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# The Impact of Immigration on Trade: the Case of Sweden

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# Abstract

The considerable increase in international trade and migration flows can be treated as the consequence of globalization and economic integration process during the recent years. The issue of immigration impact on trade has been studied a lot since the middle of 1990s and a significant and positive effect was found in most of the cases. This paper contributes to previous studies by investigating the impact of immigrants from 155 countries on Sweden's exports to and imports from these countries during the period from 1980 till 2010, using an augmented gravity model. The impact of immigrants on exports and imports is studied separately by looking at the whole period results and the dynamic of changes within the period. Besides this the influence of immigrants' home countries peculiarities (by dividing them on regions and level of development) and immigrants' type (immigrant stock, immigrant flow and asylum seekers) is tested. To the best of my knowledge it is the first study that implements this variety of classification tests for Swedish data.

The empirical results suggest that a 10 % increase in immigrant stock facilitates a 1% increase in exports to and a 0.5% increase of Sweden's imports from the immigrants' home countries. There is a tendency of gradual decrease of immigrants' impact on both exports and imports within the period under consideration. According to the different classification tests the immigrants from Africa have the largest impact on Sweden's exports, though European immigrants have the largest impact on imports; Swedish foreign born population from developed countries more facilitate trade than those who are from developing; new comers and temporary immigrants have almost the same impact on exports as the total immigrant stock, but there is even slightly negative effect on trade by asylum seekers.



**Key words:** immigration, international trade, Sweden, gravity model.

# Table of Contents

# 1. List of Tables



# 2. List of Figures

# 3. Introduction

With the process of globalization the world faces a considerable increase in international migration. So during the period from 1990 till 2010 the total number of immigrants all over the world has increased from 155.5 million to almost 214 million and is equal to 3% of the world's population (United Nations statistics). Wars and conflicts in a home country, political persecution, family reunification and seeking of better life conditions are common reasons of migration (Ministry of Foreign Affairs Department for Migration and Asylum Policy 2001:7).

Migration has numerous consequences for both donor and recipient countries, influencing several social and economic processes. One of the aspects that suppose to be influenced is bilateral trade between home and host countries. Immigrants' strong connection with home countries, language and business peculiarity knowledge make them valuable workers for companies with foreign branches, making easier across border business establishment. Many foreign born entrepreneurs base their business on home country products involving living there relatives, stimulating bilateral trade between countries, creating new working places in both countries and promoting these products abroad. Besides this immigrants may stimulate trade even without any active participation in an economic process, just creating demand in home country products in the country of their new residence. Many previous studies focused on two main channels of immigrants-trade impact: information bridge effect and immigrants' preferences.

Like many Western European countries Sweden is an open to immigrants or recipient country since the first part of the last century. It is confirmed by the fact that at present time a fifth of the Swedish population was born abroad or has both parents that were born outside of Sweden. Such a big amount of people with foreign background makes a trail in all spheres of Swedish life.

This thesis examines one of the aspects of migration consequences: the impact that migration may have on trade between home and host countries. This study aims to find out if immigrants have some impact on trade between Sweden and their home countries and if so:

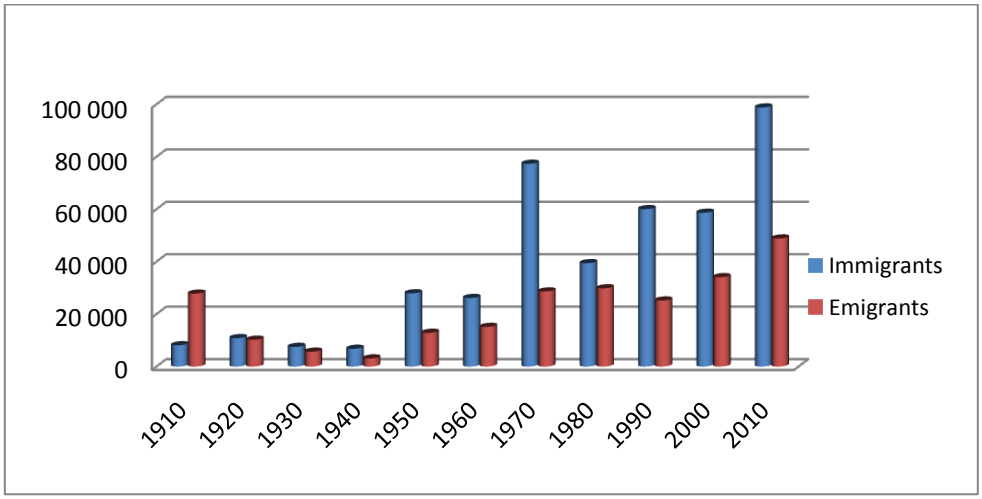
- is there any essential difference in immigrants' influence on exports and imports in Sweden;
- would we expect more or less trade creation from immigrants from developed or developing countries, from different regions and if the degree of home country dissimilarity with Sweden have some significant effect;
- is total number of stock of immigrants has the same impact on trade as that of just arrived ones along with those who visit Sweden for short periods (flow of immigrants);
- is it any impact of asylum seekers, as separated and recently growing type of immigrants, on trade in Sweden.

This paper is organized by following way. First Background is presented, containing the information about history, peculiarities and geographical structure of migration in Sweden. It is followed by theoretical chapter with explanation of migration theories, the place of the factor movement in international trade theories and the discussion about probable way of immigrants' influence on trade based on the recent investigations. Besides this theoretical foundation of gravity model is presented in this part. Chapter 6 describes the results of previous studies. Following parts of this thesis refer to the data and model description. Chapter 10 provides the information about the econometric methods on which empirical part of this study is based and short description of the tests that were done to check the consistency of the model outcome. Finally empirical results are presented in the 11-th chapter that includes panel and cross-sectional estimations, zero values and sample composition biasness checking, home countries classification tests according to the level of development and geographical regions and different variables tests, including immigrant flow and asylum seekers effect.

# 4. Background

Sweden has a long migration history with a turning point around 1930, when it went from a country of emigrants to become a country for immigrants.

**Figure 1. Number of Immigrants and Emigrants to and from Sweden 1910-2010 (immigrant flow)**




Source: Swedish statistics office

Sweden's immigration history can be divided into four periods (Roth and Hertzberg 2010:11):

*1) Refugees from neighboring countries (1938 to 1948).* The main reason for a large inflow of refugees to Sweden in this period was the Second World War and the neutral status of Sweden in it. Most of these immigrants returned to their countries in the post-war period, so migration was mostly temporary.

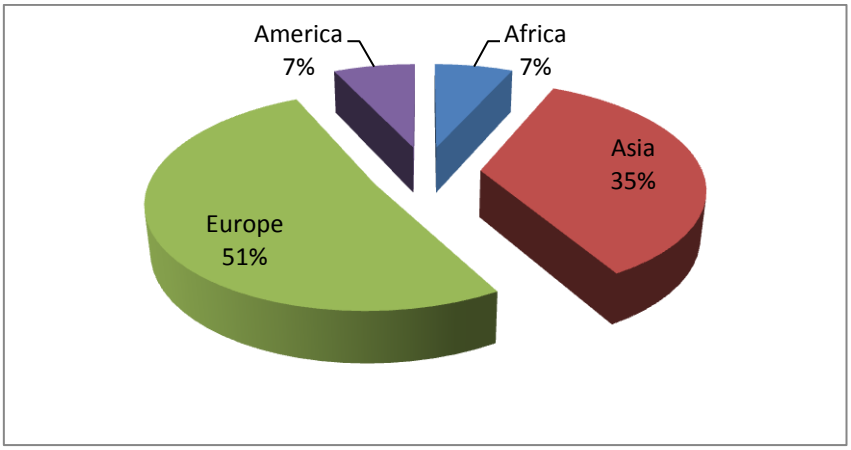
*2) Labor immigration from Finland and southern Europe (1949 to 1971).* In the post-war period, the economic situation in Sweden differed a lot from most European countries that suffered from the war. During this period Swedish products were in great demand in many European countries whose industries were damaged during the war. Sweden's export demand increased and with it the demand for labor also increased, a part of which was supplied from abroad. In the 1960-th Sweden therefore experienced big inflows of workers that came to the country in hope to find jobs. The main reason was the absence of migration programs and restrictive immigration policy that can regulate foreign labor demand (Westin

2006). The situation changed in 1968, when non-Nordic countries citizens were not allowed to come to Sweden without getting work permit before the arrival.

*3) Family reunification and refugees from developing countries (1972 to 1989).* As a result of adoption a new migration policy and economic recession due to the world oil crises the amount of immigrants in the end of 1970s and the 1980s was decreased considerably. During this span, Sweden officially adopted multiculturalism; and thus, it became a turning point of Swedish migration tendency when it switched over from the country being more open to European immigrants to the recipient country of refugees from primary Asia and Africa (Roth and Hertzberg 2010).

*4) Asylum seekers from southeastern and Eastern Europe, and the Middle East (1990 to present time) and the free movement of EU citizens within the European Union.* Sweden's EU membership that started in 1995 opened Sweden's border for citizens from many European countries who after adoption the Schengen agreement in 1996 were allowed to stay and work in Sweden. Sweden experienced waves of immigrants from new EU members after their joining in 2004 (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) and in 2007 (Bulgaria, Romania). So a general amount of immigrants to Sweden from EU member countries are almost 40% in 2010, meanwhile the total number of immigrants from whole Europe slightly overcome a half of all foreign born population living in Sweden. Due to continuing wars and conflicts in Asia and Africa Sweden still has a big amount of asylum seekers. In 2010 31% of all immigrants came to Sweden were asylum seekers (Swedish statistics office). The structure of Swedish immigrants according to their region of birth is shown at figure 2.

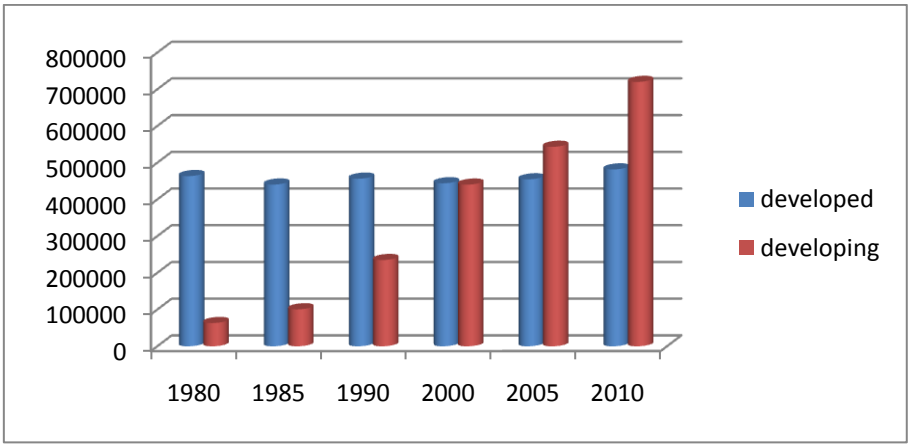
**Figure 2. Immigrants' structure by continents in 2010**




Source: Swedish statistics office

Besides the fact that according to figure 2 the biggest cluster of Swedish immigrants in recent year was from European countries, there is an evident tendency of year by year growth in immigrants from developing countries.

**Figure 3. Immigrants from developed and developing countries to Sweden 1980-2010 (immigrant stock)**




Source: Swedish statistics office

Total number of immigrants to Sweden increases from year to year during the recent period. In present time (2010) the number of people that have foreign background, and either migrated by themselves or has both parents that were born in other country, is 19% of all population, compared to 14% in 2000. The biggest surge of immigrants during recent years came in 2006, with an increase of 70% from 2005. Most of these immigrants came

from Iraq (1207 people in 2005, 2124-2006), due to the unrest in this country. In 2006 Sweden had 9 immigrants per 1000 inhabitants, while in 2010 this indicator grew till 10.6 immigrants (Swedish statistics office).

Sweden is a country with an open economy where trade openness coefficient is 90% (2010). It is export orientated country with permanently positive trade balance since 1983 and both exports and imports year by year growth. During the period 1980-2010 trade geography hasn't changed a lot and still Sweden's major trade partners are European countries and USA (Table 1). With the only exclusion for China, which exports from Sweden have raised 36 times within this span and imports increased 34 times. As about migration its changes in ten major supply countries totally confirm the tendency toward increasing number of immigrants from developing countries and refugee migration.

