UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Bachelor Thesis
Department of Economics

The impact of the refugee inflow on the Swedish labour market: Low-skilled labour supply shock

This paper examines the effects of the refugee inflows on the labour market in Sweden during the years 2003-2013. The impact of the low-skilled labour supply shock on the Swedish labour market is estimated by regressing the average wage level on the regional refugee density. The panel data analysis shows modest effects, and the refugee inflows seem to have a negative impact only on the least educated workers in Sweden. The results are evaluated cautiously and the possible limits of the analysis are discussed. To provide a comprehensive understanding of the refugee inflows' impact on the Swedish labour market, future research concerning the effects on the unemployment and the integration of the refugees into the labour market is required.

June 08, 2017

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Acknowledgement

We would like to thank our supervisor Inge van den Bijgaart for all the help, guidance, patience and feedback she provided during the thesis work.

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1 Introduction

In 2015, 162 877 people sought asylum in Sweden which is twice as many as the previous year (SCB, 2016). The number of immigrants applying for a residence permit in Sweden was the highest throughout history (SCB, 2017). In February 2016, Dagens Nyheter reported that 40% of the Swedish population considered the immigrations and integration as the most important political topic in society (Delin, 2016). The social and fiscal strains raise debate on the effects of immigration on the society and economy. In particular, the common concern is the integration of low-skilled immigrants in the labour market as well as the social and cultural cohesion (Pekkala et Kerr, 2011).

The integration of the refugees into the labour market takes several years in Sweden. The Statistics Sweden, SCB, reported that after ten years in Sweden, approximately 60% of women who immigrated as refugee or came due to the family immigrants are employed. Among the men, the percentages are 60% and 70% respective (SCB, 2014).

In this paper, we are interested in studying the effects of the refugee inflows on the Swedish labour market concerning the wage development. Our aim is to determine how the Swedish labour market is affected by an influx of low-skilled labour supply. The Swedish labour market has high educational requirements; The unemployment among workers without upper-secondary education was 13% in 2015 whereas the average unemployment rate was 7,5% (OECD, 2016).

Our research focuses on the short-term effects on the labour market impact of the refugee inflows, and we will use the data from the years 2003-2013. In economic literature, the short run and long run differs from the number of the fixed and unfixed production factors. In short run, the capital is typically assumed to be fixed (Gottfries, 2013). However, if capital stocks are assumed to adjust to the immigration shocks also in the short run, the wage effects tend to be smaller than under the assumption of the fixed capital (e.g. Ruist et Bingsten 2010, Dustman et al 2008). The assumption of the adjustment of the capital is plausible: Sweden is a small open economy and part of the EU. One of the EU's four main principles is the free movement of the capital (European Parliament, 2016). In our analysis, the capital adjustments are included in the unobserved component.

The research on the impact of immigrants on the host country's labour market is diverse. Depending on the approach, the results differ remarkably (Ayedemir & Borjas, 2011). Our study investigating the effect of refugees on the labour market in Sweden, addresses a regional cross-sectional approach.

We have chosen to use a regional approach due to the limited data access. The regional approach includes 88 data points; the data includes observations from eight regions during eleven years. Compared to the time series national approach with eleven data points, the cross-sectional data captures more variation, and thus the coefficients become more efficient.

1.1 Research question

We hypothesise that refugee inflow decreases the wage level of low-skilled workers in Sweden. This statement bases on the neoclassical labour supply-demand model where a supply shock shifts the supply curve to the right decreasing the wage level (Blanchflower & Oswald, 1995).

$$H_1: Refugee\ inflow\ has\ a\ decreasing\ effect\ on\ the\ wages\ among\ the\ low - skilled\ workers\ in\ Sweden.$$

However, we expect the effects to be small due to the high minimum wage and other hinders that may harm the integration of the refugees into the labour market. We will discuss the effects of the minimum wage on the refugees and the integration problems later in the discussion.

1.2 Purpose

Our purpose of this study is to try to demystify the negative view that has spread in the Swedish society with respect to the consequences that refugees have on the economy. The main intention is to show whether there are any measurable effects of refugees on the wages of the less-educated part of the Swedish labour market. We hope to contribute in a restricted degree to the understanding of the possible effects in an empirical way.

After the historic refugee crisis that took place in Sweden in 2015, we feel intrigued to investigate the effects of asylum seekers on the labor market. By analyzing the effects the refugees have had in the past we hope to deepen our understanding of the possible future effects.

1.3 Structure

The next chapter provides an overview of the Swedish labour market condition and the refugee inflow in the 21st century. Chapters three and four, introduce the previous studies and the theoretical background on which our research is based. The methodology and the results of the regression

analyses are presented in the chapters five and six. The two last chapters cover the conclusions and discussion.

2 Background

2.1 Refugees in Sweden

Immigration has a long history in Sweden. After the World War II, the growing industrial sector tempted labour immigrants from other Nordic countries and Southern Europe. At the end of the 60s a slower economic growth forced Sweden to start to regulate immigration and subsequently a residence permit was given only for those workers who had guaranteed employment in Sweden. The regulation included some exceptions such as Nordic citizens, refugees, and family reunification. Due to stricter regulations, refugee immigrations together with family reunifications became the most dominant immigrant group (Migrationsverket, 2016), and since the 80s, refugee immigrants have been the dominant immigration group. In 2016, 17% of the population in Sweden was born abroad, and one-third of them had a refugee background (Migrationsinfo, 2016).

The educational background of the immigrants varies depending on the country of origin, the age, and the reasons behind the immigration decision. However, the differences in the educational achievements increase among the low-educated groups. 20% of the foreign-born population had a primary education as the highest level of education in comparison to 11% of the natives in 2013. Moreover, there are clear differences in the educational achievements by the country of origin; Approximately 50% of Somalian immigrants had only a primary education. Also, the most common level of the education for immigrants from Syria, Turkey, and Thailand was a primary education (SCB, 2013).

During the 21st century, Sweden has received most of its refugees from the Middle East. Before the war in Syria, the main emigration countries were Iraq, Afghanistan, and Iran (Migrationsverket, 2017). Although the immigrants from Iraq have a higher level of education compared to the Syrians, also 30% of Iraqis immigrants had only a primary education. However, 30% of Iraqis had enrolled an upper-secondary education. Iran stands out from the statistics: on average the immigrants from Iran are more educated. More than 30% of Iran immigrants have an upper-secondary education and almost 30% the higher education more than three years (SCB, 2013).

2.2 Swedish labour markets

While the immigration has increased in Sweden, the economic structure has changed. The service sector has taken over the industrial sector, jobs are centred on urban areas, and more jobs require a

higher education (Arbetsmiljöverket, 2011). The employment statistics reflect the new requirements of the labour markets: in 2015, unemployment among high educated workers was around 4% whereas 13% of workers without upper-secondary education were unemployed (OECD, 2016).

In 2015, the labour force participation rate among natives with respect to the foreign-born population in Sweden were 83% and 77%, respectively[1]. Although the foreign-born participation rate was higher than the OECD average, the employment rate was lower (OECD, 2016). In addition to this, only 5% of the jobs in the Swedish labour market required low-skills posing challenges for the low-skilled refugees to enter the labour market (OECD, 2016). In spite of the education refugees have received in their home country, the entry to the labour market in the host country may require additional knowledge such as language, social and cultural skills (Duvander, 2001).

In Sweden, the labour protection is strong which encourages to long contracts between firms and employees and higher wages to attract high-productive labour force. Furthermore, this development leads to a lower turnover rate (Kazamaki, 2016). Since the late 19th century, the labour unions have played a major role in politics and workplaces around the country. Although there is no statutory minimum wage in Sweden, there is a minimum wage on the collective agreement negotiated by trade unions (Fackföreningarna, 2014). Furthermore, the minimum wage in Sweden is one of the highest in Europe. It is approximately 66% of a median wage, and the differences in wages between levels of education are small (Spector, 2014) and (Svensk Näringsliv, 2014).

In the Swedish labor market, there are several different regulations made to protect the employee in different situations. These regulations include, for example, the employment protection act, the working time act, the vacation act, and the parental leave act, etc. The purpose of the employment protection is to create security in the labor market and to curb the sharp fluctuations that the boom and recession have on employment. Employment legislation in Sweden concern permanent employment, fixed-term employment, and collective redundancies (Skedinger, 2010).

