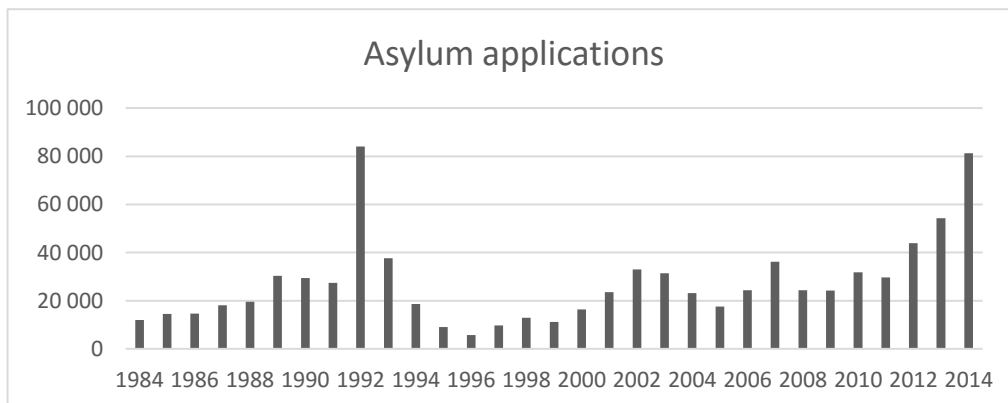

Figure 1. Asylum applications Sweden, 1984-2014

Source: Swedish Migration Agency (2016)

Thus, all asylum applicants will not be registered as migrants; the application may take time to process, the application may not be granted and it may also be withdrawn (Statistics Sweden, 2016a). The origin country of immigrants and immigration stock is in the dataset measured as country of birth. The five most common country of birth for immigrants in Sweden 2015 is Finland, Iraq, Syria, Poland and Iran (Statistics Sweden, 2016a).

Finland	156045
Iraq	131888
Syria	98216
Poland	85517
Iran	69067

Table 1. Immigrants' country of birth 2015 Source: Statistics Sweden (2016)

In line with the development of increased immigration to Sweden is Swedish exports also increasing at a high rate. Fig. 2 shows Swedish exports and immigration to Sweden over the years 1975 to 2015. The trend and growth rate is similar and share the same development path. The upward trend can partly be explained by liberal policies, both in trade and migration, in Sweden. With the introduction of EU and the common market, trade facilitation has become deepened over the last two decades. The general trend in trade policies has also gone towards becoming more liberal; average applied tariff rates of manufactured goods in the world has decreased from 10,4 percent in 1998 to 6,1 percent in 2012 (World Bank, 2016). The migration developments also point in the same direction; in 2015 nearly 244 million individuals migrated across the world compared to 151 million in 1990 (UN, 2016). In the same manner has immigration to Sweden developed, it has more than doubled, from 60 000 in 1990 to 134 000 in 2015 (Statistics Sweden, 2016a). Also, as a small open economy, Sweden and its economy is dependent of international trade to be successful. Globally, Sweden is among the most export intensive countries placing 14th in exports per capita in 2013 (CIA,

2014). Fig. 1 gives an initial hint about the relevance of the hypothesis of this study, that immigrants promote Swedish exports to their country of origin.
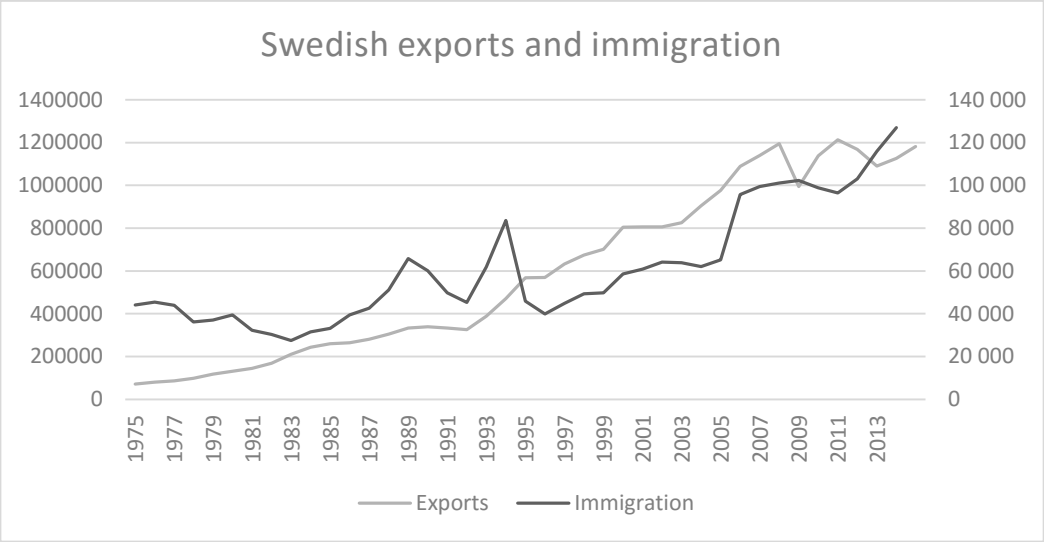

