IMMIGRATION AND NATIVE EMPLOYMENT

A study of the effects in Sweden 2011-2017

Alexandra Bojarinova Sandström
Abstract

Immigration has been and will continue to be a common occurrence in the world. As a field of study immigration is a controversial subject. In addition, there are many contradictory previous results from studies on the effects of immigration on the native born population. This thesis is a compliment to earlier research on the field with a focus on the effects on the employment rate of natives in Sweden. The aim of the study is to move the field towards coherence.

Panel data for the years 2011 to 2017 are used and the observations are the 290 municipalities in Sweden. An econometric approach is conducted where the response variable is the percent of the native born population which is gainfully employed. The thesis shows that there is a small but positive correlation between immigration and the employment rate of natives in Sweden, at least as long as there are not too many people with low economic standard. If too many people have a low economic standard the amount of foreign born who are gainfully employed will have a negative effect on the amount of native born who are gainfully employed.

Key words: immigration, employment rate, native born, foreign born, labour market
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1. INTRODUCTION

The immigration to Sweden during the twenty-first century increased considerably and it reached its peak 2016 (Statistiska Centralbyråns 2019a). Even though it peaked, there is reason to believe that immigration will continue to be a common occurrence in the future. As a matter of fact, immigration from lower-income countries to higher-income countries has been quite constant for the last 50 years with some peaks (Peri 2016, 3). In addition, climate change will probably lead to migration of people. With climate changes, natural disasters happened more frequently and degradation of environments occur (The UN Refugee Agency).

Since there is support for immigration continuing to be a phenomenon, it is relevant to study the effect of immigration on the labour market of natives, which is what this thesis aims to do. It is also relevant because of unsupported beliefs regarding the subject. One example is the common belief that immigration has a negative effect on the labour market of natives. People tend to believe that immigration lead to a lower employment rate and lower wages of native born. This common belief does not have unambiguous support in existing literature (Foged 2017).

Another common belief is that low skilled natives are affected more negatively than high skilled natives. This belief has more support in the literature. The bigger effect is explained by the possibility that immigrants are closer substitutes to less skilled natives and therefore are more likely to compete with them for jobs. The recent immigration to Europe has been comprised of low skilled immigrants and have therefore been closer substitutes to low skilled natives than high skilled natives (Kerr & Kerr 2011, 24). If one group is affected more than another group of people, it is important that we are aware of that so that we have the possibility to even out the effect, for example by compensating vulnerable groups. For that reason, this thesis tries to examine if immigration affect some groups more. Lower income is used as a proxy to less skilled and also, it is investigated if gender matters.

This study focuses on Swedish data which is important because of the lack of studies on Swedish data. Most studies are conducted on US data and the studies conducted on European data are hard to generalise due to the variation in labour markets and welfare systems in Europe. In addition, immigration flows are different from each other between locations and time, and
the characteristics of the immigration flow affect the labour market outcome (Kerr & Kerr 2011).

The fact that different immigration flows give different outcomes also support the necessity of this study. This study focuses on the recent immigration flow and uses data from 2011 to 2017. Another focus of this study is employment. This study focuses mostly on employment and not wages because of the rigid wages in Sweden. Studies on labour market outcomes of natives due to immigration in Europe often focus on employment and/or unemployment rate effects instead of effects on salaries because salaries in European countries are rigid (Okkerse 2008, 10). Even though the focus is on employment rate, the study discusses the effects on salary to some extent. The empirical work focuses entirely on employment rate.

The empirical work of this study is an econometrical analysis. Methodology in this field differs greatly and can be divided into econometrical analysis and simulation-based approach. Simulation based approach is based more on underlying theoretical frameworks. This study conducts econometrical analysis because the existing theoretical models are contradictory and it is arguable that econometric analysis is needed to improve them (Boeri & Brücker 2005).

In conclusion, this thesis aims to study the effects of immigration on the labour market outcome of native born in Sweden during the last couple of years. It focuses on the effects on employment rate because of wage rigidness and it tries to investigate if the outcome differs for genders and for less skilled natives.

2. THEORETICAL FRAMEWORK

2.1. LABOUR MARKET THEORY

The labour markets in Sweden and in the rest of Europe are not perfect. The theoretical framework for perfect markets is straight forward concerning the effects of immigration on the labour market for native but not for the imperfect markets of Europe. The imperfect markets theory has, for example, problems with predicting if the effects are positive or negative (Boeri & Brücker 2005). When changing the underlying assumptions, the theoretical predictions changes (Okkerse 2008, 1).
In a simple perfect competition supply and demand model, immigration will shift the supply curve. If the two curves are assumed to be imperfectly elastic the shift will lead to a fall in wages and rise in employment. The rise in employment will be lower than the increase in the labour force due to immigration, which will mean that some natives will be displaced (Friedberg 2001, 1372-1374).

When leaving the simplest perfect competition model, the effect of immigration depends on the type of institutions at place, the openness of the market, on the skill composition of immigrants and if the skill composition makes the immigrants compliments or substitutes. The complicated framework leads to a demand of empirical work to further develop the analysis (Boeri & Brücker 2005).

It is often concluded that immigrants lower the wages of native born if they are substitutes and raise the wages if they are compliments (Okkerse 2008, 1). This it is not only the case for wages but also for employment rate. These kind of predictions are short run predictions and take everything except change in labour supply of immigration as given (Kerr & Kerr 2011, 10).

Theory states that when immigrants arrive, the skill composition in the country changes which in turn lead to a change in equilibrium rate of wages and employment. The movement back to equilibrium result in changes in wages and employment in the short run and possible in the long run. The openness of the market is a decider of the long run effect. The more open the market is, the less effect in the long run since prices and the demand for certain goods are taken as given. The demand changes less the more open the economy is (Dustmann, Fabbri & Preston 2005).

Another factor affecting the movement to the new equilibrium after the shift of the supply curve is if the wages are rigid or not. Wages become rigid due to for example unions, minimum wages and employment protection (Aydemir and Kırdar 2017, 8).