[1] The labour force participation rate is counted as the share of employed and unemployed natives and foreign-born population respective (OECD, 2016).

3 Literature Review

The research concerning the effects of immigration on the host country's labour markets is broad, and several different results have obtained. The structure of a host country's labour market, policies and economic fluctuations affect the outcomes, and therefore it is no wonder that the research literature and results differ by country and time. In this section, we will provide an overview of the earlier literature published from our field of interest.

We base our paper on the model of neoclassical theory (Blanchflower & Oswald, 1995). Under this approach, immigration could be interpreted as an exogenous increase in labor supply. Which, ceteris paribus, would increase the level of labor employed and would produce a decrease in the market wage.

3.1 Regional approach

Card (1990) took a regional approach to evaluate the impact of the labour immigration from Cuba, called the Marielitos, to Miami. The treatment group was native inhabitants in Miami, and workers in the cities of Atlanta, Houston, Tampa-St. Petersburg and Los Angeles (California) formed the control group. Furthermore, Card (1990) hypothesised that the control cities would have the same wage level as Miami. The hypothesis raised in other empirical studies that indicate that the arrival of immigrants to a host territory generates a slight decrease in the salary of the native inhabitants (Card, 1990).

To establish the treatment group for the period before Marielitos' arrival, Card divided the treatment group into four groups: white, blacks, Cuban, and Hispanic[2]. For the period after the arrival of the "Marielitos" the analysis was based on individual microdata of the Current Population Survey (CPS) between the years 1979-1985. The labour force of control cities was divided into the three groups: whites, blacks, and Hispanics. The studied population corresponds to the population aged between 16 and 61 years (Card, 1990).

The regression applies a simple labour market model for a closed economy. The arrival of "Marielitos" immigrants is an exogenous shock independent of the economic growth in Miami. This

[2] To divide the treatment group into the four sub-groups, Card uses data from the 1980 Census.

approach also ignores cross-regional equalization trends of an integrated economy. The study reached a conclusion that immigration does not have a significant effect on the wages of the natives (Card, 1990).

Card (1990) suggested two reasons for the results. First, the “Marielitos” changed the motivation of other immigrants and Americans who would have thought to move to Miami. Secondly, a prominent industry existing in Miami, required labour with the characteristics of the before mentioned low-educated Cuban immigrants (Card, 1990).

It should be noted that the Miami labor market was not characterized as typical in the United States; the market was apparently better prepared to receive the "Marielitos" than any other city mentioned earlier (historically it was absorbing the arrival of Cubans, as well as in other Central American countries). This was mainly due to two characteristics of the market studied: its industry was structured to incorporate low-skilled workers easily, and the lack of knowledge of the English language was not a barrier to entry into employment, given the large Spanish-speaking population in Miami (Card, 1990).

Glitz (2012) estimated the skill-specific labour market effects of the immigration after the fall of the Berlin Wall. The regional approach, used by Glitz (2012) and Card (1990), has been criticized for the endogenous problem caused by a positive correlation between immigration and the labour market conditions. Glitz (2012) took advantage of the exogenous allocation of the ethnic Germans living in the Eastern Europe to whom were given an opportunity to migrate to Germany between 1987 and 2001. The exogenous allocation solves the endogenous problem partly. Moreover, Glitz (2012) did not find any significant pieces of evidence that locals responded the immigration by emigrating. Due to that, it is plausible to argue that the downward bias caused by the endogenous placement problem was negligible in Glitz’s study.

To estimate the skill-specific effects of the immigration in the German labour market, Glitz (2012) examined how the immigration affects relative supplies of the specific skill groups. The assumption is that low-skilled immigration increases the relative supply of a low-skilled labour force and controversially decreases the supply of high-skilled labour force. According to the standard labour market model of neoclassical theory (Blanchflower & Oswald, 1995), the relative changes in the labour force supply should decrease or increase the wage level depending on the sign of the labour supply shock. Glitz (2012) did not find any significant wage effects concerning the whole population.

Nonetheless, by dividing the working aged population by gender, he received negative results; the immigration affected women more than men. Glitz (2012) assumed that small or insignificant effects were a result of wage rigidity, strong labour unions, and sector negotiated collective agreements that leave only a little space for regional differences. Additionally, Glitz (2012) highlighted that the adjustments in unemployment are more likely to appear than the wage effects, at least in the short run.

Like Card (1990) and Glitz (2012), also Kugler and Yuksel's study (2008) "Effects of low-skilled immigration on U.S natives: evidence from hurricane Mitch" used an exogenous immigration wave to study the impacts of immigration on natives. The results they obtained were consistent with Card's and Glitz's observations: immigration seemed to have a positive impact on the wages of the high-educated natives and no effects on the wages of the low-skilled population. In addition, when Kugler and Yuksel took into account the possible outflows of natives and earlier immigrants, they find no wage effect but increasing unemployment among the earlier Latin Americans immigrants (Kugler et Yuksel, 2008).

As Glitz (2012), also Kugler and Yukel (2008) discussed the possible attenuation bias due to the endogenous placement of the immigrants. Borjas (2005) showed that immigration generates lower inflows and higher outflows and decrease the population growth of natives in the migration area. To examine the assumption of the exogenous placement of immigrants, Kugler and Yukel (2008) examined the natives' response to the immigration flows caused by a hurricane Mitch. The research showed that the immigration caused by the hurricane did not affect the migration decision of earlier migrated Latin Americans or Africans, but earlier Asian, European and Australian immigrants emigrated further away from the immigrated areas.

The recent study by Foged and Peri (2015) attempted to overcome the limitations of a regional approach by focusing on a migratory episode that took place in Denmark between 1986 and 1996. Thousands of refugees from the conflict countries (Bosnia, Afghanistan, Somalia, Iraq, Iran, Vietnam, Sri Lanka and Lebanon) immigrated to Denmark. After their arrival they were distributed by the Danish authorities between the different cities according to the availability of public housing and without taking into account neither the geographical preferences nor the socio-economic characteristics of the immigrants. This form of the regional distribution represents an increase in the supply of labor that does not respond to local economic conditions.

The study analysed the impact of the massive influx of the refugees on the working conditions of the less qualified native workers during 1991 and 2008. The researchers choose this group because refugees could be considered direct competitors since they generally have a low-skill level, a very low knowledge of the language and being concentrated mainly in low-qualified occupations and with a high content of manual tasks (Foged and Peri, 2015).

From this research three main results were derived. First, the arrival of refugees displaced the natives into more complex occupations and with a lower content of manual tasks. Second, a zero or positive effect on the level of employment and wages of the natives was estimated. Finally, these effects persist over time. The authors concluded that the results respond to the fact that immigrant workers have characteristics different from those of natives, and therefore are not perfect substitutes in the labor market. While immigrants tend to focus on occupations with a greater content of manual tasks, natives move to less manual occupations with a greater degree of specialization and sophistication and possibly better paid (Foged and Peri, 2015).

3.2 National approach

Borjas (2003), in the article "Labour demand is downward sloping" analysed the impact of the immigration on the unemployment and the wage level. Instead of dividing the labour market into the smaller fractions, he used a national level approach. The data was from 1960-2000 decennial censuses.

Borjas (2003) argued that the regional approach underestimates the consequences of immigration since it assumes that factors of production, labour, and capital, as well as goods, do not adjust quickly to the increase in labour supply caused by immigration. Furthermore, Borjas (2003) identified two problems in the regional approach. Firstly, immigrants are not randomly distributed among labor markets. If immigrants tend to settle down in the areas with thriving economies, there would be a positive spurious correlation between immigration and wages. This spurious correlation could attenuate or reverse any quantifiable negative effects, which immigrants may have generated on the salary of the native workers. Secondly, the emigration of the locals from the immigrated labour market would bias results. If locals move as a consequence of the immigration, an interregional comparison of the wages of native workers could show little or no difference since the effects of immigration spread throughout the national economy, not because immigration did not have economic effects.

3.3 Advantage and disadvantage of regional/national approach

Most of the earlier studies have used regional approach with correlations between zones or cities with a strong and low presence of immigrants and the wage differences between these areas. In general, these studies, of which the most significant is Card (1990) on the impact of the "Marielitos," concluded that impact of immigration on wages is the low.