**Table 1. Top ten exports, imports and immigrant supply countries.**

| Exports | | Imports | | Immigration | |
|---|---|---|---|---|---|
| 1980 | 2010 | 1980 | 2010 | 1980 | 2010 |
| Germany | Norway | Germany | Germany | Finland | Finland |
| UK | Germany | UK | Norway | Denmark | Iraq |
| Norway | USA | USA | Denmark | Norway | Poland |
| Denmark | UK | Finland | Netherland | Germany | Iran |
| Finland | Denmark | Denmark | UK | Greece | Bosnia |
| France | Finland | Norway | Finland | Turkey | Germany |
| USA | Netherland | Saudi Arabia | Russia | Hungary | Denmark |
| Netherland | France | France | France | USA | Norway |
| Italy | Belgium | Netherland | China | Chili | Turkey |
| Belgium | China | Belgium | Belgium | UK | Thailand |

Source: Swedish statistics office

Table 1 confirms that changes in geography of country's trade usually don't occur during a short period that can be explained by huge amount of factors that influence on countries' bilateral trade establishment. To find out if migration is among such factors is the main purpose of this thesis, which will be investigated in the next chapters, based on theoretical and empirical methods.

# 5. Theory

This chapter will discuss migration and its place in international trade theories, providing the discussion about the main channels of immigrants' impact on trade. Beside this it includes a short description of the gravity model that is used in this thesis for empirical investigation of immigrants-trade link for Sweden.

## 5.1 Theories of Migration

Ernest Ravenstein's two articles (1885, 1889) "The laws of migration" are considered to be the first scholarly contribution to migration theory. The first study was done for the United Kingdom and based on census data of 1871 and 1881 years, whereas the second was enriched with data for more than twenty countries. He categorized population according to their place of birth to native, from the same kingdom, from separate kingdom or from outside of the United Kingdom, thereby taking into account the effect of both internal and external migration processes. Beside this in his work he used such terms as absorption and dispersion for countries that accept more foreign immigrants than quantity of their emigrants and vice versa correspondingly.

Ravenstein established some stylized facts, or "laws" of the major causes of migration: most migrants move a short distance; the most common direction of migration within the country is from rural parts to big cities; migrant's social status, gender, age are influential factors; movements of migrants are bilateral; when people move to absorption regions, they create gaps that later will be filled up by migrants from more remote districts; migration increases with technological and transportation progress. Most of these rules are still valid today.

There are many theorists that follow and develop Ravenstein's study; one of them is Everett Lee (1966). In comparison with Ravenstein he concentrated more on internal (push) factors of migration. In his paper "A theory of migration" he discussed four factors that can have impact on decision to migrate: factors associated with the area of origin; factors associated with the area of destination; intervening obstacles; personal factors. Lee found out that besides decisions factors there are some indicators that can be important for quantity of migrants in origin and destination areas. People tend to migrate more to the areas with large people diversity; to the area where they face less obstacles; with good economic conditions;

he supported also Ravenstein's statement that volume of migration increase essentially with technological progress and noticed that the number of internal migrants within developed countries was much bigger than within developing countries.

One of the oldest and best known theories that explain labor migration is the neoclassical theory. According to Douglas S.Massey (1993) this theory can be considered in two levels: micro and macro. Macro level is represented by such authors as Lewis, 1954; Ranis and Fei, 1961; Harris and Todaro, 1970; Todaro, 1976. This theory is based on the suggestion that all countries can be divided into labor-abundant countries with large amount of labor resources, compared to capital and with relatively low level of wages and labor-scarce countries with high wage levels. People tend to migrate from the first to the second, establishing an equilibrium on the international market. Beside this there is flow of high-educated labor resources from developed to developing countries, aiming to accompany their capital inflow to these countries.

Micro level theory (Sjaastad, 1962; Todaro, 1969; Todaro and Maruszko, 1987) explains individual decision to migrate on personal costs and benefits. Massey et al (1993) build a model where the personal choice of migration is based on the expected net return to migration. This is equal to difference between earning that the migrants can get in the country of destination relative to the home country and the cost of movement, taking into account the probability of being employed and deported. If the result is positive the rational choice is migration, if negative migration will bring more costs than benefits for the person.

The extension to such individual approach to the migration in 1980s appeared as the so called "New Economics of Migration theory" (Stark 1984), that considers that decision about migration is made by a group of people such as families or households instead of one person.

There are plenty of migration theories that in general are intended for explanation of people's motivation to migrate, define positive and negative consequences of this process for migrants, situations in their home and host countries and international market in a whole. Among such consequences can be treated a possibility of migration's impact on bilateral trade between the host and home countries.

## 5.2 Migration in International Trade Theories

The major concern of international trade theories has been to explain flows of bilateral trade between countries. It doesn't concentrate on explanation of labor movement, but takes it into account as an international mobility of one of the factors of production. This section presents a brief description of some main trade theories and emphasizes the explanations that these theories provide about interaction between trade and factor (labor) movements.

At the origins of international trade theories is Adam Smith's theory of absolute advantage (1776) and David Ricardo's theory of comparative advantage (1817). Smith claimed with his theory that countries should export goods, for which production they have an absolute advantage and import those that can be produced within country only with absolute disadvantage (Myint 1977). Later, after Smith's work, Ricardo presented his theory of comparative advantage that says that even if one country can produce both goods (one of the assumption that there are only two goods in the model) more efficiently than the other country, it will gain from specialization only on one good and trade (Golub and Hsieh 2000).

Both theories used only labor as input factor but didn't assume international labor mobility between countries as one of the factor that can influence on trade pattern between them, though one of the assumptions of Ricardian model is labor mobility between two sectors in the economy.

One of the most famous theories, that suggests that trade and migration are substitutes, is Heckscher-Ohlin (H-O model). It considers the case of two countries, two factors of productions (capital and labor) and two products case. Under the basic assumption there is no difference in technological knowledge between the countries, the only difference lies in factor endowments. Accordingly all countries can be divided into capital abundant (in reality there are mostly developed countries) and labor abundant (developing countries). In this case capital abundant countries specialize on capital intensive goods production and vice versa for labor abundant countries. Such specialization leads to price level difference for these goods within the countries. Labor abundant countries become net exporters of labor intensive goods because of its comparatively low prices and importers of capital intensive goods. With free trade this will cause gradual commodity price equalization, consequently leading to factor price equality between countries. This equalization of wages

between the two countries, tend to eliminate incentives for labors (in low-wage labor-abundant country) to move to the labor-scarce country with high-wages. Thereby according to H-O model trade and migration are substitutes.

However, in reality, complete equalization of prices between countries is impossible due to the several reasons: the most evident are transaction costs of international trade that differ a lot according to the distance between trade partners and, thus, changes the price levels. If the endowments of capital and labor are not too different, free trade will result in complete factor price equalization even without movement of factors. It may be the case between two countries with the same level of development. If the endowments are too far apart, one country will become specialized in a small subgroup of commodity for which it has a comparative advantage and factor prices will not be completely equalized. In this situation, when trade doesn't equalize wages between countries, factor migration can complement trade and, thus, change endowments until factor prices are again completely equalized. It mostly characterizes trade-migration pattern between developed and developing countries.

Considering the H-O model with the possible condition of dissimilarity in immigrants' educational levels may yield some different explanations. Assume that all immigrants are divided in two categories: with basic level of education and highly educated or skilled immigrants. Labor with basic level of education is abundant in developing countries relative to that in the developed countries, and if the wages between countries are not equalized by trade as in the case described above they tend to migrate in direction from developing to developed countries. But the situation with skilled workers according to H-O theory should be opposite. As they are abundant in developed countries and scarce in developing, it means their salaries level should be higher in developing countries.

In practical reality this rule doesn't work, as skilled workers rush mostly in direction from developing to developed countries, where they are already abundant, but even then get higher wages. One of the explanations of this tendency is that skilled labor is more productive when they are abundant than scarce and have appropriate infrastructure. That contradicts the H-O model's assumption about constant retune to scale and has attracted the attention of the New Trade Theories. (J. Edward Taylor 1996)

The Specific factor theory is a variant of H-O model. It supposes the possibility of factor mobility but asserts that at least one immobile factor always exist that is called sector-specific factor. According to this theory countries differences that induce trade may be either technological and factor endowments. There are some conditions when trade and factor migration can be complements in this model, as migration of factor that is in shortage, but in most cases they are substitutes (White R. 2010).

In contrast to endowment-based models New Trade Theories (NTT) suppose a complementary relationship between trade and migration. NTT is a number of trade theories that concentrate on the phenomena of increasing returns to scale. Under the increasing scale condition specification becomes essential facility that leads to reduction in production unit cost and thereafter reward augmentation. So on international level countries gain more from specialization in goods for which they have a relatively larger demand and trade than if providing themselves with a large variety of goods without particular specialization.

As Paul Krugman, who is considered to be a founder of NTT, points out in his article "Scale economies, product differentiation and the pattern of trade" (1980), large countries with relatively larger market have an advantage in this case, with all other conditions are considered to be the same. Smaller one has to compensate this disadvantage with lower wages that can cause migration.

A short description of international trade models and their interaction with factor migration is provided in Appendix D.

Trade and migration theories don't suggest some unanimous findings about the question of trade and migration interaction, but most of them confirm that such interaction exists and recently it has become more and more important with the process of globalization.

After providing the review of migration and trade theories that have different approaches to explain the link between trade and migration, the rest of the paper focuses on the discussion about the way immigrants may impact trade based on recent studies investigations.

## 5.3 Why Migration May Create Some Impact on Trade

Gould (1994), one of the early researchers who studied possible effects of migration on trade, categorized several channels (factors), through which immigrants can have an impact on trade between their home and host countries, into two major groups: factors that connect with immigrants' preferences to home country's products and those that refer to information that immigrants have about their country of origin.

The first one may influence only host country's imports, while the second group is wider and may impact either exports or imports between these countries. It can be connected with the fact that immigrants' knowledge and information about their countries help to reduce transaction costs and enter into more stable and reliable business cooperation between countries. Particularly, as Gould (ibid) noticed, it refers to cooperation with developing countries. As their system of trade contracts is not so much institutionalized they still have some gaps in legislation. This assumption about stronger trade migration interaction between countries with different level of development is in line with H-O model, according to which migration may complement trade in case of countries with too dissimilar factor endowments. Countries dissimilarity indeed can't be measured only with the level of development, though this factor, as explained above, is rather important for the analysis, historical connection, geographical and cultural distances are also much important.

Besides the evident fact that the degree of immigrant-trade interaction depends on various characteristics of both countries, the composition or features of immigrants is also one of the most important factors. Among such characteristics is the level of immigrants' education, their skills, specialization, working positions and experience that influence on the amount and quality of the information immigrants possess about their home country market and their capability to move.

The number of years that immigrants spend in host country may create an interaction force between trade and migration. This refers especially to the first group of factors, as usually preferences to home country products become weaker with time (Gould, ibid). Number of immigrants from some exact country or similar regions accumulated in the host country also plays rather important role, since a larger cluster often leads to import substitution by creation of the product in the host country. An influential factor may be also the age of

immigrants as young people usually grasp changes more easily and don't have such strong preferences to exact products (White 2010).

On equal terms, the composition or structure of immigrants, according to their purpose of coming to Sweden, may be an influential factor. So work-permit holders are expected to have more impact on trade of Sweden with their home countries than the individuals granted refugee status; because the first one are supposed to have stronger link with their home countries that may impact imports. In majority they are more educated and, thus, have more knowledge about their home countries' business environment, which can facilitate exports. Contrary to this, refugees usually come from conflict-ridden and unstable areas that complicate trade establishment with such countries.

White (2010) added some indirect factors that, if in sum, may not be less important. Native population's demand for foreign products, originated by the effects of immigrants from these countries; FDI and remittances flows between home and host countries; host and home countries immigration and emigration policies are among such factors.

Taking in to account this theoretical foundation about significance of differences between home and host countries, immigrants' composition and structure and their reasons to move, this paper tries to find out how it works in practice on Swedish immigrants-trade pattern. To investigate the case for country differences two classifications are used: geographical and according to the level of development. Besides the main regression for immigrant stock variable, two additional regressions were run for immigrant flow and asylum seekers variables, to find out the impact of different types of immigrants on trade in Sweden. The following hypotheses are tested:

$H_1$: Immigrants have positive effect on both Sweden's exports and imports with their home countries.

$H_2$: Immigrants from more institutionally and culturally dissimilar to Sweden countries have stronger impact on Sweden's trade with their home countries.

$H_3$: Immigrants from developing countries create larger impact on Sweden's trade with these countries than from developed.

$H_4$ : The Immigrants-trade link differs according to immigrants' classification, with asylum seekers having a smaller impact on trade than that of other immigrants;

$H_5$: New comer immigrants affect Sweden's trade more than those who live in the country for long.

Following previous researchers this paper uses an augmented gravity model to test the hypotheses.

