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Does immigration affect native's labor market outcomes in Germany?

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No. 770

Does Immigration Affect Native's Labor Market Outcomes in Germany?

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Linnæus University

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Bachelor essay

Does immigration affect native's labor market outcomes in Germany?



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Abstract

Germany is one of the several countries in Europe that have opened its borders to immigrants for many years. The admission of immigrants into Germany has contributed to the country being the second largest immigration destination in the world, and this has resulted in both negative and positive outcomes for the natives. In this essay, the effect of immigration on natives' hourly wages and employment was examined, by using microdata for Germany. Native workers' educational level attainments and 16 different regions in Germany were taken into account to obtain regional variation. Cross-sectional data was used for the years 2005, 2009 and 2015 in order to measure the effect of the share of immigrants on natives' hourly wages and employment. The findings showed that the share of immigrants, had a positive effect on natives' wages and employment in 2005 and 2009. In 2015, however, a negative relationship was found, with the share of immigrants impacting negatively on natives' wages but not on employment. Thus, the study highlights the importance of immigrants on natives' hourly wages and employment.

Keywords: Immigration, Germany, natives, labor market, hourly wages, employment, native skills, regions

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1. Introduction

Germany has for many years been the second largest immigration destination in the world. According to the United Nations (UN) estimates of the international migrant stock, Germany has the highest percentage of immigrants in the European Union states, with a total of 14.8 percent as of 2017 (UN, 2017).

For over 50 years, Germany has been facing serious demographic problems. For instance, they have low birth rates, which have been far below the level required in order to keep the population constant. Because of the demographic challenges, one option for the German government has been to encourage immigration to the country (Edmonston, 2007).

In 2005, a new immigration act (*Zuwanderungsgesetz*) came into effect in Germany, as they acknowledged themselves as being an “immigration country”. The high level of immigration resulted in the Government implementing a new law, in order to regulate migration (Kohlmeier et al. 2006). After implementing the new immigration law, some conditions changed for foreigners. For instance, after graduating from German universities, international students would only be given a year to find a job to be able to stay in the country. Another condition that changed when the new immigration act came into effect, was that newly arrived immigrants were to be given the opportunity to participate in German language classes, in order to adjust socially in the country (Gräbler, 2005).

The year 2015 had the highest record for immigration in Germany, with a number of 1,091,900 registered asylum seekers. Data from BAMF¹, on the skills of asylum seekers who entered in 2015 and 2016, show that 11 percent lacked any type of formal schooling and 20.5 percent had a maximum of four years of primary school (OECD, 2017). Due to the high numbers of low educated immigrants, the German Government agreed on attracting more high-skilled immigrants. In 2018, a new immigration law was approved in order to attract more skilled

¹ “Bundesamt für Migration und Flüchtlinge” is a Federal Office for Migration and Refugees in Germany.



foreign workers to the German labor market. The law is supposed to come into force in 2020 (Knight, 2019).

Economic theories claim that immigration to countries with a closed labor market affects the wage structure, by lowering the wages of natives that compete with immigrants, while raising wages for complementary natives (Borjas 2015). This essay examines the impact of immigration on natives' labor market outcome in Germany for three different years. The reason why Germany was chosen as a survey country is because of the country's high capacity for immigration compared to many other European countries. Germany was one of the first European countries to receive asylum seekers from the eastern world, such as Asia. Although there have been some significant studies on immigration to Germany, there are very few studies with cross-sectional data on how immigrants affect natives labor market outcome, based on the different levels of natives' education and regions in Germany. Therefore, this study examined the effect of immigration on natives' wages and employment in Germany.

The structure of the essay is as follows: Section 2 presents Germany's immigration history. Section 3 summarizes previous literature on this topic. Section 4 describes the theoretical framework. Section 5 describes the methodological framework. Section 6 describes the data. Section 7 presents the results and an analysis. Lastly, section 8 consists of a conclusion.