It is generally accepted that immigrants are not randomly distributed among zones and cities and that they are grouped in places of greater economic growth giving rise to spurious correlations of positive sign between wages and migratory flow. This may lead to an underestimation of the effects the immigration has on the labour market. To solve the endogenous placement problem, some of the studies use previous immigration as an instrumental variable for predicting the present immigration. These studies assume that the past immigration has a stronger positive correlation with the present immigration than the economic circumstances (Glitz, 2012). Besides instrumenting the recent immigration by the immigration in the past, several studies have taken advantage of exogenous immigration shocks, such as Card's "Marielitos" (1990), Friedberg (2001) "The Impact of Mass Migration on the Israeli Labour Market," and Kugler and Yukel (2008). Despite the almost exogenous placement, the effects of immigration have been small or modest in the studies (Kugler et Yuksel, 2008).

Borjas in his last works (2001) and (2003) criticized the cross-sectional analysis, where the wages and labour supply in areas with a strong arrival of immigrants are compared to with areas that do not receive a significant influx of people. The criticism is based on the fact that even if they are adequately segmented by levels of training, immigrants are not distributed randomly by zones, but immigrants are concentrated in areas with economic growth which means a positive correlation source between immigration and employment. Moreover, Borjas (2005) argued that native outflows may cause a downward bias in regional studies. Therefore, the national approach corresponds better the effects of immigration on the closed economy (Borjas, 2005). Besides the approach level differences, results obtained from U.S and Europe should be compared cautiously. The labour markets in Europe are relatively inflexible, there is a high persistence of long-term unemployment, and finally, the importance of social and cultural aspects are not comparable (Zimmermann et al., 1995).

4 Supply and Demand in the Labour market

In this section, we will discuss how the labour supply and demand determine the wage level in the labour market. The wage setting theory is based on the wage determination models introduced in books Microeconomics with Calculus (Perloff, 20014) and Arbestmarknaden (Björklund et al. 2014). To provide a broad base for the analysis of the regression results, we present shortly theories about minimum wages and turnover costs based on the book Macroeconomics (Gottfries, 2013). Finally, we discuss the matching problems between firms and employees that may be partly a result of high minimum wages and turnover costs.

4.1 Wage setting theory

In the absence of market distortions, the labour demand is defined as a value of a marginal product of labour, VMP_L. In other words, it is the first derivative of a production function with respect to the labour, MP_L, multiplied by the price of the output, P, and thus it is linked to the production of goods and services. The value of the marginal product is the additional value of production that is gained for an increase in labour input, and it is assumed to decrease in every additional unit of the labour force (Björklund et al. 2014). In the short run[3], firms maximize their profits by demanding for the labour until the value of the marginal product equals the wage level in the market, w^*(Perloff, 2014).

$$VMP_L = P * MP_L = w^*$$

The labour supply is derived from an individual utility curve between income and leisure. In every wage level, the individual labour supply is the point where the marginal rate of substitution of income for leisure, MRS, equals the marginal rate of transformation of income for leisure, MRT. In the equation, w^* denotes the wage level and $\frac{U_N}{U_Y}$ the ratio between marginal utility of income and leisure.

$$MRS = \frac{U_N}{U_Y} = -w^* = MRT$$

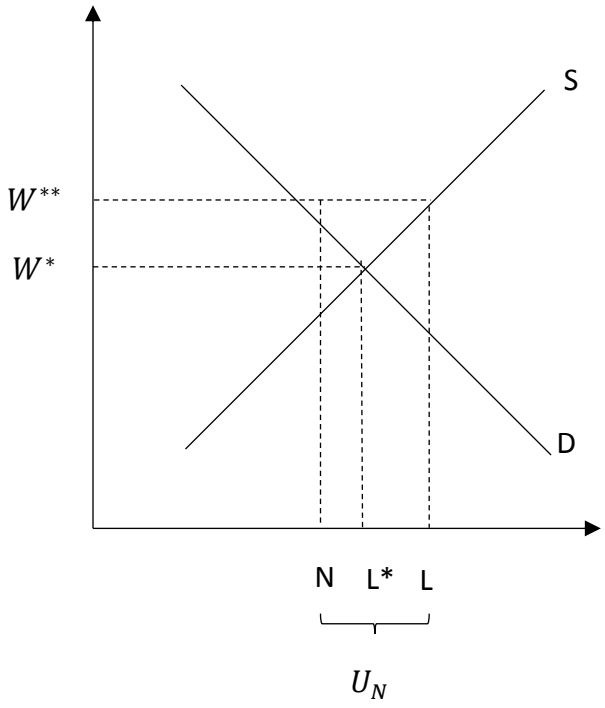
[3]The long run labour demand curve differs from the short run curve by being flatter due to the capital adjustments.

Typically, the labour supply curve is expected to have a positive slope; a higher wage level generates an increase in the labour supply. However, Björklund et al. (2014) point out that the income effect caused by a wage increase may lead to the decreasing labour supply curve. Also, the elasticity between the income and the leisure affects the shape of the labour supply curve (Perloff, 2014). The aggregate labour supply curve is a sum of all individual supply curves in the economy, and in our analysis we assume it to have a positive slope.

4.2 Labour market equilibrium and the wage determination

The wage equilibrium is an intersection of the aggregate labour demand and supply curve. In the absence of the market distortions, the market would have a full employment and the wage level w^* is determined by labour supply and demand level. However, modern labour economic theories use a term natural unemployment that implies the unemployment level U_N that exists regardless economic fluctuations. The actual wage level w^{**} tends to be higher than the natural wage level $w^*$and thus the natural unemployment equals the distinct between labour force L and employment N (Burda & Wyplosz, 2009).

Figure 1: Labour market equilibrium



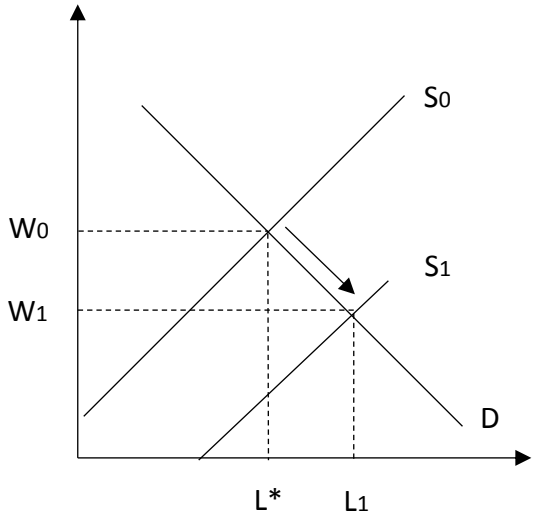
The labour market equilibrium is given by the labour demand and supply. In the absence of the market distortions the wage level equals w^* and there is no unemployment in the labour market. On the

wage level w^{**} more people are willing to work and the labour force equals L. When the wage level is higher, the demand for the labour force decreases. The unemployment equals the difference between labour force and employed workers, L-N.

4.3 Labour supply shock

The labour supply shock and its effects are illustrated below. An increase in labour force causes a shift of the labour supply curve to the right, and if the exogenous wage level remains same, in the short run, the labour supply shock generates unemployment. Labour market theories state that if there is no wage rigidity, the labour supply shock leads to a lower wage level. Based on this model we expect to obtain modest or small negative results. The presumption of the wage decrease is based on the idea that the labour supply shock also increases a number of workers who are willing to accept work on a lower wage level.