## 5.4 The Gravity model

The gravity model was introduced by Tinbergen in 1962 and since then is widely used for investigation in economic, social and political spheres, because of its great explanatory power in describing the movement of goods, people and different kind of information between cities, countries and even across regions.

According to basic gravity model, trade flows between two countries or regions is directly proportional to the market size of these countries and indirectly to the distance between them; size is usually measured by countries' GDP. Higher home country GDP potentially increases export capability between this country and its trade partners and from the other side it enhances its imports from countries with bigger market size.

The basic gravity model can be written as:

$$T_{ij} = \frac{Y_i \times Y_j}{D_{ij}} \quad (1)$$

Where $T_{ij}$ is trade between countries i and j

$Y_i$, $Y_j$ - GDP of country i and j correspondingly

$D_{ij}$ - distance between these two countries

This equation can be converted in log-linear form and, thus, can be rewritten as:

$$\ln T_{ij} = \ln Y_i + \ln Y_j - \ln D_{ij} + \varepsilon_{ij} \quad i \neq j \quad (2)$$

In line with the research questions the basic gravity model is augmented by adding the variable of preliminary interest and others that can enhance the explanatory power of the model.

# 6. Previous Studies

A large number of previous studies have focused on the issue of interaction between migration and trade. One of the first researchers who concentrated on answering the question if immigrants' links to the home country enhance bilateral trade flows between the home and host countries was Gould (1994). He presented an empirical investigation of the role immigrant links play in facilitating trade between the United States and the home countries of its foreign born population. "Using a panel data set of 47 US trading partners, the empirical analysis reveals that immigrant links to the home country have a strong positive impact on exports and imports, with the greatest effects on consumer manufactured exports. These effects tend to increase at a decreasing rate as the size of the immigrant community grows and they also depend crucially on the types of goods traded" (Gould 1994:303).

Head and Ries (1998) made the work at the same direction and investigated Canadian experience of immigrations' impact on trade flows with 136 trade partners from 1980-1992. The study has found that immigration has a positive and significant effect on Canadian trade, though imports increase relatively more than exports. So, a 10 percent increase in immigrants leads to a 1 percent growth in exports and 3 percent in imports.

Head and Ries have included dummy variables to detect regional and class specification differences. According to the results, independent immigrants have the biggest impact on Canadian bilateral trade, refugees the least and family immigrants in the middle in this context. Regional diversification shows that South American and East Asian immigrants contribute the most to trade among others.

Dunlevy and Hutchinson (1999) extended the list of this topic studies by researching the historical period from 1870 till 1910 of European migration to the US. They have found greater effect of immigrants' influence on trade for countries sharing the same with the US language (English speaking countries) and countries with relatively similar per capita income.

Girma and Yu (2002) were the first who made such studies with the UK dataset. They used the peculiarity of the UK history as a colonial State and made their research for 48 UK's trading partners classified into two groups according to whether it is a former colony or not. So there are 26 Commonwealth (former colonies) and 22 non-Commonwealth countries that are under consideration in this work. The empirical results show very different impact of immigration on exports to Commonwealth and non-Commonwealth countries. When for the second group the immigrant stock increases by 10 percent exports increase by 1.6 percent; for the first group this variable is insignificant at all. "That is, the econometric evidence seems to suggest that immigration enhances bilateral trade through the knowledge (brought by immigrants) about foreign markets and different social institutions rather than their business or personal contacts with their home countries" (Girma and Yu 2002:117). The results for imports find out pro-trade effect of immigration from non-Commonwealth countries but trade-substitution effect for Commonwealth countries.

One of the papers that reveal that the immigrants-trade effect depends on home-country specific characteristics is the research by Bardhan and Guhalhakurta (2004). They have studied immigrants-trade link for the US by dividing the country's territory into west and east part and comparing the results. The key factor is that the majority of the US west coast immigrants are from developing countries such as China, El Salvador, Mexico, the Philippines, South Korea or Vietnam while in east part from developed: Canada, the Dominican Republic, Germany and Italy. The results show rather significant effect for west coast, but slight for east.

Blanes (2005) investigated the case for Spain and compared the impact of immigration on intra and inter-industry trade and came to the conclusion about the greater effect of the first one. Beside this the effect is stronger for manufactured goods than for non-manufactured ones.

Qian M. (2008) focused his study on investigation immigrants-trade effect for New Zealand and 190 trade partners. Besides the main sample results he has studied the differences in immigrant-trade link in subpanels generated according to trade partner's countries income levels of trade partner countries, their geographical principal and cultural differences (language and main religion). Besides the immigrant stock variable effect on the New Zealand's trade he has tested the impact of immigrant flows and different visa-holders

(international students, international workers and international visitors). The results show that just arrived immigrants, immigrants from low income countries and from the countries with the most different background to New Zealand have the strongest effect on trade.

One of the more recent papers on this theme by Bettin and Lo Turco (2009) represents cross-country view on trade-migration interaction. This relation is analyzed within OECD countries and the rest of the world for two sub-periods 1990-2000 and 2005 year. It is interesting because of its empirical results that contradict to all other studies discussed above. Immigration has significant but negative effect on North-South exports. At the same time imports results are in line with earlier discussed in Girma and Yu research for the UK that showed insignificant result for Commonwealth countries.

White R. (2010) in his book "Migration and International Trade. The US experience since 1945" has provided one of the most detailed researches on this topic for the US 66 trade partners during 1992-2006. He has made following conclusions: skilled immigrants facilitate trade more than unskilled; immigrants-trade impact decreases with number of years immigrants spend in the host country increase; refugees and asylum seekers have considerably smaller effect on trade than non-refugee immigrants; immigrants from more culturally distinctive countries create more trade than from culturally similar countries; impact is larger for differentiated and consumer goods than for homogeneous and producer products.

The summary of the previous papers results is presented in the table.

**Table 2. Immigrant stock elasticity results from previous studies**

| Author | Sample description | Empirical results | |
|---|---|---|---|
| | | Exports | Imports |
| Gould, 1994 | The US and 47 trade partners, 1970-1986 | 0.02 | 0.01 |
| Head and Ries, 1998 | Canada and 136 partners, 1980-1992 | 0.1 | 0.31 |
| Dunlevy and Hutchinson, 1999 | The US and 17 European partner countries, 1870-1910 | 0.08 | 0.29 |

| | | | |
|---|---|---|---|
| Girma and Yu, 2002 | The UK and 48 trade partners | 0.16 (non-Commonwealth countries)<br>Insignificant result (Commonwealth countries) | 0.103 (non-Commonwealth countries)<br>-<br>0.097(Commonwealth countries) |
| Bardhan and Guhalhakurta, 2004 | The US and East/West regions | 0.24-0.26 (West region)<br>0.06-0.09 (East region) | - |
| Blanes, 2005 | Spain and 42 trade partners, 1991-1998 | Effect on intra-industry trade<br>0.12-0.60 (IIT)<br>0.02-0.23 (manufactures goods)<br>0.009-0.031 (non-manufactures goods) | |
| Qian M., 2008 | New Zealand and 190 trade partners, 1980-2005 | 0.05 | 0.13 |
| Bettin and Lo Turco, 2009 | OECD countries and their developing countries partners, 1990-2005 | -0.023 | -0.019 |
| White R., 2010 | The USA and 66 trade partners, 1992-2006 | 0.24 | 0.28 |

In spite of the fact that all researches considered above were chosen because of their methodology and country cases variety all of them are similar in the gravity model that was used and that is why can be more or less comparable in their results.

# 7. Data

The following paper relies on the data from 155 countries (the list of countries is mentioned in Appendix A), though only 110 have data available for whole period from 1980 till 2010. The main reason for using unbalanced data is changes that occurred in the political world map. The data are taken with 5 years interval for cross-sectional analysis, exception is the period from 1990 till 2000, when they are used with 10 years gap because of data unavailability; and for whole 1980-2010 period for panel data regression. Using both types cross-sectional and panel data give possibility to analyze the results for whole period under consideration and at the same time retrace the dynamic changes and tendency during this term. Cross-sectional analysis is done for 110 countries, for which data are complete in order to have comparable results. For panel analysis both balanced and unbalanced data results are used.

Besides the main sample that includes all home countries for immigrants in Sweden, for which data are available, this thesis investigates the effect of immigrants on trade in smaller subsamples according to the geographical reason: Africa, Asia, Europe, America (include both South and North America); and according to United Nations classification by level of development: developed and developing (Appendix B).

There are two dependent variables that are under consideration in this paper: exports and imports; and six independent variables: immigrant stock, gross domestic product, distance and trade openness, EU and Border dummies. Unlike most of previous studies that focus only on immigrant stock variable and its probable effect on trade this paper also includes the results for immigrant flow and asylum seekers flow separately. All variables except dummies are in natural logarithm form and are measured in constant US dollars with 2005 as a base year. Sources that were used are mentioned in Table 3.

Some countries (3% of total number of observations) during one or several years from the period under consideration didn't have any imports to Sweden. The Import variable is in log form, following previous studies (Eichengreen, Barry and Douglas A. Irwin (1995), J. Bryant, M. Genç and D. Law (2004), F. Ortega and G. Peri (2011)), to eliminate the selection bias I add one to imports values and thereby have ln(Import+1) that will be equal to zero for all countries from which Sweden doesn't have any imports.

The variable of preliminary interest for this thesis is the immigrant stock. According to the United Nations there are two approaches to its definition. The first one as foreign-born population of a country-"all persons who have that country as country of usual residence and whose place of birth is located in another country"; the second is foreign population of a country – "all persons who have that country as country of usual residence and who are the citizens of another country" (RSIM paras. 188,189).

This paper applies the first approach and uses the data of foreign born Swedish population for immigrant stock variable. It seems to be more reasonable as only in the year 2010 32457 people acquired Swedish citizenship and that is why would not be included in the data according to the second approach (Swedish statistics office). Excluding such people from the research sample may create bias.

The data for foreign-born Swedish population are obtained from the 1980, 1985 and 1990 Censuses and following Bryant et al (2004) approach are assumed to be constant between the Censuses. Such assumption is held because the data for immigrant flow are unavailable for this period. The data for period from 2000 till 2010 are annual and have been sourced from Swedish population register.

Immigrant flow includes both long and short-term immigrants that crossed Swedish border during the year. Asylum seekers flow is those who applied for asylum in Sweden in a given year.

Similar to Gould D. (1994), the cases when there is no immigrant stock or flow are equaled to one and its log form to zero correspondingly, in order to avoid missing values and make the observation more precise.

GDP and distance are standard variables of gravity model. GDP measures economic size of a country; and as larger country is supposed to trade more, GDP is expected to have a positive sign. In this paper both Sweden's and foreign country's GDP are combined in one variable and are taken as the ratio to the World GDP. Such approach allows implementing cross-sectional observation and at the same time doesn't omit Swedish GDP, that can't be included as a separate variable, effect on the trade.

Distance variable shows the geographical distance between Stockholm and the capital city of immigrant's home country. Distance coefficient is supposed to be negative as it represents transaction costs that increase with distance.

Trade openness variable is expected to have positive sign as the countries, that are much involved in international trade, are supposed to trade with Sweden more than isolated countries.

Finally two dummy variables are included in the model for EU member countries and for countries that share the same border with Sweden as such countries, because of the lower transaction cost and absence of trade barriers, are expected to be preferable trade partners for Sweden.

**Table 3. List of variables and sources**

| **Variable's name** | **Description** | **Source** |
|---|---|---|
| Exports | The natural log of real (2005 year based) exports. Measured in real 2005 US dollars. Current values in SEK are divided by Sweden's export price indexes (2005=100) and converted to US dollars. | Swedish statistics central office<br>Sweden's Riksbank<br>Author's calculations |
| Imports | The natural log of real (2005 year based) imports. Measured in real 2005 US dollars. Current values in SEK are divided by Sweden's import price indexes (2005=100) and converted to US dollars. | Swedish statistics central office<br>Sweden's Riksbank<br>Author's calculations |
| Immigrant stock | The natural log of immigrant stock, measured in people. | Swedish statistics central office |
| Flow of immigrants | The natural log of quantity of immigrants that enter Sweden every year during the period under consideration, measured in people | Swedish statistics central office |

| | | |
|---|---|---|
| Asylum seekers | The natural log of flow of asylum seekers to Sweden, measured in people | Swedish statistics central office |
| GDP | The natural log of $GDP_{foreign} \times GDP_{sweden} / GDP_{word}$ in 2005 constant US dollars | World Bank statistics |
| Distance | The natural log of distance between Sweden and its trade partner, measured using the great circle distances between capital cities, in kilometers | http://www.chemical-ecology.net/java/capitals.htm |
| Trade openness | The natural log of (exports+imports)/GDP | Heston, Summers, & Aten (2011) |
| EU | A dummy variable for being a member country of European Union | http://europa.eu/index_en.htm Europa – European Union web site |
| Border | A dummy variable for sharing the same border with Sweden | |

# 8. Preliminary data analysis

To introduce the main tendencies in data during the period 1980-2010, that may help to explain the final results, a preliminary data analysis has been done.