2.2. EMPLOYMENT RATE

The employment rate is affected by many factors. One such factor is the business cycle. More people are unemployed during a recession which affects the employment rate even though the correlation is not necessarily linear (Schermer 2019).
Unemployed people are defined as the ones who are actively looking for jobs and the unemployment rate are the unemployed divided with the labour force. The labour force are the unemployed ones and the employed ones. The employment rate is the people who are gainfully employed divided with the entire population and the participation rate is the labour force divided with the population (Carlin & Soskice 2006, 744).

Other factors affecting the employment rate is age structure and how many people are studying. If people are studying they are less likely to be working. This factor is also one reason to why people aged 15-24 in Sweden has a lower employment rate than people aged 25-64. People aged 65-74 has the lowest employment rate of the mentioned groups (Schermer 2019).

Even though the relation between employment rate and unemployment rate is not linear there is a relation and therefore the high youth unemployment is a contributing factor to the lower employment rate of people aged 15-24 than for 25-64. The high youth unemployment is due to structural reasons and less people leaving the Swedish upper secondary school with complete grades. Not leaving with complete grades is a factor affecting youth unemployment since it is a factor affecting employment in general. The unemployment rate is highest for the ones who have not completed Swedish upper secondary school and lowest for the ones who have done more education after upper secondary school. 2018 the unemployment rate was 20.5 percent for the group which had not completed upper secondary school, 5.3 percent for the ones who had and 3.9 percent for the ones who had completed more education than upper secondary school (Schermer 2019).

Key factors affecting the employment rate are the ones mentioned but there are some more. One of these is the increase in the amount of women working. During the 1970s the participation rate grew due to the fact that more women started to work (Schermer 2019). Another factor possible affecting the employment rate is salary. According to neo classical economics theory a lowering of the real salary leads to an increased employment rate given that everything else is the same (Morin 2016, 33). A final one is visible when comparing employment rate between regions. An explanatory factor is then characteristics of the region such as population density and population size (Okkerse 2008, 7).
3. LITERATURE REVIEW

3.1. DIFFERENT METHODS

Research on how the labour market outcomes of native born are affected by immigration has been conducted in several different ways. The different ways can be divided into simulation-based analysis and econometric analysis. Simulation-based analysis is more sensitive to changes in underlying theoretical frameworks since they are based more on existing economic models than the econometric analysis approaches (Okkerse 2008, 2).

Some simulation-based approaches have received criticism about being too limited by theoretical models. One example of criticism is that some approaches base their conclusions on the result of given elasticity of substitutions and that if the labour market model behind the elasticises is wrong the conclusions are wrong (Okkerse 2008, 4). Since the theoretical framework in this area is debated and the need for more econometric studies has been brought up (Boeri & Brücker 2005), this study focuses on the econometric approach side of the field.

Studies often divide the workforce of both native born and immigrants into different skill groups that constitutes perfect substitutes (Okkerse 2008, 4-6). The division is complicated because substitutability depends on many factors, for example time and personal traits (Kerr & Kerr 2011, 11). Also it has been argued that immigrants are compliments rather than substitutes (Foged 2017).

Often the division into skill group is done by educational attainment but according to human capital literature this is not sufficient. Experience attained from being a part of the labour market is also important when dividing individuals into skill groups. If experience from the labour market is not included people with the same educational attainment but different amount of labour market experience is considered perfect substitutes and this is not likely. (Borjas 2003, 1339-1340). Studies that have examined substitutability between natives and immigrants have found that immigrants and natives with similar education level and experience level are not perfect substitutes but closer to perfect substitutes than if only education is considered (Borjas 2003, 1344).
The econometric approaches can be sorted into area analysis, production theory approach, aggregated time-series approach and natural experiment approach. All the different econometric approaches have in common that they estimate the effect of immigration on wages and unemployment by examining correlation between the effects and changes in flows or stocks of immigrants (Okkerse 2008, 7-22).

The most common approach of all is the area analysis. This approach compares labour markets in different areas of a country and even though it is most common it has many problems and has gotten critique (Kerr & Kerr 2011, 11). One critique is the possibility that immigrants endogenously end up in locations where the economy is more prosperous. If this is the case, there will be a more positive correlation between immigrants and the labour market outcomes of native-born inhabitants than it should be. Another critique is that natives and capital might move to other locations due to immigration if it has a negative impact on wages and employment possibilities. This would change the equilibrium level of wages and employment in all locations involved and there would be an equalization. Due to the equalization aspect it might be a better idea to do the analysis on a national level. How much equalization would occur depends on how open the markets are (Borjas 2003, 1338-1339).

Another way to try to solve the problem with endogeneity and equalization is to use the natural experiment approach. It is important to solve the problem if a regression is to be done with ordinary least square (OLS) since all explanatory variables need to be exogenous in a OLS (Okkerse 2008, 8). The natural experiment approach uses a sudden inflow of immigrants where the area where the immigrants end up in the country does not depend on economical reasons. The idea is that the sudden inflow causes a shift in the labour supply of immigrants so that the short run effect of immigration can be studied before a possible equalization occur (Peri 2016, 22-23).

An influential study that used the natural experiment approach is David Cards (1989) study about the impact of the Mariel Boatlift on the Miami labour market. The Mariel Boatlift led to about 125 thousand Cuban to immigrate to the US due to Fidel Castro allowing Cubans to migrate to the US from the port of Mariel. This migration happened between May and September 1980 and around half of the immigrants stayed in Miami which led to an increase of the labour force in Miami with 7 percent. The study focuses on the effect on wages and employment of less skilled workers because most of the immigrants were less skilled.
Furthermore, the extent of the problem with equalization is unclear as studies vary in their result. Much research does not support the existence of the problem. One way to solve the possible problem is as mentioned to move the analysis to the national level or to look at a natural experiment. Another way to solve the problem is to move the analysis to the industry level. The underlying assumption behind moving the analysis to the industry level is that it is harder for people to change industry than to change region (Okkerse 2008, 9-10).