Figure 2: Labour supply shock



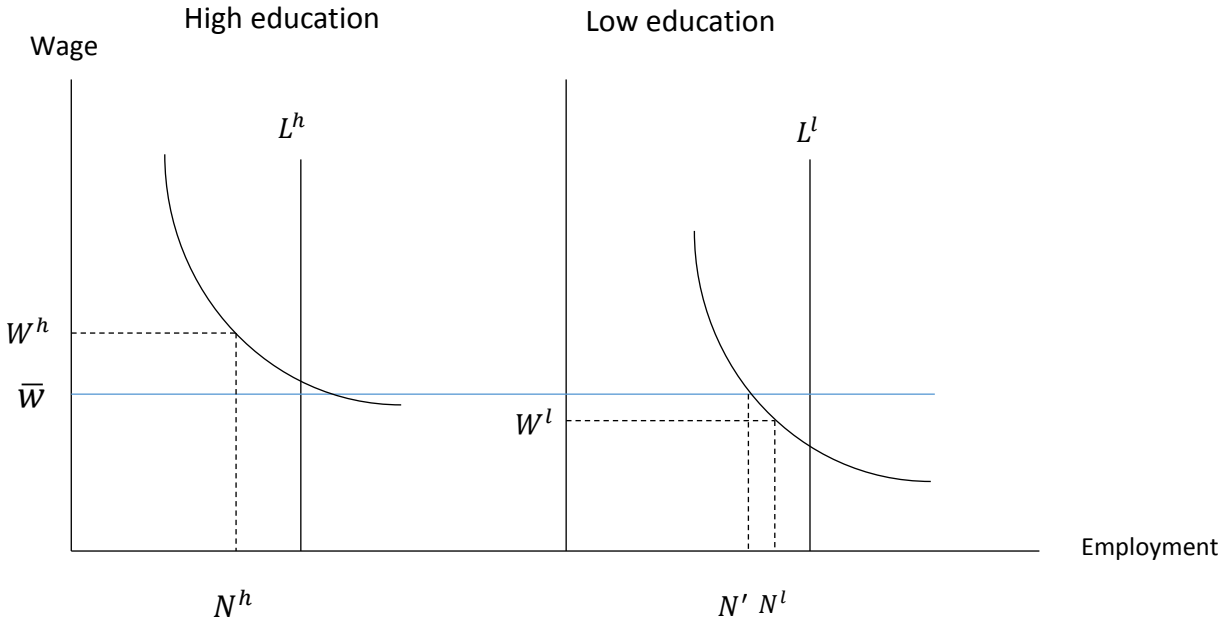
An increase in the labour force, L→ L_1, causes a rightward shift in the labour supply curve. This leads to a lower wage level W_1.*

4.3.1 Labour unions and minimum wage

The theory of labour unions and minimum wages is based on the presumption that wages set by unions are higher than the natural wage level w^*. This leads to a higher wage level. A minimum wage level w_u equals the wage level determined by the labour supply and demand and the "union mark-up" $(1 + \mu)$, $w_u = w^* \cdot (1 + \mu)$. Ceteris paribus, the union mark-up raises the relative wages which leads to the higher unemployment. The labour unions tend to have more power in the low-

skilled labour market, and hence the low-skilled workers are more affected by the "union mark-up" and higher wage level respect to the required skills (Gottfries, 2013). We base our assumption of the small negative effects on the minimum wage theory – the minimum wage hinder the refugees enter the labour market and thus the actual wage effect is modest.

Figure 3: Minimum wage in the labour market



The graph on the right side describes the effects of the minimum wage on the high-skilled workers. Because the wage level W^h is higher than the minimum wage $\overline{w}$, the minimum wage does not have a real effects on the high-skilled labour force. The graph on the left in turn, illustrates the effects on the low-skilled workers. Because the minimum wage $\overline{w}$ is higher than the wage level determined by the labour supply and demand W^l, employment decreases (Gottfries, 2013)

The minimum wage discourages firms to hire less skilled workers because firms want to maximize their profits by setting the marginal product of labour to equal the wage level (Burda and Wyplosz, 2009). Also, the "efficiency wage" - companies by themselves set a higher wage level to attempt more skilled workers and to lower the turnout ratio, generates an analogous effect as the minimum wage (Burda and Wyplosz, 2009).

4.3.2 Turnover costs, matching problems, and the wage determination

The theories above disregard other possible labour-related expenses besides wages. To hire and fire a worker is costly for a company and hence Björklund et al. (2014) suggest that the company adjust its decision to employ to the prevailing wage level and the recruitment costs. To make a recruitment decision the value of the marginal product of labour has to cover the recruitments costs *r*.

$$VMP_L = w + r$$

Another way to describe the recruitment decision is to use a model of turnover costs. The turnover equation takes into consideration the wage differences in the labour markets and the training and hiring costs.

$$TC_i = h \cdot W \cdot [s + Z(W_i/W) \cdot f]$$

The training and hiring costs are given by hours used in training, $h \cdot W$. A fraction of employed workers who leave the work for an exogenous reason stands for *s* and a fraction of employees who are looking a new job is given by $Z(W_i/W)$. The *f* is the employee's probability to find a new job and it can be estimated by the ratio of the share of job quitters and the share of all job seekers. It is good to notice that the model considers the employment and open vacancies to be constant and given exogenously (Gottfries, 2013).

The turnover costs and the wage have a negative correlation, with a higher wage level fewer workers will quit the job and thus the higher wage is not just a way to tempt well-educated workers but a trade-off between turnover costs and wage costs. The efficiency wage theory is based on the trade-off between turnover costs and wage costs.

Furthermore, by considering a *willingness and ability* of unemployed workers regarding the probability to find a new job, it is possible to obtain a more realistic estimation. Labour markets are divided into different fractions, sub-labour markets, by required skills that cause the matching problem between job seekers and firms. The probability of finding a job can be written by $f = s/(\lambda u + s)$, where λ represents the willingness and ability to find a job. Despite skilled job seekers, the mismatch between workers' skills and demanded skills may lead to unemployment and a higher wage level. The supply of "matched" workers is scarce and the wages have a pressure to increase (Gottfries, 2013).

5 Data and Its Limitations

The data, used in the panel data analysis, is data gathered from Statistics Sweden (SCB, 2017), the Swedish Migration Service (Migrationsverket, 2016) and from the Labour Force Agency (Arbetsförmedlingen, 2016). To provide a comprehensive picture of the regression analysis and to be able to analyse critically the results and limitations of the model we describe the variables and classifications shortly.

5.1 Regional divisions

The regional divisions are based on the Eurostat's regulations, where a country is divided into regions defined by the population and surface. The following eight regions are obtained (SCB, 2017):

1. SE11, Stockholm Region
2. SE12, East Central Sweden
3. SE21, Småland with the islands
4. SE22, Southern Sweden
5. SE23, Western Sweden
6. SE31, Northern Central Sweden
7. SE32, Central North Sweden
8. SE33, Upper North Sweden

5.2 Monthly salaries by skill groups

Typically, the skill groups are defined by the level of education and the working experience (e.g. Borjas, 2003). Statistics Sweden's aggregate data hinder us to define individual employees by the level of education and the working experience why we base our skill groups for the general classifications of Statistics Sweden (SCB) and Eurostat.

The dependent variable, a nominal monthly salary, is divided into five sections based on the Swedish Standard Classification of Occupation, SSYK 1996. The SSYK 1996 classification is based on the international classifications of occupation ISCO-88 and ISCO-88(COM), which have been in a common use in the European Union. The Swedish classification, as well as the international ones, use the type of the work and the required skills as a base for the classification. The "type of the work" includes the main functions and duties and the "required skills" takes into account the qualifications the work demands, such as education[4]. The demanded level of education has four different levels that follow the ISCDE's[5] classification (SCB, 2001).

1. No educational requirements
2. Primary education, high school or corresponding education required
3. Higher education up to three years required
4. Higher academic education longer than three years required.

Through the following classification, we have divided our data into five different skill groups:

1. Managers[6]
2. Professionals and, technicians and associate professionals
3. Clerks, service workers, and shop sales workers[7]
4. Craft and related trade workers, plant and machine operators and assemblers, and skilled agricultural and fishery workers[8]
5. Elementary occupations[9]

According to the Statistics Sweden, the low-skilled labour force consists of the workers who have a primary education or corresponding as the highest level of enrolled education (SCB, 2016). Based on this and the classification above, we regard the groups three (3), four (4), and five (5) as low-skilled groups. The groups three (3) and four (4) include also workers with upper secondary education or students who are studying to obtain a high education, and thus our low-skilled definition is wider than

[4] Among the low-skilled occupations, the demanded education is substituted by the required occupational specialisation. (SCB)
[5] International Classification of Education (Unesco, Paris, 1976)
[6] SSYK classification does not define managers' educational background
[7] Primary education, high school or corresponding education required
[8] Primary education, high school or corresponding education required
[9] No educational requirements

Statistics Sweden's. Due to this, we expect to see significant results particularly in the group five (5). However, we have made a difference between manual occupations and occupations that require Swedish skills to study whether the language requirements affect the results. As discussed in the literature section, there may be specific country-based skills, such as culture and language, which are required before entering in the labour market (Duvander, 2001). The group three (3) covers the occupations that may require higher language skills than in turn, the group four (4) includes manual occupations, such as assemblers and machine workers. However, to study overall effects we include the groups one (1) and two (2) also in the analysis.