Table 4 shows the mean values, year by year, and average for the whole period for the dependent variables (exports and imports) and the variable of preliminary interest of this study – the immigrant stock. The number of immigrants in Sweden in average from all countries in the sample increased almost twice from 1980 till 2010 year, while exports and imports grew up about three times. The tendency of immigrants' number and trade volume growth is inherent for almost all presented subsamples. The exceptions are only immigrants from Europe and developed countries that are relatively stable and unchangeable during this period and Sweden's imports from African countries that decreased till 2010 on about 45% in comparing to 1980. In average the largest number of immigrants in the sample is

from Europe and developed countries, though the biggest growth rate is in Africa, Asia and all developing countries, with the same tendency for exports.

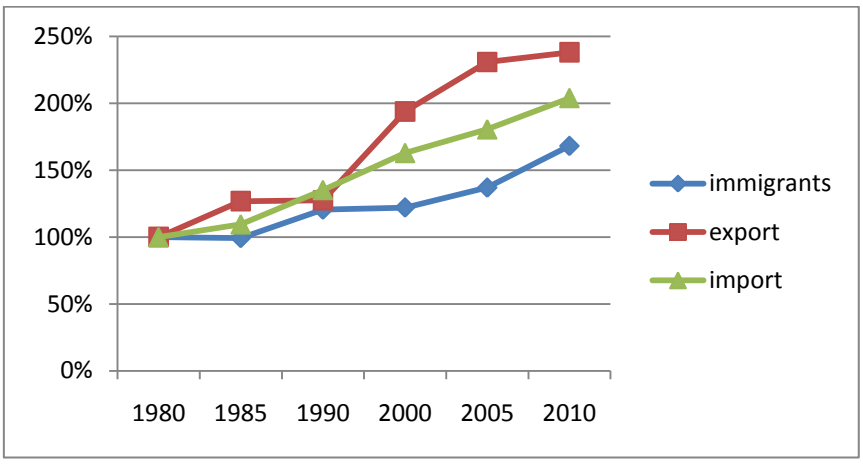
**Table 4. Mean immigrant stock, exports and imports values**

| **Immigrant stock, people (mean)** | **World** | **Africa** | **Asia** | **America** | **Europe** | **Developed countries** | **Developing countries** |
|---|---|---|---|---|---|---|---|
| 1980-2010 | 5751 | 700 | 5715 | 2248 | 17292 | 17136 | 3122 |
| 1980 | 4781 | 215 | 1805 | 1227 | 20402 | 19283 | 734 |
| 1985 | 4873 | 298 | 2800 | 1607 | 19331 | 18316 | 1122 |
| 1990 | 5733 | 576 | 5169 | 2411 | 19951 | 18963 | 2040 |
| 2000 | 6076 | 886 | 7470 | 2713 | 18561 | 17797 | 2805 |
| 2005 | 6555 | 1078 | 8978 | 2998 | 18847 | 18125 | 3326 |
| 2010 | 7512 | 1491 | 11847 | 3368 | 19735 | 19025 | 4300 |
| **Exports, thousands US dollars (mean)** | | | | | | | |
| 1980-2010 | 619904 | 36260 | 293080 | 408698 | 2086929 | 2754250 | 127118 |
| 1980 | 356374 | 28112 | 144749 | 152193 | 1418690 | 1437139 | 54765 |
| 1985 | 463670 | 23073 | 192643 | 332460 | 1711528 | 1904324 | 61627 |
| 1990 | 489255 | 13878 | 202946 | 266712 | 1916100 | 2052197 | 53085 |
| 2000 | 892119 | 30611 | 564071 | 6248430 | 3149823 | 3531151 | 155645 |
| 2005 | 1044781 | 59350 | 602454 | 707003 | 3731802 | 4139441 | 181154 |
| 2010 | 1058365 | 81945 | 753790 | 567201 | 3775311 | 3997297 | 238198 |
| **Imports, thousands US dollars (mean)** | | | | | | | |
| 1980-2010 | 572682 | 11922 | 246841 | 240352 | 2129416 | 2648893 | 93318 |
| 1980 | 391848 | 28979 | 243187 | 214545 | 1430926 | 1525677 | 75431 |
| 1985 | 440012 | 21222 | 174057 | 240683 | 1721337 | 1877826 | 38762 |
| 1990 | 567564 | 6487 | 296104 | 291148 | 2210891 | 2422937 | 49786 |
| 2000 | 815634 | 9174 | 378980 | 344288 | 3306872 | 3467656 | 75534 |
| 2005 | 872657 | 12194 | 449741 | 223723 | 3655669 | 3623786 | 104900 |
| 2010 | 936736 | 16094 | 577205 | 233989 | 3836214 | 3773088 | 145196 |

Figure 4 demonstrates changes in the immigrant stock and exports and imports average values during the period under consideration relative to the beginning of the period (1980). Though all indicators show stable increase, more similarity in the shape of immigrants and

exports lines can be noticed. The relatively straight parts alternate with periods of higher growth and more stable or growing immigrants' period leads to the same pattern in the following period for export. That with other things being equal may mean that immigrants might have more impact on exports after some year of settlement in Sweden, than just after arriving.

**Figure 4. Exports, imports and immigrant stock growth 1980-2010, 1980=100%**




Source: Swedish statistics office

Table 5 shows pairwise correlation between all variables included in the model. As expected only Distance has negative impact on trade, all other variables are supposed to have positive and significant influence.

**Table 5. Pairwise correlations**

| | **Exports** | **Imports** | **Immigrant stock** | **Distance** | **GDP** | **TrOpen** | **EU** |
|---|---|---|---|---|---|---|---|
| **Exports** | 1.0000 | | | | | | |
| **Imports** | 0.8346*** | 1.0000 | | | | | |
| **Immigrant stock** | 0.7591*** | 0.6653*** | 1.0000 | | | | |
| **Distance** | −0.4978** | −0.4562*** | −0.4890*** | 1.0000 | | | |
| **GDP** | 0.8647*** | 0.8035*** | 0.6910*** | −0.2866*** | 1.0000 | | |
| **TrOpeness** | 0.1144*** | 0.1380*** | 0.2167*** | −0.0764*** | 0.3093*** | 1.0000 | |
| **EU** | 0.4889*** | 0.5021*** | 0.4026*** | −0.7479*** | 0.3026*** | 0.0722*** | 1.0000 |
| **Border** | 0.2693*** | 0.2487*** | 0.3068*** | −0.4455*** | 0.0966*** | -0.0085 | 0.3283*** |

*** Refers to 1% significance levels.

# 9. The Model Description

There are two main models that are under consideration in this thesis:

$$\ln Export_{ij} = \alpha_{ij} + \beta_1 \ln Immigrant\ stock_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} + \beta_5 EU + \beta_6 Border + \varepsilon_{ij} \quad (3)$$

$$\ln Import_{ij} = \alpha_{ij} + \beta_1 \ln Immigrant\ stock_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} + \beta_5 EU + \beta_6 Border + \varepsilon_{ij} \quad (4)$$

where

$Export_{ij}$ is the value of Sweden's exports to country j (home country for immigrants);

$Import_{ij}$ is the value of Sweden's imports from country j;

$Immigrant\ stock_{ij}$ is the number of people living in Sweden but born in country j;

$Y_i$, $Y_j$, $Y_w$ are GDP of Sweden, country j and world respectively;

$D_{ij}$ is the distance between Sweden's and trading partner's capitals;

$TrOpeness$ is the trade openness of country j;

EU is a dummy variable equal to one for Swedish trade with EU-member countries and 0 with others;

Border is a dummy variable equal to one for trade with countries that have a common border with Sweden and 0 otherwise;

$\varepsilon_{ij}$ is an error term.

According to the pairwise correlation coefficients, that are shown in table 5 EU and Border dummies are highly correlated with the Distance variable, that lead to incorrect and insignificant results (the results are shown in table 6 for exports and table 7 for imports dependent variables for 1980 year as an example), that is why all other observations were done excluding these dummies, using the following models:

$$\ln Export_{ij} = \alpha_{ij} + \beta_1 \ln Immigrant\ stock_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} + + \varepsilon_{ij} \quad (5)$$

$$\ln Import_{ij} = \alpha_{ij} + \beta_1 \ln Immigrant\ stock_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} +$$

$$+ \varepsilon_{ij} \quad (6)$$

Beside these two main models, this thesis looks at the effect, that may occur for trade, because of impact of total immigrant flow and asylum seekers flow to the country:

$$\ln Export_{ij} = \alpha_{ij} + \beta_1 \ln Immigrant\ flow_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} +$$

$$+ \varepsilon_{ij} \quad (7)$$

$$Import_{ij} = \alpha_{ij} + \beta_1 \ln Immigrant\ flow_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} +$$

$$+ \varepsilon_{ij} \quad (8)$$

$$\ln Export_{ij} = \alpha_{ij} + \beta_1 \ln Asylum\ flow_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} +$$

$$+ \varepsilon_{ij} \quad (9)$$

$$Import_{ij} = \alpha_{ij} + \beta_1 \ln Asylum\ flow_{iJ} + \beta_2 \ln Y_i \times Y_j / Y_w + \beta_3\ TrOpeness_j - \beta_4\ D_{ij} +$$

$$+ \varepsilon_{ij} \quad (10)$$

# 10. Econometric Methodology

This study uses two types of data to analyze the impact of immigration on trade: cross-sectional and panel data. For implementing the chosen augmented gravity model Stata software is used.

Cross-sectional data look at multiple numbers of observations at one point of time. Data for 110 countries with complete figures for whole period from 1980 till 2010 are used to this part of the research. Such kind of data were chosen for this analysis as one of its purpose is to see the direction of probable changes in immigrants' impact on trade that may occur during the period under consideration.

For cross-sectional data analysis the Ordinary Least Square (OLS) method is used. The model is tested for multicollinearity problem by controlling VIF value not to be more than 10 for each variable, by looking at pairwise correlation and $R^2$ value. According to rather high pairwise coefficients between Distance variable and EU and Border dummies and

coefficients that were got after running the regression, the conclusion of a rather big impact of these dummies on the Distance variable was done. That is why they were excluded from further analysis. Heteroskedasticity was tested with the help of White's General Test for Heteroskedasticity. When it was found to be the problem, robust standard errors were used for correction. The results for Ramsey's Reset Test were mentioned to find out the existence of such problems as omitted variables or their incorrect functional form.

The second type of data that are used in this paper is panel. Such kind of data allow to look at some cross-sectional observations over several time periods, which makes it possible to get the result for whole period under consideration and all countries from the chosen sample. Panel data give more accurate results as it makes it possible to control for individual heterogeneity, cause less collinearity problems provide more variability and degree of freedom (Baltagi B.H. 2001:6). There are two main types of panel data according to their structure: balanced and unbalanced panels. The first one includes the same time periods for all observations in the sample while the second one supposes incomplete data existence for some of the observations. Both unbalanced (for 155 countries) and balanced (for 110) countries data results are presented in this paper. Though the results for unbalanced one are considered being more important as they allow to maximize the sample size and therefore get more accurate results.

Likelihood ratio test, Wooldridge test and locally best invariant LBI test are implemented to test for panel level heteroskedasticity and autocorrelation that according to tests' statistics were found to be the problems. As nonstationary data are unpredictable and may lead to spurious results; it is important to use stationary data for panel data analysis. Fisher unit root test was used to test the variables for stationarity. In compliance with its results that are presented in Appendix C, there is no evidence of nonstationarity problem for all variables in the model. Based on Baltagi B.H. and Wu P.X. (1999) research paper's substantiations feasible generalized least squares (FGLS) method with correction for heteroskedasticity and autocorrelation was chosen as the most appropriate for panels with missing values (unbalanced) with first order autocorrelation and heteroskedasticity in the data. The same method used some previous researchers such as White R. and Tadesse B.(2007) and White R.(2010).

To check for the biased results that may occur with zero values for immigrant stock and imports variables transformation, additional regressions were run excluding zero values observations for unbalanced panel and countries that have one or more zero values period for balanced.

Besides this following White R. and Tadesse B.(2007) and White R.(2010) each 155 country's influence on the final results were tested to check whether the exclusion of some particular country from the whole sample may lead to the significant changes in the results.