### 3.2. PREVIOUS CONCLUSIONS

The effects found concerning the effects of immigrants on the labour market of natives are small and contradictory (Borjas 2003, 1335-1336). The effects differ between studies conducted in the same country and in different countries. But even though the result differs there are indicators that the results of European studies are more similar to one another than the results of US studies. There are indicators that the employment rate in Europe is more likely to change than in the US and that in the US the wage is more likely to change than in Europe (Kerr & Kerr 2011, 14).

Therefore, this review of conclusions will focus on a country quite similar to Sweden; Denmark. The refugee immigration to Denmark 1995-2003 led to higher salaries and more complex jobs for the native born labour force in Denmark that had less education. This effect was due to immigrants competing for jobs that were more physical which made the native born, that immigrants competed with, look for jobs were knowledge about Denmark and its language was required. These result was explained by the immigrants being compliments to natives. The groups who could take advantage of the immigration was young people and people who could easily switch jobs according to the study (Foged 2017).

The study of the refugee immigration to Denmark 1995-2003 showed no effect on the employment rate of low skilled natives due to the immigration. The absence of an effect was explained by a flexible labour market (Foged 2017). The Swedish labour market is not as flexible as the Danish which might lead to another effect concerning employment rate in Sweden. Also, the effect on wages of immigration might not be as big (Foged 2017, 11).

Often studies calculate how much an increase in the labour market with 1 percent immigrants affects salary. The calculated effects differ amongst studies and a scientific study of 27 studies
of the effect of immigration on salaries gave a mean value of the effect of 0.008 percent. Usually
the effect lies between -0.1 and 0.1 percent. A positive effect can be explained by the
compliment theory (Foged 2017, 2).

The small effect on salary has led to many studies investigating why that might be the case. Many studies try to incorporate the possibility that immigrants endogenously end up in certain locations and the possibility that economic integration dampens the effect. The effects found in these studies are small (Kerr & Kerr 2011, 11-14). This is also the case for employment rate (Okkerse 2008, 11-15).

The effects mentioned are mainly short run. In the long run studies show that immigration lead
to the creation of jobs. More jobs are created by immigrants than taken by them in the long run
(Okkerse 2008, 24).

4. SWEDISH CHARACTERISTICS

4.1. THE SWEDISH LABOUR MARKET

Sweden has a well functioning labour market with a high employment rate. When comparing
the employment rate to other countries it is high due to many women and older people working
in comparison. A possible problem for the Swedish labour market could be the high amount of
youth unemployment. Fortunately, the youth unemployment is not long term and therefore
probably not problematic (Eriksson, Hensvik & Nordström Skans 2017, 28). Another
distinction when comparing Sweden to other countries is that it is harder for people with
immigrant background in Sweden to find work. It is also harder for people with a low amount
of qualifications (Eriksson, Hensvik & Skans 2017, 28).

When it comes to the employment rate in general it has been constantly increasing from 2011
to 2017. Immigrants have a lower employment rate but both the employment rate for people
born inside and outside of Sweden has been increasing during the period. As a matter of fact,
employment rate has increased more rapidly for people not born in Sweden and hence the
employment rate gap between native born and immigrants has decreased (Statistiska
Centralbyrån 2018 a).
The salaries in Sweden differ much between foreign and native born. In 2017, the median earnings in Sweden for people born outside of the country was 70 percent of the median earnings of native born people. People born in Africa and Asia had the lowest median earnings and people born in other Nordic country had almost the same median earnings as people born in Sweden. In addition, the length of stay in Sweden contributed substantially to the median earnings. The longer people had stayed the more they earned (Statistiska Centralbyrån 2019 b).

4.2. IMMIGRATION TO SWEDEN

31 of December 2018 almost two million people not born in Sweden were living in Sweden, which is approximately 19.1 percent of the population. The fraction of the population born outside of Sweden has been increasing. The year 2000 the fraction was only 11.3 percent. Most people born outside of Sweden in Sweden has usually been born in Finland but between 2016 and 2017 Syria took over as most common country of birth (Statistiska Centralbyrån 2019 b).

**TABLE 1: MOST COMMON COUNTRIES OF BIRTH 2018**

<table>
<thead>
<tr>
<th>Country of Birth</th>
<th>Women</th>
<th>Men</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Syria</em></td>
<td>81 067</td>
<td>104 924</td>
<td>185 991</td>
</tr>
<tr>
<td><em>Finland</em></td>
<td>89 630</td>
<td>58 253</td>
<td>147 883</td>
</tr>
<tr>
<td><em>Iraq</em></td>
<td>66 467</td>
<td>77 568</td>
<td>144 035</td>
</tr>
<tr>
<td><em>Poland</em></td>
<td>49 206</td>
<td>43 553</td>
<td>92 759</td>
</tr>
<tr>
<td><em>Iran</em></td>
<td>36 533</td>
<td>40 853</td>
<td>77 386</td>
</tr>
<tr>
<td><em>Somalia</em></td>
<td>34 705</td>
<td>33 973</td>
<td>68 678</td>
</tr>
<tr>
<td><em>Yugoslavia</em></td>
<td>32 465</td>
<td>32 659</td>
<td>65 124</td>
</tr>
<tr>
<td><em>Bosnia and Herzegovina</em></td>
<td>29 932</td>
<td>29 463</td>
<td>59 395</td>
</tr>
<tr>
<td><em>Afghanistan</em></td>
<td>18 382</td>
<td>33 597</td>
<td>51 979</td>
</tr>
<tr>
<td><em>Germany</em></td>
<td>26 859</td>
<td>24 281</td>
<td>51 141</td>
</tr>
</tbody>
</table>

Source: Statistiska Centralbyrån 2019 c

In Table 1 the ten most common countries of birth for foreign born inhabitants is presented. In the table a difference between the genders for some countries are also visible. Of the Afghanistan born inhabitants 65 percent are men and of the Syrian one 56 percent are. Of the Finish born inhabitants 61 percent are women (Statistiska Centralbyrån 2019 b).
Foreign born tend to live in Sweden’s bigger cities. A larger fraction of foreign born live in Stockholm, Gothenburg and Malmö compared to the rest of Sweden. In Stockholm and Gothenburg, the fraction of foreign born is around 25 percent and in Malmö the fraction is around 21 percent. In the rest of the country the fraction is only around 16 percent (Statistiska Centralbyrån 2019 b).