Table 1 reports nominal monthly salaries by a skill group and region over time. The average monthly salary is calculated by weighted average, dividing the sum of all salaries of a skill group by a number of employees. This method takes into account regional differences in the occupational structure and wage level.

Table 1: Nominal Monthly Salary by Skill Groups, Average and (Median)

	SE11	SE12	SE21	SE22	SE23	SE31	SE32	SE33
Wage group 1	52672 (54297)	40269 (41488)	39816 (40125)	42719 (43867)	42151 (42236)	37910 (37398)	37877 (38088)	36795 (37416)
Wage group 2	34472 (33955)	29115 (29586)	28019 (28444)	29887 (30315)	29927 (30328)	28158 (28341)	28034 (28270)	27893 (28087)
Wage group 3	22517 (22774)	21398 (21622)	21559 (21867)	21722 (21810)	21677 (21720)	21371 (21691)	21241 (21321)	21375 (21543)
Wage group 4	24700 (25063)	23738 (23921)	23327 (23594)	23504 (23696)	23863 (24423)	23911 (23888)	25114 (25201)	24917 (25362)
Wage group 5	19474 (19588)	19324 (19452)	19619 (20040)	19316 (19392)	19501 (19952)	19121 (19271)	18907 (19161)	19112 (19400)

5.3 Refugees

To approximate the effects of the refugee inflows on the wages, we use the refugee density for each region as our variable of interest (table 7 in the appendix shows the number of the refugees per 1000 inhabitants in every region). In the regression model, we take a natural logarithm of the refugee

density to analyse how a percentage change in the refugee density affect the wage level. By using the refugee density, we expect to capture the differences between regions with a lower and higher refugee density and thus obtain a more efficient estimation. The variable "refugee density" for each region is computed as a fraction of the refugees aged 18-64 from the total population aged 16-64. Swedish Migration Agency's statistics of refugees cover all new immigrants from whom the regions receive reimbursements. Based on the regulation (2010:1122) of the state reimbursement, the refugee statistics includes all asylum seekers, refugees, family members of refugees and asylum seekers and others who had gotten a residence permit for the distressing circumstances in the country of origin (Migrationsverket, 2017). The statistics take only into account the newcomers in every region. Before 2005, the refugee statistics did not have information about the age distribution why we have estimated the number of working age (18-64) refugees. The estimation is based on the statistics from the years 2005-2013. This may lead to the increased sample errors and the inefficiency of the analysis (Borjas and Ayedemir, 2011).

Table 2: The average number of refugees per 1000 inhabitants by year and the standard deviation of the refugee density between regions.

	Average	Standard deviation
2003	1,15	0,22
2004	0,93	0,19
2005	0,91	0,20
2006	2,76	0,56
2007	2,32	0,43
2008	1,74	0,33
2009	1,65	0,33
2010	1,66	0,47
2011	1,34	0,35
2012	1,81	0,43
2013	3,28	1,51

In Sweden refugees have two options concerning the accommodation: they can choose to find an accommodation by themselves and thus have an option to choose the settlement city or region. The other option is to accept the accommodation arranged by the Swedish Migration Agency, Migrationsverket, when they cannot affect the placement region. During the 21th century approximately 50% of the new refugees choose to find an accommodation by themselves. (Migrationsverket, 2017) and (Boverket, 2008). As discussed earlier in the literature review, the endogenous placement decision may bias the results.

5.4 Control variables

To take into account the regionals differences in the economic structure, we include the regional GDP per capita, the annual GDP growth and the unemployment in the regression. The variables are described in the appendix, section 11.1.1.The reason for including the controls comes from the chosen regression model; In the fixed effects model the time fixed error term a_i, captures unobserved regional differences. However, our time span 2003-2013 includes, for example the financial crisis in 2008 that also had a negative effect on the Swedish economy. The financial crisis affected differently regions; In Stockholm the unemployment and GDP growth increased respective decreased slightly whereas in Småland unemployment increased a little more than one percentage and the GDP growth dropped from 0.20% to -11.30% between 2010 and 2011. Also in the Northern and Central Sweden the changes in the unemployment and GDP growth were remarkably (SCB, 2017) and (Arbetsförmedlingen, 2016). This may cause a correlation between the independent variable (refugees) and the idiosyncratic error term if the refugees choose their settlement city based on the economic conditions, and thus generates biased results. The error components and the regression model are discussed more specific in the next chapter.

6 Methods

We use a panel data analysis to estimate the effects of the refugee inflows on the wages in Sweden. First we will present the theoretical background of our statistical experiment and afterward, we will apply the theory in our dataset.

6.1 Theoretical background

6.1.1 Fixed effect panel data analysis with multiple periods

A panel data analysis has both, a cross-sectional and a time series dimension, and therefore it is often used in a quasi-experimental analysis or to analyse effects of policy implications. The general model for a panel data analysis with multiple periods is

$$y_{it} = \delta_0 + \delta_t T_t + \beta_k x_{itk} + a_i + u_{it},$$

Where y_{it} stands for a cross-sectional element, $\delta_t T_t$ is a time dummy that includes years 2003-2013, and x_{itk} describes an independent variable *k* at time *t* in a cross-sectional group *i*. The model divides the unobserved component into two parts. The term a_i denotes an error term that remains same throughout the time and in turn, the idiosyncratic error term u_{it} includes the unobserved components that vary over time (Wooldridge, 2008).

The panel data analysis allows the variation within and between groups and thus it has some advantages compared to the cross-sectional or the time series data. The econometric estimates become more efficient and accurate when a sample includes more data points and thus variation. Moreover, the time series dimension enables to study "before" and "after" effects within and between cross-sectional groups. This, in turn, improves the analysis as it takes into account the differences in the observed factors between interest groups (Wooldridge, 2008).

Furthermore, to ensure the results are unbiased the exogeneity assumption has to hold. In other words, the idiosyncratic error term u_{it} must be uncorrelated with the independent variables x_{itk} for all t. A change in the independent variables should not affect the idiosyncratic error term and controversially (Wooldridge, 2008). If the exogenous assumption is not met the causal effects will be misleading. In our study, the placement of the refugees and the factors behind that may bias our results. If we assume that the refugees are placed randomly over Sweden, the differences in the regions' economies should not affect the placement decision. However, if the refugees choose their settlement region based on

the job opportunities, the exclusion of the control variables could lead to an exogenous problem. Moreover, the changes in the housing markets or new laws concerning the placement of the refugees would generate an endogenous problem and bias our results.

Pekkala and Kerr (2011) states main problems in a spatial approach that also has been discussed by other researchers, such as Borjas (2003). The small datasets and relative big estimation errors are a challenge in our study. Due to the limited access to the data, we abstract factors that are likely to affect the employment of the refugees and thus the average wages among specific skill groups in Sweden (Pekkala and Kerr 2011). For example, language skills, the level of education and previous working experience may play a big role in the integration of the refugees into the labour market. In addition, Borjas and Ayedemir (2011) discuss the measurement error that tends to occur in a panel data analysis where the immigration density is computed by the fraction of the workforce. Borjas and Ayedemir (2011) argue that significant regional differences captured by a fixed effect may leave only little variation left in the variable of interest. The small amount of variation in the variable of interest increases the power of a sample error in the immigration density.

6.2 Econometric approach

Pekkala and Kerr (2011) introduce a basic regression model of wage displacement effect for a panel data. The model has been commonly used in regional studies concerning the wage effects of immigration. The general model can be expressed in the following way:

$$\ln(wage_{irt}) = \mu p_{irt} + \beta X_{irt} + \eta_t + \varepsilon_{irt}. \qquad (2)$$

The dependent variable, $\ln(wage_{irt})$, gives the regional wage level at a given point of time. By taking the natural logarithm from the dependent variable, the vertical axel measures the proportional differences in the interest of the variable. The ratio scale is often used in the equation that includes variables growing over time, such as wage (Weil, 2013). In the right side of the equation, μ denotes the correlation between immigration and wages. p_{irt} is a density of immigration in a region *r* at a given time *t*, X_{irt} includes control variables, such as education, experience and occupation, and η_t and ε_{irt} are error terms with fixed and time variation effect respective. Our regression model follows Kerrs' model but instead of immigrants, we restrict our variable of interest to refugees. As mentioned in the data section, the variable "refugees" is a refugee density in a specific region. To make the interpretation easier, and to study the effects of the relative increase in the refugee density,

we take a natural logarithm of the refugee density. In our regressions controls X_{irt} are regional GDP per capita, GDP growth and unemployment rate. The fixed effects a_i (or η_t as in the Pekkala and Kerr's model) describes the unobserved effects that vary between cross-sectional components but are time constant. We assume the fixed effects to include, for example region specific integration programs, attitudes toward hiring an immigrant, and economic characteristics (number of companies, internationality etc.).