Figure 2. Yearly Swedish exports and immigration 1975-2014

Source: Statistics Sweden (2015)

Table 2 presents the top five export destination for Swedish goods and services. The values are measured in SEK for the year of 2015. Total export of Swedish goods and services in 2015 amounts to 1883 billion SEK (Statistics Sweden, 2016b). As shown in table 2 the top destinations of Swedish exports are either large economies with a great attraction of economic activity, or neighboring countries with close ties and familiar history. These kind of factors have traditionally been shown to be important parts in determining trade flows in the gravity model of trade.

Norway	121 billion
Germany	121 billion
USA	90 billion
Great Britain	84 billion
Denmark	80 billion

Table 2. Destination countries, Swedish exports 2015. Source: Statistics Sweden (2016

4.2 The data

The dataset covers 197 Swedish trading partners over the years 2000-2014 resulting in 2,765 observations. Trade data of Swedish exports is collected from Statistics Sweden, the same goes for Swedish immigration data and is measured in yearly cumulative migrant stocks for each country of birth. Hence, the migrant stock variable will cover both the existing migrant community and the yearly dynamics of the same, not only the inflow of migrants. Gross domestic product data is collected from the World Bank, it is measured in thousands current US dollars, just as the Swedish exports. Variables measuring institutional quality (Control of corruption, Rule of law, Regulatory quality, Government effectiveness and Political stability and absence of terrorism) is also gathered from the World Bank database. These institutional variables are included to measure informational barriers to trade through which immigrants can facilitate trade by having international networks and informational barriers. Control of corruption measures percentile ranks of perceived corruption and exploitation of public power for private gain. Rule of law is defined as the degree of perception about and confidence in the rules of the society, especially in terms of contract enforcement, property rights and quality of the courts. Regulatory quality measures the confidence in the government's ability to formulate and implement policies and regulations. Government effectiveness is perceptions of governmental quality and the qualities of civil services and its independence from political pressures. Lastly, political stability and absence of violence/terrorism measures the perceptions of the likelihood of political instability and politically motivated violence (World Bank, 2016).

5. Empirical analysis

5.1 Empirical strategy

The conventional approach on estimation effects on trade is the successful and frequently used gravity model. I will too in this paper use the gravity model to estimate migration effects on trade. The gravity model of trade was originally constructed by Jan Tinbergen in 1962, referring to Newton's concept of the law of gravity. The bigger the mass of an object is, the higher will the gravitational force be. The same reasoning goes for the gravity model of trade where trade (X_{ij}) between countries is determined by the economic mass measured in GDP (Y) of the countries, the distance between them (d_{ij}) and a gravity constant (g).

$$X_{ij} = g \, \frac{Y_i Y_j}{d_{ij}} \tag{1}$$

The distance variable enters the equation negatively and works as a proxy for transportation and informational costs to trade that comes with distance. Empirically the gravity model has been considered successful in estimating significant effects on trade of economic mass and geographical distance. However, most studies extend the general gravity model and augment it to account for relationships between trading partners and other cultural or geographical variables (Hatzigeorgiou, 2010b p.385). In context of this paper the gravity model will be augmented to include immigration variables and immigration interaction variables. The baseline model will be designed as follows;

$$
\begin{aligned}
Export_{ijt} = {} & \beta 0 + \beta 1 ln(GDP_{jt}) + \beta 2 \, ln(Immigrant\ stock_{ijt}) + \beta 3 \, ln(Immigrant\ stock_{ijt}^2) \\
& + \beta 4 \, ln \sum (Immigrant\ stock * Xi_{jt}) + \beta 5(T_{jt}) + \beta 6(G_j) + \varepsilon_{jt}
\end{aligned}
\tag{2}
$$