Even though the immigrants tend to move to the bigger cities, the immigration to Sweden has increased the labour supply in all different types of municipalities. Another effect on labour supply due to immigration is that the municipalities which has had problem with an aging population has received more young inhabitants which has decreased the problem (Malmberg, Wimark, Turunen & Axelsson 2016).

When comparing the foreign and native born population in Sweden one difference is the amount of education. There is no difference between the groups when it comes to education after upper secondary school for people aged 25-65. The difference is when it comes to how many who has, at the most, finished upper secondary school. 20 percent of foreign born is part of that group compared to 9 percent of native born (Statistiska Centralbyrån 2018 b).

The educational attainment differs depending on the reason for immigration and gender. Generally, immigrants who come to Sweden as refugees have a lower educational attainment. When comparing the educational attainment of men and women, women are generally more educated. This difference is smaller for foreign born than native born (Statistiska Centralbyrån 2018 b).

5. DATA

5.1. THE DATA SET

This study uses panel data. Panel data is defined as data on certain entities at two or more periods in time (Stock & Watson, 397). This study contains yearly observations from 2011 to 2017 and the entities are the Swedish 290 municipalities. All the data has been collected from Statistiska Centralbyråns (SCBs) data base for statistics named Statistikdatabasen.
The response variable is the percentage of native born in the municipality aged 20-64 that are gainfully employed. The classification if an individual is gainfully employed or not is done every year the 31 December by SCB, on individuals that are registered in the population registry maintained by the Swedish Tax Agency. The individuals are classified as gainfully employed if the individuals have an income above a certain limit that is supposed to correspond as close as possible to the International Labour Associations (ILO) definition of employment (Statistiska Centralbyrån No Date, a). The only difference between this measure and employment rate is the unit. Employment rate is a fraction and this measure is a percentage.

There is also a corresponding variable for the percentage of foreign born in the municipality aged 20-64 that are gainfully employed. This is one of the explanatory variables. Other explanatory variables are mean age, mean salary, number of individuals per square kilometre, education level, fraction of foreign born and the percentage of individuals with low economic standard in the municipality. The mean salary and the coefficient for low economic standard are in terms of disposable income and profits from capital are excluded. Disposable income is defined by SCB as the total income after tax and other negative transfers. Profits from capital is profits from selling assets. (Statistiska Centralbyrån No Date, b)

The disposable income measure is weighted. Depending on how many people that are living in a household and if there are children in the household, the disposable income of the household is divided with a certain amount (Statistiska Centralbyrån No Date, b).

The coefficient for low economic standard is defined by SCB as the fraction of the population in the municipality that has a lower disposable income than 60% of the median disposable income in Sweden (Statistiska Centralbyrån No Date, b). This variable is used as a proxy for the amount of less skilled inhabitants in the municipality.

Two variables are constructed, meaning that they are not taken straight from SCB. Those two variables are the fraction of foreign born in the municipality and the education level in the municipality. The fraction variable is constructed by dividing the number of foreign born in the municipality with the total number of inhabitants in the municipality. The education level variable is an indicator of, if there are many people in the municipality that is highly educated. Number of years studying is used as a proxy and the division between highly and not highly educated is at three or more years of schooling after Swedish Upper secondary school. The
number of individuals that has done three or more years in school after upper secondary school is divided with the total amount of inhabitants in the municipality.

In addition, the data is divided into three subsets. One subset for females (Women), one for males (Men) and one for females and males added together (Both). Some variables are the same in all three subsets. The ones which are not the same are percentage of native born which are employed, percentage of foreign born which are employed, the fraction of foreign born, mean age, the education variable and the number of individuals per square kilometre.

From now on abbreviations will sometimes be used for the different variables. The abbreviations are presented in Table 2.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>work.native</td>
<td>Percent of native born aged 20-64 that are gainfully employed</td>
</tr>
<tr>
<td>work.foreign</td>
<td>Percent of foreign born aged 20-64 that are gainfully employed</td>
</tr>
<tr>
<td>fraction</td>
<td>Fraction of population that was born in another country than Sweden</td>
</tr>
<tr>
<td>age</td>
<td>Average age</td>
</tr>
<tr>
<td>low</td>
<td>Fraction of population with low economic standard</td>
</tr>
<tr>
<td>education</td>
<td>Fraction that has studied three or more years after Upper secondary school</td>
</tr>
<tr>
<td>density</td>
<td>Number of inhabitants per square kilometre</td>
</tr>
<tr>
<td>salary</td>
<td>Mean salary</td>
</tr>
</tbody>
</table>

5.2. DESCRIPTIVE STATISTICS

Table 3 contains descriptive statistics for all variable in the subset Both. The table provides the minimum (min), maximum (max), median and mean value as well as 1\textsuperscript{st} quartile ($Q_1$) and 3\textsuperscript{rd} quartile ($Q_3$) values. The presentations of these values makes it possible to make observations about the spread of the data. One observation is that the mean is driven up relatively much from the median for the variable density, possible due to some observations with high values. That it is possible due to a few observations with high values can be suspected from the relatively high maximum values. The salary variable also has a relatively high maximum value.
TABLE 3: DESCRIPTIVE STATISTICS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>$Q_1$</th>
<th>Median</th>
<th>Mean</th>
<th>$Q_3$</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>work.native</td>
<td>71.90</td>
<td>81.00</td>
<td>83.00</td>
<td>82.95</td>
<td>85.00</td>
<td>85.00</td>
</tr>
<tr>
<td>work.foreign</td>
<td>33.30</td>
<td>50.90</td>
<td>56.50</td>
<td>56.83</td>
<td>63.08</td>
<td>78.80</td>
</tr>
<tr>
<td>fraction</td>
<td>0.03627</td>
<td>0.08721</td>
<td>0.11273</td>
<td>0.12832</td>
<td>0.15333</td>
<td>0.41479</td>
</tr>
<tr>
<td>age</td>
<td>36.30</td>
<td>41.40</td>
<td>43.55</td>
<td>43.26</td>
<td>45.10</td>
<td>49.70</td>
</tr>
<tr>
<td>density</td>
<td>0.20</td>
<td>12.30</td>
<td>26.90</td>
<td>146.06</td>
<td>76.78</td>
<td>5689.10</td>
</tr>
<tr>
<td>education</td>
<td>0.06996</td>
<td>0.11050</td>
<td>0.14259</td>
<td>0.16416</td>
<td>0.19349</td>
<td>0.60733</td>
</tr>
<tr>
<td>low</td>
<td>4.80</td>
<td>12.00</td>
<td>14.40</td>
<td>14.39</td>
<td>17.10</td>
<td>30.10</td>
</tr>
<tr>
<td>salary</td>
<td>182.7</td>
<td>224.4</td>
<td>237.7</td>
<td>244.1</td>
<td>254.3</td>
<td>614.6</td>
</tr>
</tbody>
</table>