6.2.1 Regressions

Due to our data is annual based and the data covers years 2003-2013, the regressions show short term effects of the refugee inflows on the wages in Sweden (Glitz, 2012). The first regression is run without taking into account the regional fixed effects or panel data assumptions. The regression can be written

$$\ln(wage_{group}) = \beta_0 + \beta_1 \ln(refugee\ density) + \delta_t time_t. \qquad (3)$$

The second regression includes the panel data assumption and the fixed effects a_i. By comparing the regression without and with fixed effects, our aim is to approximate the impact of the regional differences. The second regress takes the following form:

$$\ln(wage_{group}) = \beta_0 + \beta_1 \ln(refugee\ density) + \delta_t time_t + a_i. \quad (4)$$

The third step is to examine, whether the regional differences in the economic circumstances can be smooth by adding controls that describe the regional economic growth.

$$\ln(wage_{group}) = \beta_0 + \beta_1 \ln(refugee\ density) + \beta_2 unemployment + \beta_3 GDPgrowth + \beta_3 GDPcapita + \delta_t time_t + a_i \qquad (5)$$

7 Results

In results, we will focus on the groups three (3), four (4), and five (5) to analyse the effects of the refugee inflows on the low-skilled workers. Table 3 presents the results obtained from the first regression without regional fixed effects. The coefficients of the refugee density are negative except the wage group four (4). Moreover, the negative coefficients are also significant. The negative impact of the refugee inflows is consistent with the simple labour supply-demand model.

Table 3: The effect of the refugee inflows on the wages, no regional effects

ln(wage)	(1)	(2)	(3)	(4)	(5)
ln(refugee density)	-.0970* (.0543)	-.0678** (.0324)	-.0205** (.0089)	.0077 (.0159)	-.01711** (.0711)
time fe	yes	yes	yes	yes	yes
region fe	no	no	no	no	no
R^2	0.5044	0.6590	0.9659	0.9057	0.9729
R^2 adjusted	0.4326	0.6097	0.9609	0.8921	0.9690

In every regression table (tables 3, 4 and 5), the significance of the coefficients is denoted by stars (significance on the 10 % significance level, ** 5% and ***1%, respectively). Standard errors are in brackets and they are computed on the 5% significance level. The wage groups are denoted by the numbers (1), (2), (3), (4), and (5).*

R^2, the coefficient of determinants describes how well the independent variables explain the variation in the dependent variable (Jaggia et Kelly, 2013). By comparing the standard errors and the R-squared, it is possible to find the best descriptive model. When we add the fixed effects in the regression (xtreg), we obtained slightly lower standard errors and higher coefficient of determination (Table 4).

Within R-squared exceeds 0.90 in every wage group. This means that more than 90% of the variation in the wage level of each skill group within the regions is explained by the model. The between R-square is much smaller implying that the model does not explain the differences in the wage levels between regions. The overall R-squared increases when the wage group requires a lower level of education.

The coefficients of the fixed effect regression differ from the coefficients obtained from the first regression. Except the wage group five (5), the coefficient of the refugee density is positive in every wage group, implying that the refugee inflows increase the wage level. The coefficients for the refugee density are significant on the 5% significance level in the wage groups four (4) and five (5). One percentage increase in the refugee density generates a .0344% change in a monthly salary in the wage group 4. In the wage group 5: one percentage increase decreases the average monthly salary by .0145%. Due to the standard errors and determinants of coefficients improves by adding the fixed effects in the model, we will use the fixed effects regressions as the base for our discussion.

Table 4: The effect of the refugee inflows on the wages, fixed effects

ln(wage)	(1)	(2)	(3)	(4)	(5)
ln(refugee density)	.0083 (.0207)	0.0005 (.0071)	0054 (.0048)	.0344** (.0141)	-.0145** (.0066)
time fe	yes	yes	yes	yes	yes
region fe	yes	yes	yes	yes	yes
R^2 within	0.9355	0.9883	0.9953	0.9636	0.9891
R^2 between	0.0953	0.1135	0.1936	0.0165	0.0766
R^2 overall	0.4789	0.6392	0.9621	0.9023	0.9729

The third regression includes control variables unemployment, GDP growth and GDP per capita. The control variables do not change the results remarkably. Again, the refugee density has a significant effect on the wages only in the wage group four (4) and five (5). The coefficient remains almost same

in the wage group four (4): the control variables decrease the coefficient by .0020 making the coefficient cluster closer to zero. In turn, in the wage group five (5), the coefficient decrease and the wage effect becomes more negative.

Table 5: The effect of the refugee inflows on the wages, fixed effects with controls

ln(wage)	(1)	(2)	(3)	(4)	(5)
ln(refugee density)	.0041 (.0202)	.0001 (.0073)	.0045 (.0044)	.0324** (.0135)	-.0519** (.0067)
Unemployment	.1164 (1.004)	.0825 (.3637)	.4121* (.2176)	-2.189*** (.6730)	.0197 (.3318)
GDP growth	.2565 (.1738)	.0279 (.0629)	.0672* (.0376)	.0596 (.1164)	.0852 (.0578)
GDP capita	-.0010*** (.0004)	-.0001 (.0001)	-.0003*** (.0001)	-.0003 (.0002)	-.00002 (.0001)
time fe	yes	yes	yes	yes	yes
region fe	yes	yes	yes	yes	yes
R^2 within	0.9426	0.9884	0.9963	0.9678	0.9895
R^2 between	0.7720	0.8508	0.8797	0.5699	0.0550
R^2 overall	0.0912	0.5614	0.8619	0.8480	0.9730

R-squared increases when control variables are added (Jaggia et Kelly, 2013). Due to that, the higher values of R-squared do not signify that the model with control variables gives better results than the model without the control variables. The standard errors do not change a lot when adding the control variables. Moreover, the control variables are only significant in the wage groups one (1), three (3)

and four (4). Due to this, we assume that the fixed effects capture most of the region based variation and the control variables are not needed.

8 Conclusions

The purpose of the present study was to determine the effects of the refugee inflows on the Swedish labour markets. Based on the neoclassical labour supply-demand theory (presented in the theoretical background), we hypothesised the refugee inflows to have a negative effect on the wage level in Sweden. The regression results support the statement partly. The wage effect is negative among the least educated wage group (5) and positive among the machine and industrial workers (4) (Table 4 and 5). Conversely, the wage effect caused by the refugee inflows is not significant among the other wage groups (service and sales personal, higher educated professionals, and managers). These results are supported by Foged and Peri's (2015) findings: they estimate the refugee inflows increase the labour supply in the low-skilled and manual occupations more than in the occupations that demand for a high education or linguistic skills. Moreover, they found a positive wage effect on the native low-skilled workers: the native workers changed to jobs with higher linguistic requirements, refugees seemed to be complements for native workers.

The significant results from the wage group four (4) and five (5) cluster around zero that has also been a frequent finding in the earlier regional studies (Borjas, 2003). The significant coefficients .0344 and -.0145 (coefficients obtained from the regressions without controls) indicates the refugee inflows affect wages in Sweden mostly among the manual workers[10]. However, the percentage changes are small: one percentage change in the refugee density increases wages of the group four (4) by a .0344% and decreases wages of the group five (5) by a .0145%. Due to this, we are careful to draw conclusions about the actual wage effects. Nonetheless, even the small negative effects raise concern about the impacts on the low-skilled labour force.