Exports from Sweden to trading partners ($Export_{ijt}$) is the dependent variable. GDP enters as a fundamental gravity model factor while the immigrant stock ($Immigrant\ stock_{ijt}$) is the relevant variable for my study. Further, the immigrant stock is squared to control for non-linear effects ($Immigrant\ stock^2_{ijt}$), as suggested by the literature (Genc et al, 2011). Plotting exports and the stock of migrants further indicates that there exist non-linear effects of immigration on exports, although increasing and not decreasing as previous studies have shown.
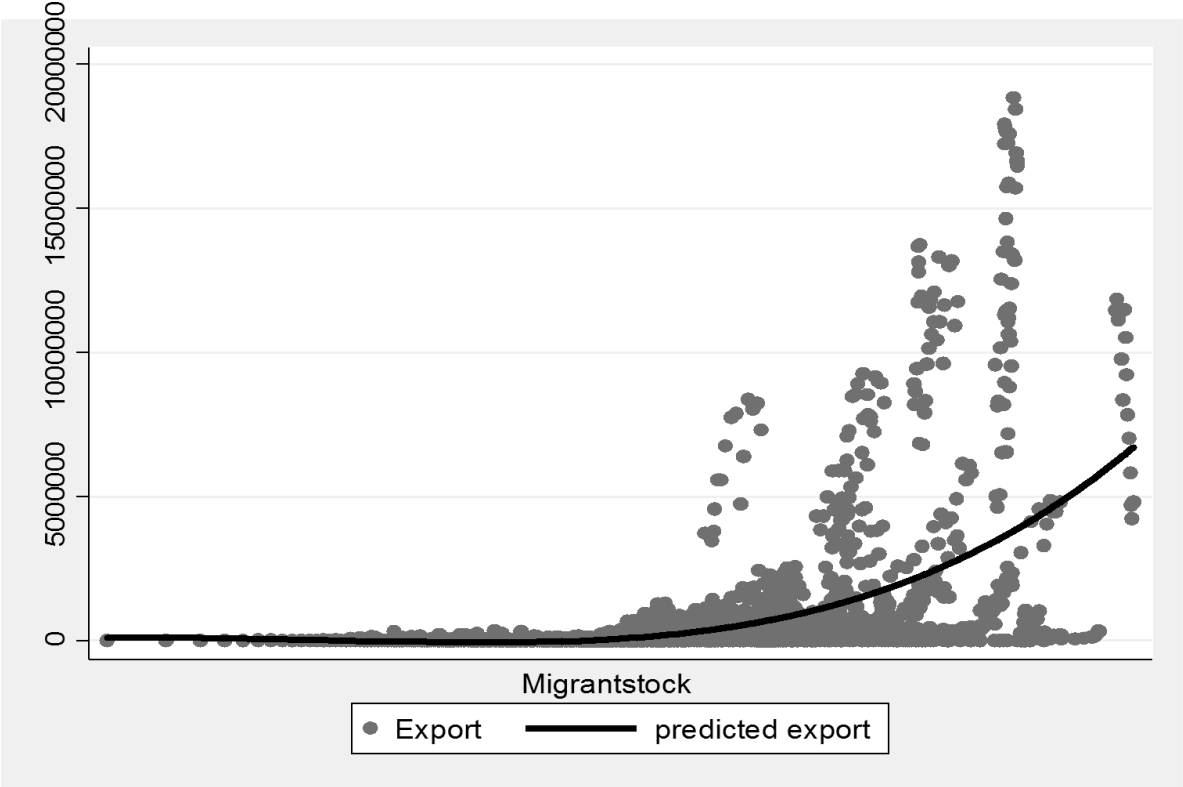
Figure 3. Swedish exports and immigrant stock, 197 countries 2000-2014, exports in thousand $, stock of migrants in levels