Furthermore, the fraction variable has some traits worth mentioning. It does not differ especially much between the 1st and 3rd quartile but has a relatively low minimum value and relatively high maximum value. When the maximum and/or minimum values differ much as in the variables mentioned there is reason to suspect outliers.

An additional comment about the data presented in Table 3 is the difference between work.native and work.foreign. The minimum value of work.native is higher than the 3rd quartile value of work.foreign.

FIGURE 1: MUNICIPALITY MEAN PERCENT THAT ARE GAINFULLY EMPLOYED
The difference between work.native and work.foreign is also visible in Figure 1. Figure 1 illustrates the yearly municipality mean of the percent that are gainfully employed in each municipality for native born and foreign born for the years 2011 to 2017. The mean value differs with more that 20 percent units every year and no trend for a decreasing difference is visible.

The visualizing of the data in Figure 1 to Figure 5 of mean values versus time is done with the package gplots made by Warnes et al. (2019). The plots depict the mean of the municipalities values for the chosen variable on the x-axis and year on the y-axis. The mean value also has a 95 percent confidence interval connected to it. In Figure 1 it is to small in relation to the x and y axis to be seen for most observations.

Moving on, the mean values does not only differ for native and foreign born but also for men and female which can seen in Figure 2 and 3. For both foreign born and native born, the mean values differ between men and women and a higher percentage of men than women are employed. This can be seen in Figure 2 and 3. Notable is that the difference seems to have a decreasing trend and that the means differ more between the genders for foreign born than for native born when comparing year to year.

In addition to the percent of foreign born that are employed, the fraction of foreign born in the municipalities is an important explanatory variable in this study. In Figure 4 the mean value of that variable is plotted against year.
In Figure 4 it is shown how much the municipality mean fraction of immigrants has grown between the years 2011 and 2017.

Finally, some descriptive statistics about the variable low are visible in Figure 5. Low seems to have an increasing trend and the municipality mean value differs on a 5 percent significance level between some of the years.
6. METHOD

6.1. EMPIRICAL MODEL

This study conducts area analysis over seven years. A measure of labour market outcomes of natives is used as a response variable and this measure is the percentage of native born which are gainfully employed. To find the effect of immigration on the labour market outcomes of natives two key explanatory variable are included in the analysis. The first one being the percent of foreign born who are gainfully employed and the second one being the fraction of native born in the municipality. The other explanatory variables in the model are chosen based on theory to explain as much of the percent of native born being gainfully employed as possible. In addition to the two key variables, an interaction term is included to the analysis of the effect of immigration on the labour market outcomes of native born. According to theory the effect of immigration differs depending on the skill composition of immigrants and natives. To investigate support for that theory an interaction term between the fraction of the population with low economic standard and the percentage of foreign born in the municipality which are gainfully employed is included. The interaction term reveals if the effect of the two variables on the response variable depend on each other.

The empirical model is:

\[
\text{work.native}_{it} = \beta_1 \text{work.foreign}_{it} + \beta_2 \text{low}_{it} + \beta_3 \text{fraction}_{it} + \beta_4 \text{age}_{it} + \beta_5 \text{education}_{it} + \beta_6 \text{density}_{it} + \beta_7 \text{low}_{it} \ast \text{work.foreign}_{it} + \mu_t + \lambda_i + \varepsilon_{it}
\]

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Municipality index, (i = 1, 2, \ldots, 290)</td>
</tr>
<tr>
<td>(t)</td>
<td>Time period index, (t = 2011, 2012, \ldots, 2017)</td>
</tr>
<tr>
<td>(\mu)</td>
<td>Entity fixed effect</td>
</tr>
<tr>
<td>(\lambda)</td>
<td>Time fixed effect</td>
</tr>
<tr>
<td>(\varepsilon)</td>
<td>Error term</td>
</tr>
<tr>
<td>(\text{low*work.foreign})</td>
<td>Interaction term between low and work.foreign</td>
</tr>
</tbody>
</table>

As shown in the empirical model and in Table 4 two fixed effects are included. To deal with the endogeneity problem occurring with area analysis the entity fixed effect is included in the
empirical model. This entity fixed effect will take away biases that occur when there are fixed effects in the region that correlate with the fraction of immigrants. The time fixed effect is included to avoid time effects affecting the variables which are not included in the model. One such effect is economic growth and the business cycle.

The statistical software used in the study is R. To perform the regression with panel data, the plm package is used. The plm package uses OLS to estimate basic panel data models like the fixed effects model used in this study (Croissant & Millo 2008, 6-7).

When deciding how to estimate the coefficients for panel data models, a common way is to first test for poolability. Testing for poolability shows if all observations can be explained by the same coefficients. The second step is commonly to investigate if a time effect and/or entity effect is present. If such an effect is present, the third step is to decide whether to include a random or fixed effect (Croissant & Millo 2008, 4). This common method is used in this study.

The plm package offers the possibility to test for a time and/or entity effect model against the alternative of a pooling model. The test is carried out in this study and the alternative hypothesis is that there is an effect (Croissant & Millo 2008, 21-22). Tests are conducted for both possible effects separately and both effects together.