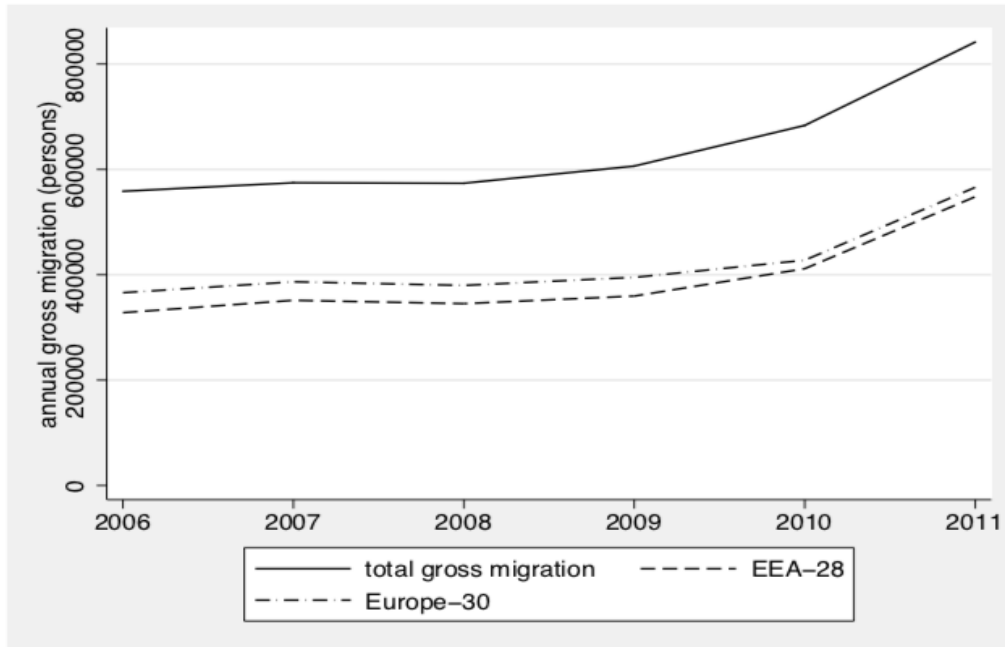
2. Contextual framework: Germany's immigration history

For many years Germany has been one of the most appealing migration destinations in the world, with the country being a station for immigrants who flee from unfortunate wars, religious conflicts and famine. According to Beyer (2016), Germany has had two large waves of immigration: in the 1960s and 1990s. Immigration to the country increased yet again after the Global Financial Crisis in 2007. The number of foreign-born in Germany was over 10 million in 2013 and the number has been increasing each year with new arrivals. In 2015, Germany registered over one million asylum seekers, which was twice as many as in 1990, with most of them being Syrian citizens because of an open-door refugee policy. Many other asylum seekers in Germany came from the Middle Eastern countries such as Afghanistan, Iraq and Pakistan (Beyer, 2016).

Figure 1 reported in Bertoli et al. (2013) displays Germany's total migrant gross inflows with countries of origin from all over the world and inflows from 28 EEA countries (Iceland and Norway excluded). The figure also displays an extended sample of 30 European countries' inflows. Between the years 2006 and 2009, the total gross immigration was approximately 600,000 per year, and then increased by 40 percent by 2011 as shown in the table, which resulted in the total inflow being at 840,000. (Bertoli et al. 2013).

According to Bertoli et al. (2013), Poland represented the main country of origin with a total number of 888,776 between the years as shown in figure 1. Poland was then followed by countries such as Romania and Bulgaria with a total number of 397,078 and 199,505 respectively.

Figure 1: Gross inflows to Germany by country sample, 2006 - 2011



Note: EEA is an agreement on the European Economic Area (including 28 member countries).

Source: Bertoli et al (2013), Statistisches Bundesamt (2012).