In Sweden, almost 50% of the refugees arrange an own accommodation, and the rest are divided among the municipalities (Boverket, 2008). To improve the estimations of the expected wage effects, we could study the correlation between the placement decisions of the refugees and the economic circumstances and thus take into consideration the possible endogeneity problem discussed in the literature review. In the analysis we tried to control the exogeneity problem by including control variables that take into account economic factors that may affect the placement of the refugees. We did not find any significant improvements in the analysis. Nonetheless, the coefficient of the wage group five (5) decreased from -.0145 to -.0519. Borjas (2005) and Kugler et Yukel (2008) included

[10] Skill groups four (4) and five (5) consist of the machine and transport workers, agricultural workers, cleaners, assemblers and building constructors.

the emigration of the locals into their studies. Both studies showed that the locals tend to emigrate as a result of immigration, or the native inflows to the immigrated areas decreased. The NUTS2 regions are relative big and thus we assume the emigration of the locals happens inside the regions. The migration within the region should not affect the obtained results.

The integration times of the refugees into the labour market tend to be relative long: after five to six years of immigration more than 50% of refugees were integrated into the labour market (European Parliament, 2016). Due to this, to make the analysis more precious, the integration times should be taken into account. This can be done by using a lagged refugee density in the regression model. The lagged refugee variable can still cause problems: European Parliament (2016) reported that those refugees who have not integrated into the host countries labour market in five to six years tend to emigrate. Moreover, it is difficult to approximate the number of lagged years: in the small open economy capital adjusts quite fast and thus the effects of the lagged refugee inflows can be displaced by the capital inflows.

To deepen the analysis and to provide a more comprehensive picture of the economic consequences of the refugee flows, we could study the effects of the refugee inflows on the unemployment. Glitz's study (2012) shows significant effects of the low-skilled immigration on the unemployment in the German labour market. Swedish and German labour markets have similar features, such as wage rigidity and the wage level negotiated by the labour unions, why we could expect to obtain corresponding results. On the other hand, Foged and Peri (2015) did not find significant increase in unemployment of the native workers in Denmark. Due to the opposite results, the analysis concerning the unemployment in Sweden would response the demand for the knowledge of actual labour market effects of the refugee inflows.

9 Discussion

There are many reasons to expect the impact of immigration on the labour market to look different in different countries as we briefly argue in the literature review. Some of the factors that cause this variation among the countries are, for example, the degree of regulation of the labour market, the existence of a low-wage sector, the mobility of international capital etc. (Ruist, 2015).

Sweden is relatively active to facilitate the entry of refugees into the labour market. For example, immigrants receive free language courses and specialized support in seeking employment. The issue that arises is why Sweden has monitored poor results in OECD measurements (Ruist, 2015). There are plenty of possible explanations to this trend, we refer to what we estimate the most important; Sweden has a higher minimum wage than the most of OECD countries (Spector, 2014) and (Svensk Näringsliv, 2014).

High minimum wages can lead to higher unemployment, especially for low-skilled groups. One major problem is that for anyone who is considered to be low-skilled, a high wage level can mean unemployment. Foged and Peri (2015) regard refugees as low-skilled, and also our analysis is based on this idea. In addition, the education can be seen as a measurement of a productivity, and thus the refugees can be considered to be less productive. This problem may become more difficult over time if technological advances benefit skill-biased technical change. This means that highly educated become more sought after in the labor market meanwhile decreasing the need for less educated, because technological advances only benefit those with higher education (Gottfries, 2013).

In the Swedish political scene, it has been discussed to reduce entry salaries, and thus simplifying the entry of the refugees and low-educated workers the labour market. Because Sweden has the lowest share of simple jobs, low-skilled jobs, in the EU (Spector, 2014), there is no room for more job seekers competing for one and the same place. One possible solution could be to decrease the entry salary. This would encourage the firms to hire low-skilled workers and thus more people would have a possibility to gain working experience. However, even small structural changes in the labour market can lead to unexpected future consequences. Therefore, the possible policy implications concerning a lower entry salary should be analysed cautiously and future research is required.

Moreover, Skedinger, (2010) discuss that employment protection leads to increased costs for the employer when staffing needs to be adjusted, which affects incentives for both employers and

employees. The level of employment or unemployment as a whole is not affected, but structural change is slowing down. Staff turnover decreases and marginal groups such as young people, immigrants and people with disabilities get adversely affected by the increasing demands of employers on qualifications.

In the theory section, we discussed the matching problems that may occur and hence affect the integration of the refugees into the Swedish labour markets. By examining the educational level of the refugees, the previous working experience and comparing it with the required skills among the sectors the refugees are employed, it would be possible to study the matching problems. According to European Parliament's (2016) and Statistics Sweden's (2014) report it takes more than five years before 50% of the refugees are employed. As discussed, a high minimum wage may harm the employment: the marginal productivity has to equal the wage level. In addition, the long integration time can be a consequence of the matching problems: it takes years before refugees are adapted to the requirements of the Swedish labour market. Our study does not cover the matching problem or other factors that may affect the integration of the refugees into the labour market. However, the matching problem may increase unemployment and in that case smooth the wage effects. Also, the long matching times enables the capital adjustments.

The turn-over costs can have similar effects on the obtained results; High turn-over costs increase the wage level and generates a corresponding effect than the minimum wage. Companies try to maximise their profits by setting an "efficiency wage" that also minimise the requirement costs. The "efficiency wage" is one of the reasons behind the matching problems that in turn may harm the integration of the refugees into the labour market.

A possible change in the regulation of the labour market, such as minimising the protection of workers, would improve labour mobility and potentially increase the intensive for the natives to educate themselves and improve their abilities. Thus the natives could opt for jobs that require a higher level of education, giving immigrants more space in the labour market. At the same time, it is necessary to mention the question of how the deregulation of the labour market will affect the structure of the market as a whole.

In our study, we included data from asylum seekers who came mainly from Iran, Iraq and Afghanistan. Asylum seekers who came from Iran and Iraq had generally higher education, as we

discussed earlier in the study. The fact that they had higher education could have helped reduce the impact of their entry into the labor market.

It is important to note that the largest majority of asylum seekers who came to Sweden 2015 were from Syria. These asylum seekers from Syria are generally less educated and their prerequisites to establish themselves are a little more complex: they come from an ongoing civil war. All this means that their entry into the labour market can be completely different from those previous inflows of asylum seekers that we included in our study. Thus, we are careful to analyse the possible future impacts.

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11 Appendix

11.1 Data specifications

11.1.1 Description of variables

Name of the variable	Description	Reference
Wage	The variable wage is a weighted average of a monthly salary computed for every region between years 2003-2013.	Statistic Sweden SCB
Refugees	The variable "refugees" cover all new refugee immigrants aged 18-64. The number of refugees per region is computed by adding together refugees in every county that belongs to the NUTS2 region. The years 2003 and 2004 are estimated using the average number of the working aged refugees between the years 2005-2013.	Swedish Migration Agency
Population	The variable "population" includes inhabitants in every NUTS2 region aged 16-64.	Statistic Sweden SCB
Refugee Density	The refugee density is computed as a fraction of the variables "refugees" and "population".	Swedish Migration Agency Statistic Sweden SCB
Unemployment	The unemployment is used as a control variable. It is the number of unemployed workers who belongs to the workforce.	Statistic Sweden SCB
GDP growth	The GDP growth is a yearly percentage growth rate by a region.	Statistic Sweden SCB
GDP per capita	The GDP per capita is the total output of a region divided by inhabitants. The variable is measured in Swedish krona.	Statistic Sweden SCB

11.1.2 NUTS2 Regions and counties

NUTS Region	County
SE11 Stockholm	Stockholm
SE12 East Central Sweden	Uppsala Södermanland Östergötland Örebro Västmanland
SE21 Småland with the island	Jönköping Kronoberg Kalmar Gotland
SE22 Southern Sweden	Blekinge Skåne
SE23 Western Sweden	Halland Västra Götaland
SE31 Northen Sweden	Värmland Dalarna Gävleborg
SE32 Central North Sweden	Västernorrland Jämtland
SE33 Upper North Sweden	Västerbotten Norrbotten