The immigrant stock is then interacted with institutional variables creating a set of interaction variables $\sum(Immigrant\ stock * Xi_{jt})$. The Xi_{jt} variable is the different institutional variables that is used as a proxy for informational barriers to trade. This will be, together with the immigration variable the important variable to test

for this study, examining if it is possible to capture the pro-trade effects that immigrants create through the information and network channel. The interacting procedure is done by dividing the institutional variables into three dummy levels; top, middle and lower third of the institutional quality spectra. This is because I want to be able to more clearly sort countries lacking functioning institutions vs. countries with efficient institutions. This is preferential as there is more straight forward interpretation of the output compared to when institutional quality is measured as a continuous variable. The institutional quality is measured in continuous numbers where higher values indicates better quality, when interacting this kind of variable it is harder to dissect effects. Are higher values due to high immigration or good institutional quality? It does not either capture the informational barriers to trade that this study tries to estimate; informational barriers would suggest

The model will also be estimated using time fixed effects and region fixed effects. (T_{jt}) is a time dummy variable controlling for yearly effects on exports. As my data span over 15 years including the financial crisis years of 2007-2008 and the euro crisis years of the early 2010s, it is reasonable to believe that these years will capture or explain some of the variation in the dependent variable. The motive for using region fixed effects (G_j), is that a country fixed effect, capturing all individual country characteristics will erode the relevance of my study, capturing too much of the effects that this paper tries to explain. The use of region fixed effects will cover some country characteristics and reduce the threat of unobserved heterogeneity when not controlling for entity characteristics. The data will be assigned a region dummy variable and is divided into eight different regions; Europe, Africa, West Asia, East Asia, North America, South America, Caribbean, and Pacific.

5.2 Estimation technique

Traditionally the gravity equation has been estimated using a log-linearized OLS technique, however, recent studies have claimed severe flaws with this kind of estimation. Santos Silva and Tenreyro (2006) published a pioneering study   (3)

presenting the drawbacks of estimating log-linearized gravity models. Generally, Log-linear models are specified as:

$$lnX_{ij} = \beta_0 + \beta_1 lnY_j + \beta_2 lnD_{ij} + ln\varepsilon_{ij}$$

In this specification, the error term is measured in logarithms as the regressors and the mean of the error term is dependent on higher moments of ε_{ij} including its variance. In cases like this, one can suspect the Jensen's inequality to hold, $E(lnY) \neq \ln E(Y)$ where the expected value of the logarithm of a random variable is different from the logarithm of its expected value. It has implications on the log-linear gravity model when the model is exposed to heteroscedasticity, that is, when the error term is not independent of the regressors. When taking logarithms of the error term you get $E(ln\varepsilon)$ and not $\ln E(\varepsilon)$, and $E(ln\varepsilon) \neq \ln E(\varepsilon)$ where $lnE(\varepsilon_{ij}|Y_j) = 0; E(ln\varepsilon_{ij}|Y_j) \neq 0$, resulting in Jensen's inequality which in turn gives us heteroscedastic error terms (Kareem, 2014 p.12). This violates the conditions of least squares making the estimates biased and inconsistent with misleading results. Several studies have found it common for gravity models to suffer from heteroscedasticity; Santos Silva and Tenreyro (2006) found in a case study, that it is not uncommon for gravity models to suffer from heteroscedasticity making many gravity model studies inconsistent and biased. Santos Silva and Tenreyro (2006) claim that log-linear OLS models intrinsically suffers from heteroscedasticity and estimates lead to inefficient and biased results. The explanation for the common heteroscedasticity in gravity models comes from the high variation in the values in the lower spectra of the trade resulting in higher variance of the error term (Arvis & Sheperd, 2013 p.3-4).