The plm package also offers the possibility to test if the effect should be random or fixed. A test that can be used for this purpose is called the Hausman test and is used to compare two models that are estimated in different ways (Croissant & Millo 2008, 22). The null hypothesis when conducting this test on panel data and when comparing fixed and random effects is that a random effect is preferred. The alternative hypothesis is that a fixed effect is preferred.

6.2. MODEL ASSUMPTIONS

There are four assumptions when performing regression with a fixed effect. The first one is that the error term has the conditional mean zero and the second one is that the variables for each entity are independent and identically distributed (i.i.d.) between each other. They are allowed to correlate over time. The third condition states that large outliers are unlikely and the forth states that perfect multicollinearity is not present (Stock & Watson, 411-412). The first and
second assumption can be controlled by plotting the models residuals against the models fitted values. This can be done by using the package car (Fox & Weisberg 2011).

One way to test the forth assumption of multicollinearity is to obtain the variance inflation factor (VIF). The lowest VIF value possible is 1 and a value higher than 5 or 10 is usually seen as a sign of a problem with multicollinearity (James, Witten, Hastie & Tibshirani 2013, 101-102). It is not possible to obtain VIF values for the fixed effects model but it is possible to obtain for the pooled one. Doing the VIF test on the pooled model instead of the fixed effect model will still show if there is multicollinearity because the difference between the models is if they use one or multiple intercepts in the estimation of the coefficients. If there is no multicollinearity in the pooled model, there should not be multicollinearity in the fixed effects one. When conduction the VIF test in the pooled model it is also preferable not to include the interaction term since it will be highly correlated with the variables low and work.foreign because it is a multiplication of the two.

The empirical model does not contain all variables included in the data set because the variables low and salary measure similar aspects, should therefore have similar effects on the response variable and are linearly highly correlated. If two explanatory variables are highly linearly correlated there is multicollinearity and one of the model assumptions is not fulfilled. The most common test for correlation between two variables is the Pearson correlation test. The problem with the Pearson test is that it assumes bivariate normal distribution. If this assumption is not assumed a Spearman rank correlation test can be conducted (R Core No Date).

One way to test if the assumption about bivariate normal distribution is fulfilled is to preform a Shapiro-Walk test. The null hypothesis is that the data is normally distributed and the alternative hypothesis is that the data is not. In the study a Shapiro-Walk test is conducted. In this study the test indicates that the Spearman test is the preferred test. The Spearman test points towards correlation so to decide which one of the variables to use in the final model they are plotted against the response variable and the relationship between them and the response variable is compared. They are plotted for the year 2017. In addition, the correlation coefficient towards the response variable is compared and they are put in the panel data regression one by one to see how they affected the response variable in relationship with the other variables.
7. RESULT

7.1. THE MODEL

In Table 5 the final model is presented and there is estimates for each of the three datasets. The key explanatory variable *fraction* is significant for all three datasets and have a positive correlation to *work.native* in the model for all three datasets. There is a more positive effect in the dataset Women than in the dataset Men. The interpretation is that if the variable *fraction* increases with 1 percent unit and everything else is the same, *work.native* will increase with 0.1925 units on average in the subset Men, 0.2603 in the subset Women and 0.1759 in the subset Both. The unit for *work.native* is percent.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Men</th>
<th>Women</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>work.foreign</em></td>
<td>0.053 ***</td>
<td>0.065 ***</td>
<td>0.066 ***</td>
</tr>
<tr>
<td><em>fraction</em></td>
<td>19.252 ***</td>
<td>26.029 ***</td>
<td>17.594 ***</td>
</tr>
<tr>
<td><em>age</em></td>
<td>0.012</td>
<td>-0.045</td>
<td>-0.258 ***</td>
</tr>
<tr>
<td><em>low</em></td>
<td>-0.074</td>
<td>-0.026</td>
<td>-0.036</td>
</tr>
<tr>
<td><em>education</em></td>
<td>-0.147</td>
<td>2.809</td>
<td>1.133</td>
</tr>
<tr>
<td><em>density</em></td>
<td>-0.003 ***</td>
<td>-0.005 ***</td>
<td>-0.002 ***</td>
</tr>
<tr>
<td><em>low</em> <em>work.foreign</em></td>
<td>-0.002 *</td>
<td>-0.003 *</td>
<td>-0.003 **</td>
</tr>
</tbody>
</table>

Note: *** one percent significance level, ** five percent significance level, * ten percent significance level.

The other key variables; The interaction term, *low* and *work.foreign* are complicated to interpret. First of all, *Low* is not significant in any model at any significance level but this is probably due to the interaction term. When the interaction term is not included in the model *low* is significant on a 1 percent significance level. The interaction term is significant on a 10 percent significance level for Women and Men but on 5 percent significance for Both. The significance level for *low*, *work.foreign* and the interaction term is not especially reliable due to the high correlation between the variables.

The interaction term and the variable *low* has a negative effect in all three datasets and the *work.foreign* variable has a positive effect in all three datasets. This means that if *low* increases
and everything else is the same, the effect on work.native is negative. That both the interaction term and the variable low is negative means that the negative effect of low will be bigger for a higher value of work.foreign. The interpretation of an increase in work.foreign and with everything else the same, is more complicated because work.foreign is positive and the interaction term is negative. The positive effect of an increase in work.foreign will be dampened by the low variables value. If the low variable is big enough the effect of an increase in work.foreign will be negative instead of positive. This value is on average 26.5 for the subset Men, 21.667 for the subset Women and 22 for the subset Both. The values are above the third quartile for the subset both. The third quartile value for the subset Both is 17.10.

Finally, density is significant and has a negative correlation in all models. Education is not significant and has a negative correlation in the dataset Men but a positive in the dataset Women. Age is significant in the model done on the dataset Both but not for the datasets Women and Men. Age has a positive correlation in the dataset Men but a negative in the dataset Women.

### 7.2. DIAGNOSTICS AND TEST RESULTS

The test for a time and/or entity effect model against the alternative of a pooling model gave the result that a time and an entity effect should be used. The test has the alternative hypothesis that there is an effect and tests are conducted of both possible effects separately and both effects together. For all possible options of effects and for all three subsets the result is always a p-value lower than 0.000.