# 11. Results

## 11.1 General Results

### *11.1.1 Panel Data Results*

Table 6 includes the panel data results for whole period 1980-2010 for both exports and imports dependent variables. The regressions were run for two types of samples, the first one for the unbalanced panel including 155 countries observation and the second one for balanced 110 countries sample. As was mentioned above this paper mostly relies on the results from the first, i.e. unbalanced sample, as the balanced sample was included for comparison reason with the cross-sectional data estimation. All tests' results are presented in the end of the table and variables' standard errors are mentioned in brackets.

**Table 6. Panel data 1980-2010 estimates of immigrant stock impact on exports and imports**

| Explanatory variables | Dependent variables | | | |
|---|---|---|---|---|
| | Exports | | Imports | |
| | (1) unbalanced | (2) balanced | (1) unbalanced | (2) balanced |
| **Immigrant stock** | 0.106 *** | 0.137*** | 0.053** | 0.061** |
| | (0.013) | (0.014) | (0.020) | (0.024) |
| $\frac{GDP \times GDP_{swe}}{GDP_{world}}$ | 1.048 *** | 0.997*** | 1.317 *** | 1.242*** |
| | (0.012) | (0.013) | (0.019) | (0.022) |
| **Distance** | −0.730 *** | −0.908*** | −1.009 *** | −1.078*** |
| | (0.025) | (0.027) | (0.035) | (0.040) |
| **TrOpeness** | 0. 654 *** | 0.732*** | 0.666 *** | 0.621*** |
| | (0.031) | (0.035) | (0.042) | (0.047) |
| **Constant** | 3.152 *** | 5.597*** | -0.403 | 1.804*** |
| | (0.330) | (0.365) | (0.514) | (0.597) |
| Number of observations | 4121 | 3410 | 4121 | 3410 |
| Groups | 155 | 110 | 155 | 110 |
| Wald chi2 | 15059.91*** | 12912.13*** | 8484.87*** | 5599.72*** |
| LR test | 2617.07*** | 2190.51*** | 4187.76*** | 3379.40*** |
| Wooldridge test | 58.367*** | 40.179*** | 29.755*** | 35.519*** |
| Bhargava et al. | 0.899 | 0.873 | 1.147 | 1.068 |
| Baltagi-Wu LBI test | 0.993 | 0.939 | 1.224 | 1.132 |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

The result for the Immigrant stock variable is significant at 1% level for both exports and imports for the unbalanced sample and at 1% and 5% level for balanced one and shows positive sign for all of them. According to unbalanced sample results 10% immigration increase courses 1% increase in exports and 0.5% in imports with immigrants' home countries. Such results are consistent with many previous studies with one exception that most of them got slightly bigger coefficient for imports in comparing with exports, though Gould (1994), Girma and Yu (2002) in their studies made for USA and UK also found higher immigrants' impact on exports. It can be explained by the fact that Sweden has

rather big number of asylum seekers (31% in 2010), that comes from unstable due to wars and different conflicts regions. As usual imports with such countries are minimized though exports remain important. Balanced data results don't differ a lot but have slightly bigger coefficients.

GDP is highly significant, positive and its coefficients vary near to one as consistent with gravity model theory.

Distance also shows significant, but as was expected, negative results for all samples with coefficients near to one value.

Trade openness is positive and significant at 1% level. This confirms the suggestion that one of the important factors that may influence Sweden's bilateral trade is the degree of partner country openness for international trade.

Trade openness coefficients for 155 countries sample show almost the same influence on Sweden's exports and imports, whereas the results for balanced 110 countries data indicate a little bit more influence on exports.

The above discussed results totally confirm the first hypothesis of this thesis as both exports and imports are positively influenced by immigrants.

### *11.1.2 Cross-sectional Data Estimation: Exports*

Tables 7 and 8 show cross-sectional data results for exports and imports dependent variables. 110 countries sample for which data are available for whole period from 1980 till 2010 is used in order to save comparability of the results between different years. For year 1980 two types of models are presented to have opportunity to investigate the effect of EU and border dummies on the model.

**Table 7. Cross-sectional OLS estimates of immigrant stock impact on exports**

| **Explanatory variables** | **Dependent variable Exports** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1980 (1)** | **1980 (2)** | **1985** | **1990** | **2000** | **2005** | **2010** |
| **Immigrant stock** | 0.373*** | 0.354*** | 0.373*** | 0.406*** | 0.222*** | 0.244*** | 0.161** |
| | (0.062) | (0.077) | (0.058) | (0.068) | (0.075) | (0.062) | (0.063) |
| $\frac{GDP \times GDP_{swe}}{GDP_{world}}$ | 0.929*** | 0.945*** | 0.907*** | 0.915*** | 1.143*** | 0.912*** | 0.969*** |
| | (0.076) | (0.078) | (0.067) | (0.074) | (0.067) | (0.057) | (0.056) |
| **Distance** | −0.518*** | −0.344* | −0.505*** | −0.629*** | −0.743*** | −0.798*** | −0.897*** |
| | (0.167) | (0.203) | (0.151) | (0.169) | (0.156) | (0.037) | (0.133) |
| **TrOpeness** | 1.086*** | 1.081*** | 0.919*** | 1.068*** | 0.723** | 0.676*** | 0.615*** |
| | (0.201) | (0.229) | (0.186) | (0.204) | (0.286) | (0.176) | (0.179) |
| **EU** | | 0.275 | | | | | |
| | | (0.306) | | | | | |
| **Border** | | 0.841* | | | | | |
| | | (0.433) | | | | | |
| **Constant** | 2.397 | 0.645 | 2.580 | 2.843 | 0.408 | 5.545*** | 5.835*** |
| | (1.982) | (2.578) | (1.820) | (1.998) | (1.945) | (1.564) | (1.511) |
| Number of observations | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| F | 164.21*** | 152.44*** | 202.06*** | 171.49*** | 249.89*** | 231.60*** | 247.95*** |
| Adjusted $R^2$ | 0.8622 | 0.8641 | 0.8806 | 0.8622 | 0.8888 | 0.8943 | 0.9006 |
| Multicollinearity | no | yes | no | no | no | no | no |
| Heteroscedasticity | 20.28 | 21.43 | 16.04 | 19.08** | 27.17** | 13.55 | 15.30 |
| Ramsey RESET test | 0.67 | 0.54 | 0.33 | 1.83 | 0.45 | 0.60 | 0.92 |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct heteroskedasticity when it is found to be a problem

As expected immigrant stock variable is positive and significant for all years. It varies from more than 4% exports increase due to 10% growth in foreign born Swedish population that is from exports receiving countries in 1990 to 1.6% in 2010. The total tendency during whole period 1980-2010 may be described as gradual decrease of immigration impact on Sweden's exports to immigrants' home countries. Though the total number of foreign born people living in Sweden from 110 countries that are under consideration in this sample changed during this period from 525992 to 826427, that indicates about 1.5 times increase.

Such a dynamic is consistent with Gould's suggestion that the immigrants' impact on trade dissolves or becomes relatively smaller when their number reaches some critical value. For example, for exports case, it can be connected with pretty good awareness about home country market, economic situation and business peculiarities, conclusion of long term stable trade contracts with their country. When additional information and experience that can be contributed by new immigrants have mostly been already available and that is why subsequent immigrants can't bring essential changes.

GDP is significant and positive for all years and its coefficients are closed to one.

Distance as it was expected is negative and highly significant. Its negative impact on exports, during 1980-2010 period slightly increases, that indicates that Sweden's preference to export the goods and services to neighbor countries may increase within this period. This tendency shows that in spite of globalization and economic integration process, the expense of long distance trade not only remains to be a significant factor but became more important.

Trade openness shows significant and positive results for all years in the period with constant tendency of decreasing with time.

For year 1980 the result for two dummies was included in the table. EU dummy shows insignificant result and Border is significant only for 10% level, that indicate that both variables don't have high explanatory power for the model, but influence substantially on distance variable by decreasing its coefficient and significance level. Due to these reasons both dummies were excluded from further analysis.

### *11.1.3 Cross-sectional Data Estimation: Imports*

**Table 8. Cross-sectional OLS estimates of immigrant stock impact on imports**

| Explanatory variables | Dependent variable Imports | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1980 (1)** | **1980 (2)** | **1985** | **1990** | **2000** | **2005** | **2010** |
| **Immigrant stock** | 0.546*** | 0.496** | 0.600*** | 0.348* | 0.399*** | 0.366** | 0.403** |
| | (0.160) | (0.230) | (0.220) | (0.126) | (0.144) | (0.160) | (0.183) |
| $\frac{GDP \times GDP_{swe}}{GDP_{world}}$ | 1.741*** | 1.776*** | 1.514*** | 1.254*** | 1.723*** | 1.356*** | 1.455*** |
| | (0.197) | (0.207) | (0.255) | (0.137) | (0.169) | (0.147) | (0.162) |
| **Distance** | 0.112 | 0.654 | 0.009 | −0.684** | −0.821*** | −0.991*** | −0.909*** |
| | (0.430) | (0.532) | (0.366) | (0.313) | (0.277) | (0.351) | (0.272) |
| **TrOpeness** | 2.190*** | 2.173*** | 1.705*** | 1.469*** | 1.274** | 1.359* | 1.394*** |
| | (0.517) | (0.562) | (0.645) | (0.378) | (0.530) | (0.451) | (0.533) |
| **EU** | | 1.031 | | | | | |
| | | (0.745) | | | | | |
| **Border** | | 2.044** | | | | | |
| | | (0.883) | | | | | |
| **Constant** | −9.941*** | −25.198*** | -5.711 | -3.254 | −13.068*** | -4.406 | −7.151* |
| | (3.565) | (6.425) | (5.717) | (3.694) | (4.058) | (4.012) | (3.746) |
| Number of observations | 110 | 110 | 110 | 110 | 110 | 110 | 110 |
| F | 61.53*** | 79.32*** | 51.53*** | 70.56*** | 61.19*** | 75.9*** | 99.84*** |
| Adjusted $R^2$ | 0.6896 | 0.7061 | 0.6712 | 0.7185 | 0.7610 | 0.7332 | 0.7970 |
| Multicollinearity | no | yes | no | no | no | no | no |
| Heteroscedasticity | 15.11 | 47.55*** | 47.78*** | 13.86 | 30.57*** | 13.08 | 21.94* |
| Ramsey RESET test | 6.04*** | 6.12*** | 3.82** | 0.1 | 3.95** | 0.62 | 0.84 |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct heteroscedasticity when it is found to be a problem

Immigrant stock for imports as dependent variable is also positive and highly significant for all years. As the same with exports case, immigrants' influence on imports also has a tendency to decrease, but with different dynamics. Its coefficients vary at about 0.6 for year 1980 and 1985, whereas from 1990 they sharply decrease and fluctuate near to 0.4 levels till 2010.

There are several reasons that can be mentioned as explanation for such dynamics. The first one is the same as for exports. According to the table 4 with mean values dynamic and figure 4 there is a relatively large jump in immigrants' figures from 1985 to 1990 years with further considerable increase in subsequent period. Sometimes a large amount of immigrants from some countries may course changes in host country production structure in the endeavor to satisfy huge demand of new comers for the products they used to in their home countries. Such production may be treated as import substitution. Besides this, 1990 was a year of change in immigration period, with turning from mostly European family reunification migration to a large number of asylum seekers. The changes in immigrants' structure also may cause turn to decrease in its impact on Sweden's trade.

GDP remains to have positive and highly significant impact on imports as for exports, but with a little bit larger coefficients that is in line with panel data results. It may mean that Sweden has highly diversified exports' structure, though it tends to import mostly from the countries with larger economy.

Distance has positive and insignificant coefficients for 1980 and 1985, though after running based gravity model regression for the same years including only GDP and distance as independent variables, it changes the sign to be consistent with the theory and becomes significant at 10% and 5% level correspondingly. That may be an evidence of rather big correlation between immigration, trade openness and distance variables for these years. During whole subsequent period 1990-2010, distance variable has, consistent with the theory, negative and highly significant coefficients with the same tendency of growing as for exports.

Trade openness is positive and significant for whole period. It has larger impact on imports in comparing with exports, but the same tendency of its decreasing is saved.

## 11.2 Biasness Checking

### *11.2.1 Zero Values Biasness Testing*

As it was mentioned above, there are some countries from the sample that have zero imports to Sweden and/or zero immigrant stock during one or several years. Following the approach of the previous authors, to avoid missing observations in logarithmic form for import and immigrant stock variables, this paper used ln(Import+1) variable and the cases

with zero immigrant stock were equaled to one. In order to investigate how much such assumptions have changed the results the regressions, which results are presented in table 9, were run: (1) - unbalanced data sample with missing values for years when immigrant stock is equal to zero; (2) - balanced excluding all countries that have zero immigrant stock one or more years during the period under consideration; (3) and (4) refer to unbalanced and balanced samples with missing values for zero import variable and excluding all countries that have zero imports to Sweden during one or more years correspondingly.