Another disadvantage of using log-linearized model comes with the zero-trade values. In traditional Newtonian gravity theory, gravity can never be zero, but in international trade it can, it is not seldom to have zero trade between two countries. In my case, it is not unreasonable to believe that there are some countries in a given year that Sweden do not trade with. In the dataset; countries such as Tuvalu, Timor-Leste, South Sudan and Micronesia, to name a few has

multiple zero values. In log-linear models zero-values are not feasible and thus observations have to be dropped or rounded up to 1 resulting in biases as these zero-values are exclusively belonging to distant and small economies and are not randomly distributed (Santos Silva & Tenreyro, 2006 p.642). This posts a significant problem in handling zero-values, whether it comes from missing observations or actual zero-values, which will lead to sample selection bias.

The problems of using log-linearized OLS estimating technique adds up and seem problematic to use. Hence, Santos Silva and Tenreyro (2006) suggests an alternate estimation method that solves the problems of the log-linear model. The authors suggest that the model should be estimated in its multiplicative form using a Pseudo poisson maximum likelihood (PPML) estimator, that is;

$$X_{ijt} = \exp[\beta_0 + \beta_1 lnY_{jt} + \beta_2 lnD_{ij}]\varepsilon_{ijt} \tag{4}$$

The properties of the PPML have significant advantages as we firstly can include zero-values in the estimation, eliminating the sample selection bias as the dependent variable is measured in levels rather than its logarithm. Secondly, it solves the "adding up"-problem that many log-linear models suffer from. Log-linear OLS estimations is found to consistently overestimate trade and effects on trade while PPML estimations are closer to actual trade (Santos Silva & Tenreyro, 2006, Arvis & Sheperd, 2013 p.5). Hence, the Jensen's inequality will not post a problem using the PPML estimator. Further, using this method does entail an interpretative loss as it is interpreted in the same way as a traditional OLS estimation with independent variables measured in logarithms as simple elasticities (Shepherd, 2012 p.52).

In the question of whether to use fixed or random effects in estimating the gravity model, the fixed effect approach has been dominating in use. In terms of the problem of heteroscedasticity; fixed effects will eliminate the presence of unobserved heterogeneity where the error term captures unobserved variables that is correlated with the regressors making the model suffer from heteroscedasticity and omitted variable bias. This makes the use of fixed effects

appealing, and will be used for a regional level in this study. Further will the model be estimated with robust standard errors further controlling for heteroscedasticity. The random effects estimations come with strict assumptions for the model to hold; that is, the error term need to be uncorrelated with the regressors. Unobserved factors that may influence the outcome of the dependent variable need to be uncorrelated with independent variables included in the model in order for the results to be efficient (Clarke et al. 2010 p.7). The fixed effects approach however, comes with the assumption that any unobserved heterogeneity in the model is constant over time. That is, any significant effect of an unobserved variable at one time is the same in other time periods, it is fixed over time. Factors that may be unobserved and possibly correlated with regressors is thus assumed to be time-invariant and constant for each entity (Williams, 2015 p.1). The fixed effect of this study is modelled at region level controlling for fixed effects across regions, this would create potentials for capturing factors such as geographical distance, cultural distance, transportation costs and factor endowments.

Alternative common estimation methods for the gravity model of trade includes the Heckman sample selection estimator. Like the PPML estimator, the Heckman estimation is also efficient in handling zero values in the dependent variable. The Heckman model assumes that the probability of zero-values of trade is correlated with trade costs and should be included in the model since dropping these observations (as in OLS) would result in sample selection bias. However, when comparing with the PPML estimator, both are efficient in handling zero-values and the choice is this aspect arbitrary, but the PPML estimator is more efficient in handling heteroscedasticity and would be preferred in my study (Shepherd, 2013 p.55, 58).

6. Results

The results will be attained by estimating a panel Pseudo poisson maximum likelihood estimation using time- and region fixed effects. However, before presenting the results there is need to make sure that fixed effects is preferred over random effects, not only theoretically but statistically as well. Performing a Hausman specification test in confirming my beliefs in using fixed effects rather than random effects show that there is no probability in assuming that there is no significant difference in using either of the models.[1] The Hausman test gives very strong indications that using fixed effects is the appropriate way of estimating the model.