The Hausman test with the null hypothesis that a random effect is preferred and the alternative hypothesis that a fixed effect is preferred gave the result that a fixed effect should be included. The p-value obtained was 0.000 for the datasets Both and Women but 0.5689 for the subset Men. The random effects model has an additional assumption that the entity effect is not correlated with the explanatory variables and therefore another Hausman test was conducted. This time with fraction as only explanatory variable since that is the variable that theory says is correlated. The p-value received for that test was 0.000 which indicate that the assumption does not hold.
Figure 6 illustrates the variable low plotted against the variable salary for the year 2017. Just by looking at the plot there seems to be a strong linear correlation. The Spearman rank test gave the correlation coefficient -0.8967, which means that there is a high linear correlation.

The Spearman test was conducted because the Shapiro-Wilk test gave the p-value 0.0413 for low and 0.000 for salary. Since the alternative hypothesis is that the variable does not have a normal distribution the assumption for bivariate normal distribution is not fulfilled and the Pearson test could not be conducted.

Figure 7 illustrates the residuals in the subset Both plotted against their fitted value for the year 2017. In the plot it can be analysed if the error terms have the conditional mean zero and if the variables for each entity are i.i.d. between each other.
For there to be a conditional mean of zero, the residuals should be evenly distributed around zero. For the i.i.d. condition to hold there should be no pattern concerning the distance of the residuals from zero.

**FIGURE 8: LOW AND SALARY PLOTTED AGAINST WORK.NATIVE 2017**

Figure 8 illustrates plots of the variables low and salary against work.native for the year 2017. Low seem to be more correlated with work.native than salary but it is hard to judge just by looking. The Spearman correlation test gave the correlation 0.5794 for salary and work.native and -0.6698 for low and work.native. The reason for why low is chosen over salary, in addition to the higher correlation, is the fact that salary has a positive correlation in the plot, but in a regression with all explanatory variables except low the coefficient estimate is negative.

In Table 6 VIF values for a pooled model without the interaction term is presented. No VIF value is above 5 for any variable in any one of the subsets.

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Women</th>
<th>Men</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>work.foreign</td>
<td>2.746</td>
<td>2.220</td>
<td>2.802</td>
</tr>
<tr>
<td>fraction</td>
<td>2.269</td>
<td>1.959</td>
<td>2.182</td>
</tr>
<tr>
<td>age</td>
<td>2.575</td>
<td>2.077</td>
<td>2.355</td>
</tr>
<tr>
<td>low</td>
<td>4.025</td>
<td>3.264</td>
<td>4.041</td>
</tr>
<tr>
<td>education</td>
<td>2.010</td>
<td>1.727</td>
<td>1.870</td>
</tr>
<tr>
<td>density</td>
<td>1.510</td>
<td>1.451</td>
<td>1.499</td>
</tr>
</tbody>
</table>
8. DISCUSSION AND CONCLUSIONS

8.1. VARIABLES AND MODEL

In this study natives have been defined as native born and immigrants as foreign born. This division is quite rough and insinuates that all immigrants have the same effect on employment rate, which is not the case according to theory. It also insinuates that the effect is the same on all native born which is also probably not the case. The study tried to nuance this a bit by including a variable for the fraction of the population in the municipality with low economic standard and by including gender, in the analysis.

Like native and not native born the division is quite rough for economical standard and for the education variable. The education variable is an indicator for if there are many highly educated inhabitants in the municipality. In addition to being rough, the division is not done at an optimal place. According to theory the biggest effect of education on employment rate is for the ones who have not completed Swedish upper secondary school. The division in this study is done at three or more years of schooling after Swedish upper secondary school. This study estimated an insignificant coefficient for education. It is possible that the coefficient would have been significant if the division was done at another place.

Even though some variables can be criticised for being rough, it can also be good with rough variables because it can give more significant results. That the education variable is rough is not a big problem. A bigger problem is that the effect of education on employment rate might have been lost due to the wrongfully done division.

Low economic standard is used as a proxy for less skilled in this study and it is not a perfect proxy. As a proxy for skill group, educational attainment and/or work experience has often been used in previous studies. Using economical standard is a bit different. It is used because the study assumes that the more skilled individuals are, the more they get paid and the higher economical standard they have. It is debatable if educational attainment is a better proxy but it also has flaws. Human capital theory has shown that the same years of schooling and work experience does not make natives and immigrants perfect substitutes.
The analysis in this study would have been better if a separation between more variables than employment rate between foreign and native born would have been possible. For example, if the proxy variable for less skilled would have been divisible the analysis of substitution and compliment theory would have been better. The reason for why separation of the variables was not the case in this study, is that the data available did not have that form.

A common problem for all area studies in this field is the endogeneity problem. Many studies have gotten critique for not including the possibility that immigrants endogenously end up in a location. Even though this critique does not have much support in research, this study has done its best to account for the possibility by including a fixed entity effect. As long as the municipalities has not changed too much during the years 2011 to 2017, when it comes to their influence on the amount if immigrants in them, the fixed effect should account for endogeneity. Not only the amount of immigrants ending up in a location is accounted for, but also the skill composition.

For the time fixed effect homogeneity amongst municipality, when it comes to economic growth and other time effects, is key for the included effect to work properly. The more homogenous the better. An alternative to use fixed effects is to try to use the natural experiment approach, but since the assumptions for a fixed effect model hold the method used should avoid the endogeneity problem.

The only model assumption that might be a problem is the assumption about large outliers being unlikely. This assumption might need to be investigated more, since the descriptive statistics indicate that there might be some municipalities with extreme values. On the other hand, there are 290 municipalities and the data used is municipality averages or fractions/percentages. Many observations and data that lessens the effect of extreme values due to being averages or percentages/fractions make large outliers quite unlikely. One aspect that might create outliers is that immigrants tend to move to the bigger cities of Sweden. Looking at the variable values of the bigger cities is where a deeper analysis of outliers can begin in a future study. Apart from the outlier assumption the other three model assumptions are investigated thoroughly and hold.