**Table 9. Zero values biasness testing**

| **Explanatory variables** | **Dependent variables** | | | | | |
|---|---|---|---|---|---|---|
| | **Exports** | | **Imports** | | | |
| | **(1)** | **(2)** | **(1)** | **(2)** | **(3)** | **(4)** |
| **Immigrant stock** | $0.106^{***}$ | $0.128^{***}$ | $0.050^{**}$ | $0.039^{*}$ | $0.092^{***}$ | 0.006 |
| | (0.013) | (0.014) | (0.020) | (0.025) | (0.012) | (0.014) |
| $\frac{GDP \times GDP_{swe}}{GDP_{world}}$ | $1.049^{***}$ | $0.995^{***}$ | $1.317^{***}$ | $1.245^{***}$ | $1.365^{***}$ | $1.275^{***}$ |
| | (0.012) | (0.013) | (0.019) | (0.023) | (0.010) | (0.012) |
| **Distance** | $-0.730^{***}$ | -0.924 | $-1.013^{***}$ | $-1.112^{***}$ | $-1.032^{***}$ | $-1.197^{***}$ |
| | (0.025) | (0.027) | (0.035) | (0.041) | (0.020) | (0.022) |
| **TrOpeness** | 0.654 | $0.725^{***}$ | $0.664^{***}$ | $0.613^{***}$ | $0.663^{***}$ | $0.689^{***}$ |
| | (0.031) | (0.035) | (0.042) | (0.048) | (0.026) | (0.029) |
| **Constant** | $3.158^{***}$ | $5.845^{***}$ | -0.339 | $2.202^{***}$ | $-8.681^{***}$ | $-4.433^{***}$ |
| | (0.331) | (0.367) | (0.516) | (0.602) | (0.274) | (0.313) |
| Number of observations | 4106 | 3348 | 4106 | 3348 | 4014 | 2790 |
| Groups | 155 | 108 | 155 | 108 | 155 | 90 |
| Wald chi2 | $14997.58^{***}$ | $12736.75^{***}$ | $8393.52^{***}$ | $5310.75^{***}$ | $44805.80^{***}$ | $27308.85^{***}$ |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Missing zero immigrant stock observations in unbalanced data sample almost don't bring any changes in all variables' results that may also be caused by rather small number of such missing values. Whereas total exclusion of countries, even with small number of immigrants to Sweden, from observation in balanced data sample brings essential changes in coefficients of immigrant stock variable for both exports and imports dependent variables cases. It means that effect of ignoring of such "small" immigrants supplier countries may biased the results and besides this shows a week side of the balanced data

results. Missing imports zero values results from unbalanced sample, as expected, leads to the increase in immigrant stock impact on imports, though for balanced data sample the situation is the same as for zero immigrant stock (the coefficient has changed considerably and even become insignificant).

The results mentioned in table 9 evidently confirm the propriety of the used in this thesis method of missing values avoiding.

### *11.2.2 The Sample Composition Biasness Testing*

To investigate whether some country from the sample may cause the considerable changes in the final results additional regressions were run with consecutive exclusion one home country from the whole sample. For example the first regression was run while removing Afghanistan from the sample, then Albania and etc. The results, which are presented in Appendix E, show that all 310 coefficients for both exports and imports dependent variables are within the 95 percent confidence intervals that are 0.081-0.132 for exports and 0.012-0.093 for imports. It confirms that results are robust to sample composition.

## 11.3 Regional Classification

Table 10 includes results of cross-sectional and panel data estimations for subgroups according to regional classification: Africa, Asia, Europe and America. The regressions were run including all variables from equations (5) and (6), but only the results for variable of preliminary interest – immigrant stock are mentioned.

**Table 10. OLS and panel data estimates by continents for exports**

| **Immigrant stock** | **Dependent variable export** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1980** | **1985** | **1990** | **2000** | **2005** | **2010** | **1980-2010 (panel)** |
| **Africa** | 0.561*** | 0.535*** | 0.635*** | 0.337** | 0.405*** | 0.375*** | 0.301*** |
| | (0.129) | (0.095) | (0.129) | (0.130) | (0.109) | (0.099) | (0.026) |
| **Asia** | 0.190** | 0.192 | 0.159 | 0.032 | 0.036 | 0.124 | 0.032 |
| | (0.088) | (0.121) | (0.104) | (0.092) | (0.109) | (0.108) | (0.020) |
| **Europe** | 0.405** | 0.477** | 0.376* | 0.493* | 0.154 | -0.176 | 0.108*** |
| | (0.184) | (0.189) | (0.214) | (0.287) | (0.256) | (0.233) | (0.035) |
| **South and North America** | 0.273 | 0.139 | 0.256** | -0.086 | 0.122 | 0.003 | 0.171*** |
| | (0.184) | (0.153) | (0.103) | (0.131) | (0.110) | (0.142) | (0.033) |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct heteroskedasticity when it is found to be a problem

The results for whole 1980-2010 period may be ranged in descending immigrant-trade impact order like this: Africa, America, Europe and Asia. Africa has not only the highest average period immigrant-trade link, but also positive and highly significant coefficients for each cross-sectional observation, that was done with 5 years gap, with very similar to world pattern dynamic from table 7 of gradual decreasing.

African first place is in line with the theory as in all aspects it is the most dissimilar with Sweden part of the world. Factor's prices according to H-O model are not completely equalized because African countries are two apart with Sweden in factor endowments and specialization correspondingly. Essential salaries difference attracts immigrants from these countries to Sweden. Their knowledge about home countries market, law and language brings considerable contribution to Sweden's trade establishment with these countries and helps to overcome cultural differences.

Asian last place among other continents and insignificant results are rather unexpected. But even then there are some reasons that can be mentioned as explanation. Asia is on the second place after Europe according to quantity of immigrants to Sweden and has the largest immigrant growth rate among other regions. Swedish market has already had a lot of information about Asian countries business peculiarities and further immigration doesn't bring essential effect on exports' enlargement. In comparing with Europe that has the biggest among other continents immigration to Sweden, but even then shows the significant result, Asian countries are much more remote from Sweden. Large transaction costs make basically rather expensive Swedish product even more costly and noncompetitive on cheap Asian market.

**Table 11. OLS and panel data estimates by continents for imports**

| Immigrant stock | Dependent variable imports | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1980** | **1985** | **1990** | **2000** | **2005** | **2010** | **1980-2010 (panel)** |
| **Africa** | 0.850* | 0.355 | 0.224 | 0.711** | 0.678** | 0.626** | -0.018 |
| | (0.453) | (0.341) | (0.187) | (0.294) | (0.272) | (0.297) | (0.061) |
| **Asia** | 0.061 | 0.940*** | 0.411 | 0.219 | 0.055 | 0.108 | 0.089** |
| | (0.158) | (0.198) | (0.371) | (0.133) | (0.158) | (0.203) | (0.037) |
| **Europa** | 0.170 | 0.039 | 0.292 | 0.225 | 0.098 | -0.210 | 0.116*** |
| | (0.177) | (0.207) | (0.216) | (0.228) | (0.202) | (0.183) | (0.040) |
| **South and North America** | 0.137 | 0.031 | 0.147 | -0.204 | -0.231 | 0.551 | 0.015 |
| | (0.058) | (0.400) | (0.358) | (0.727) | (0.589) | (0.389) | (0.077) |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct heteroskedasticity when it is found to be a problem

The situation with imports is a little bit different. Africa and America that have rather essential immigrant-export link have insignificant coefficient for imports. Such result for Africa may be caused by the prolonged instability in this region that decreases considerably its competitiveness in international trade market and incentive of other countries to import goods from this region. The cause of the lack in American imports- immigration interaction may be hidden in a big geographical distance between Sweden and this region that lead to considerable transaction costs increase and rise in products' prices correspondingly, that decrease immigrants' demand on their home country products in favor to local one.

## 1.4 Classification According to the Level of Development

**Table 12. OLS and panel data estimates for developed and developing countries (exports)**

| Immigrant stock | Dependent variable exports | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1980** | **1985** | **1990** | **2000** | **2005** | **2010** | **1980-2010 (panel)** |
| **Developed** | 0.258* | 0.565** | 0.630** | 0.026 | 0.163 | -0.081 | 0.254*** |
| | (0.157) | (0.215) | (0.314) | (0.217) | (0.211) | (0.183) | (0.032) |
| **Developing** | 0.357*** | 0.356*** | 0.412*** | 0.195** | 0.236*** | 0.169** | 0.118*** |
| | (0.073) | (0.065) | (0.092) | (0.078) | (0.067) | (0.069) | (0.013) |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct for heteroskedasticity where it was found to be the problem

**Table 13. OLS and panel data estimates for developed and developing countries (imports)**

| Immigrant stock | Dependent variable imports | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1980** | **1985** | **1990** | **2000** | **2005** | **2010** | **1980-2010 (panel)** |
| **Developed** | 0.243* | 0.117 | 0.396* | -0.118 | -0.079 | -0.086 | 0.164*** |
| | (0.187) | (0.236) | (0.321) | (0.232) | (0.216) | (0.192) | (0.034) |
| **Developing** | 0.451* | 0.510** | 0.309* | 0.349** | 0.355* | 0.417** | 0.120*** |
| | (0.238) | (0.243) | (0.184) | (0.158) | (0.181) | (0.172) | (0.025) |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct for heteroskedasticity where it was found to be the problem

According to the results presented in tables 12 and 13 for both exports and imports dependent variables the impact of immigrants from developed countries on Sweden's trade with these countries is slightly higher than from developing, that is a little bit surprisingly as according to the theory we may expect the opposite. Such issue probably may be explained by the fact that even among the countries that are included in the developed group Sweden might be considered as a relatively more capital than labor abundant country and as the country with historically very stable economic development. Besides this the developed countries group includes so called "new" EU member countries that are famous

by their high immigration level to "old" EU countries where Sweden is not exception. Though if look at the dynamic of immigrants-trade impact it becomes evidently that the impact of developed countries decreased considerably recent years in absolute and comparing to developing countries.

In spite of the fact that tables 10 and 11 show a big variation in different regions' results, there is no any exact conformation of the fact that home and host countries differences may stimulate immigrants-trade link between them. Besides, according to the table 12 and 13, developed countries effect even a little bigger than developing countries. That leads to the rejection of the second and the third hypotheses.

## 11.5 Immigrant Flow and Asylum Seekers Tests

**Table 14. OLS and panel data estimates for immigrant flow and asylum seekers**

| | **Dependent variable** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Exports** | | | | **Imports** | | | |
| | **2000** | **2005** | **2010** | **1980-2010 (panel)** | **2000** | **2005** | **2010** | **1980-2010 (panel)** |
| **Immigrant flow** | 0.212** | 0.195*** | 0.129** | 0.072*** | 0.384** | 0.230 | 0.307* | 0.014 |
| | (0.097) | (0.068) | (0.064) | (0.014) | (0.169) | (0.171) | (0.172) | (0.021) |
| **Asylum seekers** | - | −0.138** | -0.072 | −0.034*** | - | −0.435*** | −0.260* | −0.121*** |
| | | (0.063) | (0.050) | (0.011) | | (0.141) | (0.135) | (0.021) |

* Refers to 10% significance, ** refers to 5% significant and *** refers to 1% significance levels.

Robust standard errors are used to correct for heteroskedasticity where it was found to be the problem

Additional test for asylum seekers variable shows that, as it was expected, refugees' and asylum seekers' effect on Sweden's trade is rather small and even negative, which is in line with the fourth hypothesis of the thesis. As were mentioned above asylum seekers mostly don't have possibility for strong connection with their home countries as other immigrants due to the reasons inducing them to move as war or personal persecution caused by flagrant violation of human rights in their countries of origin. As refugees often come from so called "hot spots" trade and especially imports from such countries is extremely difficult, that may explain higher negative imports' coefficients in comparing with exports'.

Immigrant flow to Sweden shows positive and significant effect on its exports, when 10% increase in immigrants leads to 0.7% rise in exports, though the result for imports is not

significant. This indicate that new comers, including short period immigrants have almost the same influence on Sweden's exports to their home countries as total number of immigrants living in Sweden (immigrant stock).

As immigrant flow includes people who come to Sweden due to different reasons during the year and often stay just for a short period without settlement here they aren't supposed to have large effect on the trade. From the other hand new comers may have much stronger preferences for the home product they used to than people were born in other country but have been living in Sweden for a very long period.