Below are the results of the baseline augmented gravity model of trade including immigration and interaction variables. According to the standard gravity theory, the GDP variable is positively significant throughout all tests indicating that the model is specified correctly according to gravity theory. The immigration variable is also positively significant through the majority of models and are in line with the theory predicting increased exports with higher stock of immigrants. The values ranging from 1,4 to 3,7 percent increase in exports with a ten percent increase in the immigrant stock. However, when including non-linear effects, the significance disappears in model 4 and 5, table 3 where instead the squared migration variable becomes significant indicating existence of non-linear effects in the migrant stock variable. Still, throughout all models, migration variables show positive significant effects on exports confirming the relevance of migration as trade facilitators.

Looking at the interaction variables in models 2 to 6 in table 3a and 3b where the lower two thirds of the institutional quality levels are interacted with the immigrant stock. In all models, the interaction variables are statistically

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[1] Test: Ho: difference in coefficients not systematic
Prob>chi2 =   0.0000

significant at the 1 percent level, however, the signs are all negative. This means that immigrants from countries with low institutional quality cannot facilitate trade relative to immigrants from other countries. In fact, exports to countries with low institutional quality is significantly lower than to others, even when including and allowing for immigration. This goes for all measures of informational barriers; Corruption, Rule of law, Regulatory quality, Government efficiency and Political stability.

Dependent variable: Export			
	1	2	3
GDP	0.592***	0.524***	0.546***
	(0.0167)	(0.0192)	(0.0182)
Immigration stock	0.367***	0.267***	0.137*
	(0.0264)	(0.0876)	(0.0759)
Immigration stock^2		0.00716	0.0143***
		(0.00440)	(0.00386)
Immigration * High Corruption		-0.140***	
		(0.00840)	
Immigration * Medium Corruption		-0.0890***	
		(0.00648)	
Immigration * Medium Rule of Law			-0.0789***
			(0.00586)
Immigration * Low Rule of Law			-0.143***
			(0.00759)
Constant	-0.222	1.516***	1.633***
	(0.287)	(0.299)	(0.280)
Observations	2,765	2,765	2,765
Region FE	YES	YES	YES
Year FE	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3a. Effects of immigration on Swedish exports

Dependent variable: export	4	5	6
GDP	0.554*** (0.0183)	0.547*** (0.0182)	0.606*** (0.0206)
Migrantstock	0.0760 (0.0752)	0.0982 (0.0735)	0.305*** (0.0989)
Migrantstock^2	0.0185*** (0.00377)	0.0166*** (0.00373)	0.00416 (0.00508)
Immigration* Medium Regulatory Quality	-0.0865*** (0.00589)		
Immigration * Low Regulatory Quality	-0.172*** (0.00891)		
Immigration * Medium Government efficiency		-0.0884*** (0.00578)	
Immigration * Low Government efficiency		-0.183*** (0.00945)	
Immigration * Medium Political stability			-0.0569*** (0.00634)
Immigration * Low Political stability			-0.110*** (0.00685)
Constant	1.642*** (0.284)	1.781*** (0.281)	-0.223 (0.409)
Observations	2,765	2,765	2,765
Region FE	YES	YES	YES
Year FE	YES	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3b. Effects of immigration on Swedish exports

The results fail to show any positive significant effects of immigration from countries with poor institutions on exports, shown in the interaction variables in table 3 a and b. This indicates that immigration cannot compensate for the negative effects that weak institutions have on international trade. The general effects of immigration however, show positive significant effects on exports confirming the theories suggesting that immigration promotes international trade.

7. Discussion

In line with theory and previous studies the estimates provided from my model show positive significant effects of immigration on trade. The estimated coefficients of immigration on trade varies between 1,4 to 3,7 percent for a 10 percent increase in immigration, across models. Compared to Hatzigeorgiou's (2010b) study of immigration and export for the case of Sweden the coefficients in this study is significantly smaller than the 6 percent increase in export of a 10 percent increase in immigration provided by Hatzigeorgiou. This could be due to the "adding-up" problem that Arvis & Sheperd (2011) suggest that log-linear gravity models suffer from; log-linear models are found to consistently overestimate trade while poisson models performs more accurately. The difference in the estimates of the migration effect on exports between this study and the Hatzigeorgiou (2010b) study could be explained by this fact. Alternative explanations could be the larger dataset (four times as large) covering different characteristics of immigration and trade. The dataset of Hatzigeorgiou (2010b) covers the years of 2002-2007 and thus not covering the financial crisis and euro crisis years which could affect the outcomes. Further may the composition of immigration change over periods, as seen in figure 1 asylum applications varies significantly from one year to another and have been extraordinarily high in the recent years. There are good reasons to believe, and that studies also show including Head and Ries (1998) and Bowen and Wu (2012), that the characteristics of immigrants will have different effects on international trade. Thus, the results will depend on the composition of inward migration in terms of skilled vs. unskilled labor, regional origin, asylum migration or work related migration.