Unfortunately, the variable for mean disposable income had to be removed due to high correlation with the variable for low economic standard. This was essential for the model assumptions to hold. Fortunately, it was easy to argue for keeping the variable for low economic
standard instead of the variable for mean disposable income, as the variable for low economical standard did more for the analysis than the mean disposable income variable did. The mean disposable income variable was supposed to be included because of its possible connection to employment rate. That connection is not straightforward according to theory and the result of this study also indicates this because of the contradictory results for the estimated coefficient the variable received when put in the model.

A final discussable aspect of the model and the variables is whether or not the relationship between the explanatory variables and the response variable is really linear. The relationship is probably not linear but the true relationship is not known.

8.2. RESULT

How the measure of labour market participation of natives is done is important and make the comparison with theory and previous research a bit problematic. Unemployment rate, participation rate and employment rate are all frequently used in the literature. This study tries to focus on employment rate but other measurements are also brought up. One problem with employment rate is that it is defined for different age ranges in different literature which might affect the result some, as age is an important decider of employment rate. This factor makes comparisons between results a bit problematic. Another problem is that it does not say anything about how much an individual is working. A future study could focus on if the amount of hours the native born population is working is affected by immigration.

Theory supports that the skill composition of native and immigrants affect the effect of immigration. The skill composition affects the effect due to compliment and substitute theory. If immigrants are compliments they will positively affect natives but if they are substitutes they will negatively affect natives. This theory is short run, in the long run immigrants create more jobs than they take according to theory.

When conducting a study in this subject it is hard to separate the long run and short run effect. The result of this study is not separated for short and long run effect. From this study it is therefore impossible to know for sure if the mainly positive effect from immigration shown is long term or short term. The fact that the fraction of immigrants increased a lot during the time
between 2011 and 2017, and that the results found are positive, might be an indicator of at least a not too negative effect in the short run.

The result of this study points on a positive effect of the amount of immigrants in a municipality on the employment rate of natives. According to theory this can be explained either by the immigrants being compliments to natives or by the effect being a long run effect. In addition, the influence of institutions and flexibility of the markets in the country is an important explanation for the difference between countries for similar inflows of immigrants. The more open and flexible market, the smaller effect.

Another possible reason for the positive effect is that it takes a while for immigrants to adapt to the new country. It takes a while for many immigrants to get a job. More immigrants in a country means that more resources are needed and if these new people are not working immediately, more of the already established people might be needed for work.

Previous results of the effect of immigrants on the employment rate of natives has been small and contradictory. The result of this study also points on a small effect but not a contradictory one. The interpretation of the result is that if the fraction of immigrants in the municipality increases with 1 percent unit and everything else is the same, the percent of the native born in the municipality that is gainfully employed will increase with 0.1925 units on average in the subset Men, 0.2603 in the subset Women and 0.1759 in the subset Both.

When it comes to the effect of the percent of the foreign born in the municipality that is gainfully employed on the percent of the native born in the municipality that is gainfully employed there is also a small positive effect as long as the percentage of inhabitants with low economic standard is not too high. If the percentage of people in the municipality with low economic standard is over 26.5 for the subset Men, 21.667 for the subset Women and 22 for the subset Both, the effect will instead be negative. These values are quite extreme values when looking at descriptive statistics for the variable for low economic standard.

That the results show that foreign born displace more native born workers if the municipality has many inhabitants with low economic standard indicates that there might be a substitution effect in place if there are many low skilled workers. The positive results, on the other hand, are indicators supporting the theory that immigrants are compliments. That there is a breakpoint
between positive and negative effect after a certain amount of inhabitants with low economic standards, can be an indicator that both effects are in place. That there is a negative effect after a breakpoint is not surprising since it is hard for people with immigration background and/or with a low amount of qualifications in Sweden to find work.

Furthermore, there seems to be a difference between the subsets. The effect seems to be bigger for the subset Men than for the subset Women. One possible explanation for the difference might be country of origin. Most foreign born from Finland are women and most foreign born from Syria and Afghanistan are men and the immigrants from Finland differ from the immigrants from Afghanistan and Syria. The amount of education is one such difference and salary is another. On average difference in education level and salary is explained by reason for immigration and length of stay in Sweden. Important to mention is that the difference in employment rate between men and women seem to be shrinking for the years 2011 to 2017 for both native and foreign born which might lead to the difference between the subsets to lessen.

Another explanation for the difference between the subsets might be the difference in employment rate between the genders. If that is the case the result of studies in other countries might differ from Sweden due to that fact. Considering that the employment rate of Swedish women is more close to the employment rate of Swedish men compared to other countries it is quite possible that the difference between the estimates is bigger in other countries. This is a subject that can be interesting to investigate more. Is the effect of immigration on the employment rate of native different for countries with bigger difference in employment rate between the genders?

This thesis brought up theory and research concerning salaries in addition to employment rate. It did so because much of the field contains information about salaries and because the effect on salaries and the effect on employment is correlated. Both effects are small, contradictory and are affected by similar aspects. The reason why this study did not include salary in the econometric analysis is the lack of data and the rigidness of Swedish salaries.

One aspect of salaries that is brought up is that the salaries in Sweden differs much between foreign and native born. People born in Africa and Asia had the lowest median earnings 2017 and people born in other Nordic country had almost the same median earnings as people born in Sweden. In addition, the length of stay in Sweden contributed substantially to the median
earnings. The longer people had stayed, the more they earned. The differences in wages might be an indicator for immigrants being substitutes or compliments. It seems like people from Nordic countries might be substitutes. But to be able to draw any general conclusions about this a more thorough investigation about skill composition has to be conducted.

If people born in Finland are close to being substitutes like the wage data might be an indicator of, the positive result of this study might not be as positive as it should. If there is a positive compliment effect, like the result is suggesting, it might not be entirely visible since Finland, a Nordic country, is the country where the second largest amount of foreign born are born and the data for foreign born is not divided by country of origin. Moreover, a division of the foreign born group into countries of origin might affect the breakpoint.

In conclusion, there is a small but positive correlation between immigration and employment rate of natives in Sweden. The correlation is positive as long as there are not too many people with low economic standard. In addition, the correlation seems to be different depending on gender. To really understand why this is the case more research has to be conducted.
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