11.1.3 Working aged (18-64) refugees per 1000 inhabitants

Year	Region SE11	SE12	SE21	SE22	SE23	SE31	SE32	SE33
2003	1,14	1,42	1,23	1,43	1,05	0,95	1,18	0,77
2004	0,68	1,06	0,99	0,97	0,70	0,88	1,28	0,93
2005	1,04	1,12	0,80	0,70	0,71	1,03	1,17	0,72
2006	3,60	3,17	2,92	2,79	2,68	2,66	2,64	1,64
2007	2,94	2,88	2,27	2,40	1,82	2,32	2,18	1,77
2008	1,50	2,33	1,94	1,78	1,34	1,89	1,76	1,39
2009	1,33	2,11	1,76	1,41	1,35	2,08	1,80	1,39
2010	1,11	1,86	1,94	1,03	1,29	2,26	2,16	1,63
2011	1,01	1,41	1,29	1,08	0,99	1,45	2,07	1,42
2012	1,39	2,46	1,72	1,40	1,38	2,06	2,33	1,73
2013	2,20	6,52	3,44	2,16	2,58	3,76	3,72	1,83

11.1.4 The effect of the refugee inflows on the wages, no regional effects

ln(wage)	(1)	(2)	(3)	(4)	(5)
ln(refugee density)	-.0969** (.0543)	-.0678** (.0325)	-.0205** (.0089)	.0077** (.0159)	-.0171** (.0071)
Region fe	no	no	no	no	no
Time fe					
2004	.0256 (.0597)	.0182 (.0357)	.0317*** (.0098)	.0400** (.0174)	.0251*** (.0078)
2005	.0468 (.0600)	.0401 (.0358)	.0604*** (.0099)	.0693*** (.0175)	.0513*** (.0078)
2006	.1801** (.0755)	.1365*** (.0452)	.1120*** (.0124)	.0893*** (.0221)	.0990*** (.0099)
2007	.2021*** (.0701)	.1626*** (.0420)	.1268*** (.0115)	.1262*** (.0205)	.1086*** (.0091)
2008	.2472*** (.0630)	.1834*** (.0377)	.1776*** (.0104)	.1763*** (.0184)	.1598*** (.0082)
2009	.2521*** (.0619)	.2119*** (.0370)	.2128*** (.0102)	.2130*** (.0181)	.1747*** (.0081)
2010	.2804*** (.0616)	.2238*** (.0369)	.2313*** (.0101)	.2225*** (.0180)	.1982*** (.0080)
2011	.2977*** (.0592)	.2350*** (.0354)	.2490*** (.0097)	.2566*** (.0173)	.2108*** (.0077)
2012	.3454*** (.0635)	.2798*** (.0380)	.2809*** (.0105)	.2772*** (.0186)	.2516*** (.0083)
2013	.4302*** (.0795)	.3478*** (.0476)	.3119*** (.0130)	.3017*** (.0233)	.2889*** (.0104)
_cons	9.7817*** (.3710)	9.680*** (.2218)	9.681*** (.2218)	9.974*** (.1086)	9.611*** (.0486)
R^2 Adjusted R^2	0.5044 0.4326	0.6590 0.6097	0.6590 0.6097	0.9057 0.8921	0.9729 0.9690
Number of obs.	88	88	88	88	88

In the table, the significance of the coefficients is denoted by stars (significance on the 10 % significance level, ** 5% and ***1%, respectively). Standard errors are in brackets and they are computed on the 5% significance level.*

11.1.5 The effect of the refugee inflows on the wages, fixed effect

ln(wage)	(1)	(2)	(3)	(4)	(5)
ln(refugee density)	.0083 (.0207)	.0005 (.0071)	.0054 (.0048)	.0344** (.0141)	-.0145** (.0065)
Region fe	yes	yes	yes	yes	yes
Time fe					
2004	.0472*** (.0165)	.0321*** (.0056)	.0370*** (.0038)	. 0454*** (.0112)	.0257*** (.0052)
2005	.0713*** (.0166)	.0560*** (.0057)	.0664*** (.0038)	.0755*** (.0113)	.0519*** (.0052)
2006	.0878*** (.0241)	.0766*** (.0083)	.0893*** (.0056)	.0659*** (.0164)	.0968*** (.0076)
2007	.1274*** (.0217)	.1141*** (.0074)	.1084*** (.0050)	.1073*** (.0147)	.1068*** (.0068)
2008	.2027*** (.0182)	.1545*** (.0062)	.1666*** (.0042)	.1650*** (.0124)	.1587*** (.0057)
2009	.2135*** (.0176)	.1868*** (.0060)	.2032*** (.0041)	.2032*** (.0120)	.1737*** (.0056)
2010	.2436*** (.0175)	.1999*** (.0060)	.2222*** (.0040)	.2132*** (.0119)	.1973*** (.0055)
2011	.2821*** (.0162)	.2249*** (.0055)	.2451*** (.0037)	.2526*** (.0110)	.2104*** (.0051)
2012	.2980*** (.0184)	.2485*** (.0063)	.2692*** (.0042)	.2651*** (.0126)	.2504*** (.0058)
2013	.3260*** (.0260)	.2801*** (.0089)	.2862*** (.0060)	.2753*** (.0177)	.2863*** (.0082)
_cons	10.496*** (.1412)	10.143*** (.0486)	9.856*** (.0327)	10.155*** (.0962)	9.628*** (.0448)
R^2 within	0.9355	0.9883	0.9953	0.9636	0.9891
R^2 between	0.0953	0.1135	0.1936	0.0165	0.0766
R^2 overall	0.4798	0.6392	0.9621	0.9023	0.9729
Number of obs.	88	88	88	88	88

In the table, the significance of the coefficients is denoted by stars (significance on the 10 % significance level, ** 5% and ***1%, respectively). Standard errors are in brackets and they are computed on the 5% significance level.*

11.1.6 The effect of the refugee inflows on the wages, fixed effect with controls

ln(wage)	(1)	(2)	(3)	(4)	(5)
ln(refugee density)	.0041 (.0202)	.0001 (.0073)	.0045 (.0044)	.0324** (.0135)	-.0519** (.0067)
Unemployment	.1164 (1.004)	.0825 (.3637)	.4121* (.2176)	-2.189*** (.6730)	.0197 (.3318)
GDP growth	.2565 (.1738)	.0279 (.0629)	.0672* (.0376)	.0596 (.1164)	.0852 (.0578)
GDP capita	-.0010*** (.0004)	-.0001 (.0001)	-.0003*** (.0001)	-.0003 (.0002)	-.00002 (.0001)
Region fe	yes	yes	yes	yes	yes
Time fe					
2004	.0527*** (.0172)	.0326*** (.0062)	.0370*** (.0037)	.0557*** (.0116)	.0236*** (.0057)
2005	.0907*** (.0195)	.0579*** (.0071)	.0692*** (.0042)	.0949*** (.0131)	.0516*** (.0064)
2006	.1274*** (.0277)	.0812*** (.0100)	.0997*** (.0060)	.0775*** (.0186)	.0970*** (.0091)
2007	.1891*** (.0316)	.1225*** (.0114)	.1308*** (.0068)	.0887*** (.0211)	.1094*** (.0104)
2008	.2777*** (.0330)	.1644*** (.0119)	.1930*** (.0072)	.1471*** (.0221)	.1629*** (.0109)
2009	.0330*** (.0351)	.1945*** (.0127)	.2194*** (.0076)	.2371*** (.0236)	.1824*** (.0116)
2010	.3049*** (.0370)	.2061*** (.0134)	.2324*** (.0080)	.2662*** (.0248)	.1947*** (.0123)
2011	.3663*** (.0380)	.2341*** (.0138)	.2640*** (.0082)	.2958*** (.0255)	.2126*** (.0126)
2012	.3870*** (.0418)	.2581*** (.0151)	.2883*** (.0090)	.3156*** (.0280)	.2544*** (.0138)
2013	.4187*** (.0469)	.2901*** (.0170)	.3059*** (.0102)	.3289*** (.3289)	.2903*** (.0154)
_Cons	10.741*** (.1837)	10.169*** (.0665)	9.900*** (.0398)	10.346*** (.1231)	9.6221*** (.0607)
R^2 within	0.9426	0.9884	0.9963	0.9678	0.9895
R^2 between	0.7720	0.8508	0.8797	0.5699	0.0550
R^2 overall	0.0912	0.5614	0.8619	0.8480	0.9730
Number of obs.	88	88	88	88	88

In the table, the significance of the coefficients is denoted by stars (significance on the 10 % significance level, ** 5% and ***1%, respectively). Standard errors are in brackets and they are computed on the 5% significance level.*