The main question of this study, if immigrants is successful in promoting trade between Sweden and their country of origin is according to the estimates confirmed to hold. With a 10 percent increase in the immigrant stock, exports will increase with 1,4 to 3,7 percent. The results are in line with previous research and the estimates are larger than those country-aggregated studies, which ranges from 0,7

and 1,4 percent. This is reasonable as Sweden, a small open economy, is a relatively big exporter, 14th in the world in exports per capita and is dependent on international trade to be economically successful (CIA, 2013). It is thus likely that addition to the population in form of immigration will have relatively larger impact on exports for Sweden than larger economies.

Extending the question into what theoretical mechanisms that determines the migration effects on exports, the model used in this paper fails to explain the theoretical aspects of migration and trade. Using institutional variables to explain informational barriers does not succeed in capturing the pro-trade effects of immigration. The results obtained show that immigration cannot compensate for informational barriers in terms of weak institutions relative to exports to countries with well-functioning institutions. It is not easy to estimate the link between migration and informational barriers, on the one hand is immigration positively affecting trade and on the other is informational barriers negatively affecting trade. There are two opposing forces and the aim is to estimate which of them is the strongest. According to my results, having poor institutional qualities will weaken the exports from Sweden more than the migrant stock in Sweden will increase Swedish exports. Whether this is because Sweden fail to integrate immigrants from these types of countries into the exporting sector or if the negative effects of weak institutions is hard to penetrate for exporting firms is not explained in the results and is a topic for future discussion.

Optimally, as in many studies, would have been to find a natural experiment case where there is a before- and after immigration case. If one where to find a case where, ceteris paribus, there is a time-series with before- and after immigration in countries with informational barriers. This will be a topic for future studies to improve; to find a dataset, or to create variables or models that efficiently captures variables that can explain the theoretical mechanisms in the trade and migration nexus. As my results show it is more probable that immigrants can facilitate trade through traditional business networks in their home countries rather than that they manage to correct for poor institutions which still poses as a trade barrier.

It is also relevant to discuss the measurement difficulties of estimating informational barriers to trade. The question is how to define these informal barriers; I have used institutional variables and corruption in line with theory and previous studies. But these variables are in themselves more arbitrary and measured in a qualitatively manner with potential subjective bias. Further, it is also hard to define and to quantify the migrants' qualities that would make them especially successful in promoting trade. How do one measure networks, trust or informational assets? And do all migrants possess these qualities? These are further questions this field need to study to find measures capturing foreign market information in general and among immigrants as well.

The results suggest that immigration is an efficient factor in conducting foreign trade policy. As informational barriers to trade in foreign countries are hard for Swedish policymakers to correct as they are more informal to its character than political policies can capture. Then, Swedish immigration policy is a much more feasible option, integrating immigrants with network and information assets into the exporting sector would according to my results facilitate exports for Sweden. The values that can be captured are also significant; Swedish exports in 2015 was 1883 billion Swedish Krona. Immigration of foreigners into Sweden numbered to 120 000 in 2015, an increase of the existing immigration stock by 7%. Implementing these numbers with the results obtained indicates potential increase in yearly exports by 18 to 49 billion SEK. Hence, it makes sense for policymakers to implement immigration policies designed to reap these pro-trade effects of immigration. However, it is noteworthy to remember that the results of immigration from countries with weak institutions show to be negative for Swedish exports to these countries. Thus, when disregarding humanitarian reasons for immigration policymakers need to be cautious when referring to economic reasons for actively promoting immigration from weak institutional countries as the model constructed in this study cannot support this claim.

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