Besides Sweden has a big amount of international students. So in 2006-2007 academic years there were 27900 international students in Swedish higher educational institutes (Swedish National Agency for High education). They come every year for rather short period from one semester for exchange students to 1-4 years for others. It is high skilled and educated people who from one hand possess the knowledge of their countries peculiarity and at the same time bring some useful information about Sweden to their homes after returning, that they got during the period of education. Undoubtedly such bilateral exchange of information may create positive effect on trade contacts establishment.

# 12. Conclusion

Trade and especially exports are believed to have significant role in the country's economic growth facilitation; that is why it is so important to find out and investigate all factors that may have some impact on it. This study focuses on the process of immigration and its consequences for the trade creation. For Sweden, as an immigrants' host country, it is important as well as interesting to explore all consequences, particularly potential benefits, that immigrants may bring to it. Hopefully the empirical results of this thesis may provide the policy makers with useful information about the benefits associated with the immigrants' inflows.

This study has been done for 155 Swedish trade-partners for the period from 1980 to 2010. Both the period and the sample are chosen to use the maximum data available. Empirical part of the paper is based on the gravity model augmented with immigrant stock and trade openness variables. With the aim, not only to get the result for the whole period but also to look at the immigrant-trade dynamic of changes within the period under consideration, both panel and cross sectional data have been used.

The empirical results of this thesis show that there is a positive and significant impact of immigrants on both the exports and imports of Sweden. So, a 10% growth in immigrant stock leads to a 1% rise in Sweden's exports and 0.5% more imports with immigrants' home countries. Such findings are consistent with the first hypothesis that was tested in this thesis.

According to the cross-sectional estimation, the tendency of immigrant-trade interaction slackening was found for both exports and imports during the period under consideration, though the number of foreign born people, living in Sweden, has increased about 1.5 times within this time. That confirms the suggestion about diminishing immigrants trade effect after their number from some countries or similar countries groups reaches some critical value, when additional immigrant don't bring some essentially new information about the home country and imports can be substituted by a new production organization.

Home countries classification tests, when divided according to the geographical regions and the level of development, show that there is an essential difference between the effects of immigrants from different regions on Sweden's trade; and developed countries have

slightly larger influence than that of developing-ones; though cross-sectional estimates within the period show diminishing tendency of developed and increasing tendency of developing countries' impact on Sweden's trade recently. Both of these classification tests show that hypothesis that home and host countries' dissimilarity makes immigrants-trade effect between these countries stronger, isn't proved for Sweden.

Additional variables tests for asylum seekers and immigrant flow support a preliminary hypothesis and show that asylum seekers have even negative effect on Sweden's trade; though immigrant flow's impact on Sweden's exports is just slightly smaller than immigrant stock's. That evidently affirms that newcomers bring essential information about current situation and business peculiarities in their home countries that may be previously not available for those immigrants who have been living in Sweden for long. Besides, an annual immigrant flow usually contain a large percent of short period immigrants, who return home with new knowledge about Sweden that also facilitate information interchange between Sweden and their home countries.

Though this study, to my best knowledge, was the first which used a variety of tests for home countries classification and new variables tests for asylum seekers and immigrant flow for Swedish data, further analysis needs to be done to make the picture clearer. So, for comparison with developed and developing countries results, the test for the home countries' income level classification may be implemented. In addition, based on other countries research practice, immigrants' effect differs a lot according to the type of tradable goods, that also should be checked for Sweden.

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# 13. Appendix

## Appendix A List of countries

| | | | |
|---|---|---|---|
| Afghanistan* | Egypt* | Lao People´s Democratic Republic* | Saint Lucia |
| Albania | El Salvador | Latvia* | Samoa* |
| Algeria | Equatorial Guinea | Lebanon* | Sao Tome and Principe* |
| Angola* | Eritrea* | Liberia | Saudi Arabia |
| Argentina | Estonia* | Libyan Arab Jamahiriya* | Senegal |
| Armenia* | Ethiopia | Lithuania* | Seychelles |
| Australia* | Fiji | Luxembourg* | Sierra Leone |
| Austria | Finland | Macedonia* | Singapore |
| Azerbaijan* | France | Madagascar | Slovak Republic* |
| Bahamas | Gabon | Malawi | Slovenia* |
| Bangladesh | Gambia | Malaysia | South Africa |
| Belarus* | Georgia* | Maldives* | Spain |
| Belgium | Germany | Mali | Sri Lanka |
| Bolivia | Ghana | Malta | Sudan |
| Bosnia and Herzegovina* | Greece | Mauritania | Suriname |
| Botswana | Grenada | Mauritius | Swaziland |
| Brazil | Guinea* | Mexico | Switzerland |
| Bulgaria | Guinea-Bissau | Moldova Republic* | Syrian Arab Republic |
| Burkina Faso | Guyana | Mongolia | Tajikistan* |
| Burundi | Haiti* | Morocco | Tanzania, United Republic of* |
| Cambodia* | Honduras | Namibia | Thailand |
| Cameroon | Hong Kong Special Administrative Region of China* | Nepal | Togo |
| Canada | Hungary | Netherlands | Trinidad and Tobago |
| Cape Verde | Iceland | New Zealand | Tunisia |
| Central African Republic | India | Niger | Turkey |
| Chad | Indonesia | Nigeria | Turkmenistan* |
| Chile | Iran (Islamic Republic of) | Norway | Uganda |
| China (excluding Hong Kong) | Iraq* | Oman | Ukraine* |
| Colombia | Ireland | Pakistan | United Arab Emirates |
| Costa Rica | Israel | Panama | United Kingdom |
| Cote d´Ivoire | Italy | Papua New Guinea | United States of America |
| Croatia* | Jamaica | Paraguay | Uruguay |
| Cyprus | Japan | Poland* | Uzbekistan* |
| Czech Republic* | Jordan | Portugal | Venezuela |
| Democratic Republic of the Congo - Kinshasa | Kazakhstan* | Qatar* | Viet Nam* |
| Denmark | Kenya | Republic of the Congo - Brazzaville | Yemen* |
| Djibouti* | Korea, Republic of Korea | Romania | Zambia |
| Dominica | Kuwait* | Russian Federation* | |
| Dominican Republic | Kyrgyzstan* | Rwanda | |
| Ecuador | | | |

* refers to countries that don't have data available for whole time period

## Appendix B Classification of Trading Partners

### Table 1. Countries Classification by geographic approach

| Europe | Asia | Africa | America |
|---|---|---|---|
| Albania | Afghanistan | Algeria | Argentina |
| Austria | Armenia | Angola | Bahamas |
| Belarus | Azerbaijan | Botswana | Bolivia |
| Belgium | Bangladesh | Burkina Faso | Brazil |
| Bosnia and Herzegovina | Cambodia | Burundi | Canada |
| Bulgaria | China (excluding Hong Kong) | Cameroon | Chile |
| Croatia | Hong Kong Special Administrative Region of China | Cape Verde | Colombia |
| Cyprus | India | Central African Republic | Costa Rica |
| Czech Republic | Indonesia | Chad | Dominica |
| Denmark | Iran (Islamic Republic) | Cote d´Ivoire | Dominican Republic |
| Estonia | Iraq | Democratic Republic of the Congo - Kinshasa | Ecuador |
| Finland | Israel | Djibouti | El Salvador |
| France | Japan | Egypt | Grenada |
| Georgia | Jordan | Equatorial Guinea | Guyana |
| Germany | Kazakhstan | Eritrea | Haiti |
| Greece | Korea, Republic of Korea | Ethiopia | Honduras |
| Hungary | Kuwait | Gabon | Jamaica |
| Iceland | Kyrgyzstan | Gambia | Mexico |
| Ireland | Lao People´s Democratic Republic | Ghana | Panama |
| Italy | Lebanon | Guinea | Paraguay |
| Latvia | Malaysia | Guinea-Bissau | Saint Lucia |
| Lithuania | Maldives | Kenya | Suriname |
| Luxembourg | Mongolia | Liberia | Trinidad and Tobago |
| Macedonia | Nepal | Libyan Arab Jamahiriya | United States of America |
| Malta | Oman | Madagascar | Uruguay |
| Moldova, Republic of | Pakistan | Malawi | Venezuela |
| Netherlands | Qatar | Mali | |
| Norway | Saudi Arabia | Mauritania | |
| Poland | Singapore | Mauritius | |
| Portugal | Sri Lanka | Morocco | |
| Romania | Syrian Arab Republic | Namibia | |
| Russian Federation | Tajikistan | Niger | |
| Slovak Republic | Thailand | Nigeria | |
| Slovenia | Turkey | Republic of the Congo - Brazzaville | |
| Spain | Turkmenistan | Rwanda | |
| Switzerland | United Arab Emirates | Sao Tome and Principe | |
| Ukraine | Uzbekistan | Senegal | |
| United Kingdom | Viet Nam | Seychelles | |
| | Yemen | Sierra Leone | |
| | | South Africa | |
| | | Sudan | |
| | | Swaziland | |
| | | Tanzania, United Republic of | |
| | | Togo | |
| | | Tunisia | |
| | | Uganda | |
| | | Zambia | |

**Table 2. Countries Classification by the level of development**

| Developed | Developing | | |
|---|---|---|---|
| Australia | Afghanistan | Georgia | Oman |
| Austria | Albania | Ghana | Pakistan |
| Belgium | Algeria | Grenada | Panama |
| Bulgaria | Angola | Guinea | Papua New Guinea |
| Czech Republic | Argentina | Guinea-Bissau | Paraguay |
| Denmark | Armenia | Guyana | Poland |
| Estonia | Azerbaijan | Haiti | Qatar |
| Finland | Bahamas | Honduras | Republic of the Congo – Brazzaville |
| France | Bangladesh | Hong Kong Special Administrative Region of China | Russian Federation |
| Germany | Belarus | India | Rwanda |
| Greece | Bolivia | Indonesia | Saint Lucia |
| Hungary | Bosnia and Herzegovina | Iran (Islamic Republic of) | Samoa |
| Iceland | Botswana | Iraq | Sao Tome and Principe |
| Ireland | Brazil | Israel | Saudi Arabia |
| Italy | Burkina Faso | Jamaica | Senegal |
| Japan | Burundi | Jordan | Seychelles |
| Latvia | Cambodia | Kazakhstan | Sierra Leone |
| Lithuania | Cameroon | Kenya | Singapore |
| Luxembourg | Cape Verde | Korea, Republic of Korea | South Africa |
| Malta | Central African Republic | Kuwait | Sri Lanka |
| Netherlands | Chad | Kyrgyzstan | Sudan |
| New Zealand | Chile | Lao People´s Democratic Republic | Suriname |
| Norway | China (excluding Hong Kong) | Lebanon | Swaziland |
| Portugal | Colombia | Liberia | Syrian Arab Republic |
| Romania | Costa Rica | Libyan Arab Jamahiriya | Tajikistan |
| Slovak Republic | Cote d´Ivoire | Macedonia | Tanzania, United Republic of |
| Slovenia | Croatia | Madagascar | Thailand |
| Spain | Cyprus | Malawi | Togo |
| Switzerland | Democratic Republic of the Congo - Kinshasa | Malaysia | Trinidad and Tobago |
| United Kingdom | Djibouti | Maldives | Tunisia |
| United States of America | Dominica | Mali | Turkey |
| | Dominican Republic | Mauritania | Turkmenistan |
| | Ecuador | Mauritius | Uganda |
| | Egypt | Mexico | Ukraine |
| | El Salvador | Moldova, Republic of | United Arab Emirates |
| | Equatorial Guinea | Mongolia | Uruguay |
| | Eritrea | Morocco | Uzbekistan |
| | Ethiopia | Namibia | Venezuela |
| | Fiji | Nepal | Viet Nam |
| | Gabon | Niger | Yemen |
| | Gambia | Nigeria | Zambia |

**Appendix C Fisher Unit Root Test's results**

| Indicator | Variable – ln immigrant stock | | | | |
|---|---|---|---|---|---|
| | Lag(0) | Lag(1) | Lag(2) | Lag(3) | Lag(4) |
| **Inverse chi-squared** | 554.8271 | 539.8036 | 566.5953 | 604.1399 | 801.4708 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse normal** | -6.6672 | -7.5013 | -8.1612 | -8.7838 | -11.9427 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse logit t** | -6.6912 | -7.7245 | -8.4551 | -9.3174 | -15.6981 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Modified inv. chi-squared** | 9.8325 | 9.2291 | 10.4191 | 11.9318 | 23.5669 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |

P value is shown in brackets

| Indicator | Variable – ln export | | | | |
|---|---|---|---|---|---|
| | Lag(0) | Lag(1) | Lag(2) | Lag(3) | Lag(4) |
| **Inverse chi-squared** | 1226.1363 | 1000.2293 | 861.2451 | 819.0427 | 645.2012 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse normal** | -23.7711 | -20.3634 | -17.6384 | -16.6997 | -13.7616 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse logit t** | -26.6085 | -21.4187 | -18.0844 | -17.0294 | -14.0321 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Modified inv. chi-squared** | 36.7929 | 27.7203 | 22.2909 | 20.5905 | 16.7402 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |

P value is shown in brackets

| Indicator | Variable – ln import | | | | |
|---|---|---|---|---|---|
| | Lag(0) | Lag(1) | Lag(2) | Lag(3) | Lag(4) |
| **Inverse chi-squared** | 1541.7712 | 1247.9346 | 1046.2861 | 973.9832 | 860.9221 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse normal** | -28.0886 | -24.3246 | -20.7824 | -19.3704 | -18.8004 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse logit t** | -33.6512 | -27.0437 | -22.3216 | -20.3391 | -19.9537 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Modified inv. chi-squared** | 49.4691 | 37.6684 | 29.7464 | 26.8332 | 26.1640 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |

P value is shown in brackets

| Indicator | Variable – ln tropenness | | | | |
|---|---|---|---|---|---|
| | Lag(0) | Lag(1) | Lag(2) | Lag(3) | Lag(4) |
| **Inverse chi-squared** | 923.1298 | 853.8273 | 833.5128 | 841.6581 | 705.3755 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse normal** | -17.9788 | -16.9193 | -16.6970 | -16.3025 | -14.8416 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse logit t** | -19.2633 | -17.5707 | -17.2416 | -17.1824 | -15.4804 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Modified inv. chi-squared** | 24.6239 | 21.8406 | 21.1735 | 21.5017 | 19.3689 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |

P value is shown in brackets

| Indicator | Variable – ln GDP | | | | |
|---|---|---|---|---|---|
| | Lag(0) | Lag(1) | Lag(2) | Lag(3) | Lag(4) |
| **Inverse chi-squared** | 774.2588 | 871.1968 | 767.8225 | 808.6451 | 653.1475 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse normal** | -14.7333 | -18.0718 | -15.5641 | -16.1095 | -14.3135 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Inverse logit t** | -15.3331 | -18.3391 | -15.5784 | -16.3347 | -14.3701 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| **Modified inv. chi-squared** | 18.6451 | 22.5382 | 18.5268 | 20.1716 | 17.0874 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |

P value is shown in brackets

## Appendix D Migration in international trade models

| Theory | Trade structure | Other model assumptions | Mechanism | Migration | Effect of migration |
|---|---|---|---|---|---|
| Adam Smith's model | Two goods | Capability of one country produce more of a product with the same amount of output then another country | A country exports a good it has absolute advantage in production | | |
| Ricardian model | Two goods and one factor | Technology differences between countries. Labor is only one factor of production is mobile across sectors but immobile internationally. | A country exports a good it has comparetiva advantage in production | | |
| Ramaswami model | One good | Exogenous factor supplies. Labor internationally mobile. Same technology available across countries. | A country exports a good it has comparative advantage, which depends on factor endowments. | Driven by supply-demand differences in regions (until the wage equalization hold) | If production prices are constant (small open economy) an increase in labor supply leads to an increase in output and some negative effects on wages<br>Trade and migrations is consider to be substitutes |
| Heckscher-Ohlen model | Variety of goods | Exogenous factor supplies. Labor internationally mobile. Same technology available across countries. | A country exports goods that intensively use factor endowments which are abundant. | Driven by supply-demand differences in regions (until the wage equalization hold) | Wages remain unchanged with increase in labor supply (Rybeczynski theorem) until it influences on reduction of world prices on labor intensive goods. Until the second condition occur trade and migration are complements then substitutes. |
| Specific factor model | Two goods and three factors | Technology and factor endowments differences between countries. Labor is mobile within sectors. Other factors | A country exports goods it has comparative advantage. | Workers migrate to regions with higher wages. | Wages remain unchanged with increase in labor supply (Rybeczynski theorem) until it influences on |

| | | | | | |
|---|---|---|---|---|---|
| | | are assume to be immobile specific factors. Free trade equalizes output prices but not wages. | | | reduction of world prices on labor intensive goods. Until the second condition occur trade and migration are complements then substitutes. |
| New trade theory | Variety of goods | Specialization increase output and reduces costs under the condition of increasing returns to scale. | Establishing of few production centers specializing in particular goods production. | Workers migrate to regions with higher wages. Due to economies of scale many regions offer better employment chances and higher wages at the same time. | Trade and migration are complements. |

Source: Budnik K.B. (2011) with author's additions

## Appendix E Country by country exclusion results: robustness check

| Country | Export | Import | Country | Export | Import |
|---|---|---|---|---|---|
| Afghanistan | 0.109*** | 0.058*** | Ethiopia | 0.106*** | 0.058** |
| Albania | 0.106*** | 0.049** | Fiji | 0.106*** | 0.049** |
| Algeria | 0.105*** | 0.050** | Finland | 0.087*** | 0.026** |
| Angola | 0.107*** | 0.049** | France | 0.112*** | 0.046** |
| Argentina | 0.106*** | 0.052** | Gabon | 0.103*** | 0.044** |
| Armenia | 0.106*** | 0.053** | Gambia | 0.100*** | 0.057*** |
| Australia | 0.106*** | 0.051** | Georgia | 0.106*** | 0.052** |
| Austria | 0.106*** | 0.053** | Germany | 0.113*** | 0.057*** |
| Azerbaijan | 0.107*** | 0.052** | Ghana | 0.105*** | 0.052** |
| Bahamas | 0.108*** | 0.060*** | Greece | 0.109*** | 0.062*** |
| Bangladesh | 0.108*** | 0.048** | Grenada | 0.106*** | 0.054*** |
| Belarus | 0.104*** | 0.047** | Guinea | 0.106*** | 0.053** |
| Belgium | 0.113*** | 0.066** | Guinea-Bissau | 0.108*** | 0.055** |
| Bolivia | 0.104*** | 0.058*** | Guyana | 0.105 | 0.052 |
| Bosnia and Herzegovina | 0.113*** | 0.059*** | Haiti | 0.106*** | 0.050** |
| Botswana | 0.109*** | 0.044** | Honduras | 0.106*** | 0.056*** |
| Brazil | 0.106*** | 0.055*** | Hong Kong | 0.111*** | 0.064*** |
| Bulgaria | 0.109*** | 0.042** | Hungary | 0.112 | 0.053 |
| Burkina Faso | 0.101*** | 0.054** | Iceland | 0.096*** | 0.041** |
| Burundi | 0.108*** | 0.054*** | India | 0.109*** | 0.058** |
| Cambodia | 0.106*** | 0.052** | Indonesia | 0.105*** | 0.051** |
| Cameroon | 0.101*** | 0.053** | Iran | 0.112*** | 0.058*** |
| Canada | 0.108*** | 0.050** | Iraq | 0.110*** | 0.064*** |
| Cape Verde | 0.104*** | 0.059** | Ireland | 0.112*** | 0.061*** |
| Central African Republic | 0.103*** | 0.044** | Israel | 0.107*** | 0.056*** |
| Chad | 0.102*** | 0.036** | Italy | 0.104*** | 0.048** |
| Chile | 0.093*** | 0.031** | Jamaica | 0.105*** | 0.055*** |
| China | 0.105*** | 0.053** | Japan | 0.106*** | 0.063*** |
| Colombia | 0.110*** | 0.052** | Jordan | 0.105*** | 0.052** |
| Costa Rica | 0.106*** | 0.058** | Kazakhstan | 0.103*** | 0.050** |
| Cote d'Ivoire | 0.104*** | 0.056*** | Kenya | 0.107*** | 0.054** |
| Croatia | 0.109*** | 0.053** | Korea Republic | 0.109*** | 0.045** |
| Cyprus | 0.106*** | 0.053*** | Kuwait | 0.112*** | 0.041** |
| Czech Republic | 0.105*** | 0.055*** | Kyrgyzstan | 0.106*** | 0.054** |
| Democratic Republic of the Congo | 0.104*** | 0.061*** | Lao People's Democratic Republic | 0.105*** | 0.047** |
| Denmark | 0.097*** | 0.041** | Latvia | 0.105*** | 0.051** |
| Djibouti | 0.108*** | 0.049** | Lebanon | 0.111*** | 0.069** |
| Dominica | 0.106*** | 0.054*** | Liberia | 0.103*** | 0.054** |
| Dominican Republic | 0.105*** | 0.054*** | Libyan Arab Jamahiriya | 0.105*** | 0.052** |
| Ecuador | 0.108*** | 0.052** | Lithuania | 0.104*** | 0.050** |
| Egypt | 0.106*** | 0.052** | Luxembourg | 0.099*** | 0.059** |
| El Salvador | 0.108*** | 0.055*** | Macedonia | 0.109*** | 0.052** |

| | | | | | |
|---|---|---|---|---|---|
| Equatorial Guinea | 0.103*** | 0.033** | Madagascar | 0.106*** | 0.055** |
| Eritrea | 0.106*** | 0.059** | Malawi | 0.105*** | 0.056** |
| Estonia | 0.104*** | 0.049** | Malaysia | 0.107*** | 0.056*** |
| Maldives | 0.109*** | 0.053** | Seychelles | 0.106*** | 0.053** |
| Mali | 0.104*** | 0.052** | Sierra Leone | 0.105*** | 0.050** |
| Malta | 0.108*** | 0.058** | Singapore | 0.111*** | 0.061** |
| Mauritania | 0.108*** | 0.048** | Slovak Republic | 0.100*** | 0.053** |
| Mauritius | 0.105*** | 0.054** | Slovenia | 0.106*** | 0.055*** |
| Mexico | 0.105*** | 0.046** | South Africa | 0.106*** | 0.052** |
| Moldova | 0.106*** | 0.048** | Spain | 0.107*** | 0.051** |
| Mongolia | 0.106*** | 0.053** | Sri Lanka | 0.108*** | 0.043** |
| Morocco | 0.103*** | 0.055** | Sudan | 0.108*** | 0.052** |
| Namibia | 0.105*** | 0.052** | Suriname | 0.105*** | 0.051** |
| Nepal | 0.106*** | 0.049** | Swaziland | 0.106*** | 0.055** |
| Netherland | 0.110*** | 0.060** | Switzerland | 0.110 | 0.060 |
| New Zealand | 0.107*** | 0.055** | Syrian Arab Republic | 0.110 | 0.058 |
| Niger | 0.103*** | 0.040** | Tajikistan | 0.105*** | 0.052** |
| Nigeria | 0.105*** | 0.052** | Tanzania | 0.105*** | 0.052** |
| Norway | 0.099*** | 0.042** | Thailand | 0.111*** | 0.042** |
| Oman | 0.115*** | 0.044** | Togo | 0.105*** | 0.057** |
| Pakistan | 0.107*** | 0.059** | Trinidad and Tobago | 0.106*** | 0.052** |
| Panama | 0.109 | 0.059 | Tunisia | 0.107*** | 0.051** |
| Papua New Guinea | 0.105*** | 0.058** | Turkey | 0.112*** | 0.066** |
| Paraguay | 0.105*** | 0.051** | Turkmenistan | 0.104*** | 0.049** |
| Poland | 0.111*** | 0.060** | Uganda | 0.107*** | 0.055** |
| Portugal | 0.106*** | 0.053** | Ukraine | 0.106*** | 0.050** |
| Qatar | 0.108*** | 0.049** | United Arab Emirates | 0.114*** | 0.056** |
| Republic of Congo | 0.104*** | 0.052** | United Kingdom | 0.107*** | 0.055** |
| Romania | 0.109*** | 0.054** | United States of America | 0.105*** | 0.055** |
| Russian Federation | 0.106*** | 0.051** | Uruguay | 0.105*** | 0.043** |
| Rwanda | 0.106*** | 0.073** | Uzbekistan | 0.106*** | 0.054** |
| Saint Lucia | 0.106*** | 0.052** | Venezuela | 0.106*** | 0.059** |
| Samoa | 0.105*** | 0.052** | Viet Nam | 0.111*** | 0.053** |
| Sao Tome and Principe | 0.106*** | 0.052** | Yemen | 0.107*** | 0.049** |
| Saudi Arabia | 0.116*** | 0.054** | Zambia | 0.106*** | 0.051** |
| Senegal | 0.105*** | 0.050** | | | |