3. Literature review

In a study by Card (1990), the impact of the Mariel boatlift² on the Miami labor market was analyzed using data from the Current Population Survey (CPS). The purpose of the study was to examine if the Mariel boatlift affected the Miami labor market of less-skilled workers' unemployment rates and wages. Results from the study show that the labor force in Miami increased by 7 percent in 1980, due to the Mariel immigrants' inflow. Most of the immigrants were relatively unskilled which resulted in an increase in less-skilled occupations in the country. In the study, Card presents means of log wages of Non-Cubans in Miami by using quartiles of predicted wages. According to his results, there is no evidence of Cuban

² 125,000 Cuban immigrants arrived on flotillas in Miami, in September 1980. The reason for the emigration was due to an economic downturn in Cuba, which resulted in Cubans searching for better economic opportunities.



immigrants having an effect on less-skilled natives regarding their wages. This was controlled by observing the lowest skill quartile that covers native workers' wages and compared to the workers in the upper quartile, which showed that there was no decline in the workers' wages. The unemployment rates are also analyzed in the paper and compared to those of other cities. Card didn't find any evidence on the Mariel inflow having an effect on natives' employment in Miami. He concluded that the Mariel immigrant inflow had no effect on less-skilled non-Cuban workers' unemployment rates or wages.

Borjas et al. (1996) analyzed the effect of immigration on the labor market by comparing the outcome of two different approaches, the area approach and the factor proportions approach. Cross-section comparisons were made by using samples from 1980 and 1990 Censuses of the Population. The method area analysis was applied, since specific areas in a country can be immigrant concentrated. According to Borjas et al. (1996, p.1), "*area analysis contrasts the level or change in immigration by area with the level or change in the earnings (or employment) of non-immigrant workers*". Previous studies with area analyses as in for instance Borjas (1994), has only found a very slight effect of immigration on natives' employment and earnings. The estimates in the study presented a negative coefficient when including area fixed effects. This was interpreted as different education groups within regions, implied a negative immigration effect on the labor market. Borjas et al. (1996) concludes in the study that control variables and the choice of geographic area in the regression have an effect on the results. If for instance, the nation was covered instead of analyzing only smaller areas, it would result in a greater negative effect of immigration on natives' labor market outcome.

In the factor proportions analyses it was stated that "*immigrants are treated as a source of increased national supply of workers of the relevant skill*" (Borjas et al. 1996, p.1). The calculations of the factor proportions showed that immigration contributed to a slightly reduced pay for both high-skilled natives and low-skilled natives (Borjas et al, 1996).



Kugler and Yuksel (2008) studied if there is an effect of less qualified Latin American immigrants, on employment and wages in the United States. The study is based on a natural experiment³, as in Card (1990), and data from a natural disaster, Hurricane Mitch, which resulted in the U.S. border states being inflowed in the late 1990s by Central American immigrants. Despite the beliefs that the inflow of less qualified Latin American immigrants has had a negative impact on the employment and wages of less qualified natives, previous studies show that in general, not much evidence is found on that being the outcome. According to the study by Kugler and Yuksel (2008), results from an OLS regression shows that the immigration of Latin Americans is related negatively towards the employment of natives and positively to their hourly wages. They further explain the estimates and how they might be biased, due to immigrants migrating in order to settle in states where the demand for their skills is relatively high. Different estimates in the study regarding the inflow of less-skilled Latin American immigrants during Hurricane Mitch, showed positive effects on educated native men's wages when controlling for state-specific trends, but no effect on their employment. These results show skilled native workers and unskilled immigrants being as not competitors, but as complementing each other (Kugler & Yuksel, 2008).

Bratsberg and Rauum (2012), studied the wage impact of immigration in the Norwegian construction sector during an eight-year period (1998 to 2005). According to their study, if immigrants compete with native workers due to similar skills, it can result in natives' wages being pressured downwards. On the other hand, if they complement each other, the outcome can be beneficial for natives since the value of their service can rise on the labor market. To be able to study the development of Norwegian natives' wages over a longer period of time, panel data was used. Bratsberg and Rauum (2012) explain that due to the use of panel data, they found that individual workers who faced an increase in immigrant employment share, experienced a lower wage growth.

³ A natural experiment is an observational study of an intervention that occurs independently of researchers' manipulations. The circumstances surrounding the intervention are not controlled by experimenters instead they are influenced by nature or other outside factors.



Bratsberg and Rauum (2012) found evidence on Norwegian native workers' wages being affected by immigrant workers. The outcome was a 10 percent increase in immigrant employment, reduced natives' wages by 0.6 percent in the construction business.

Foged and Peri (2015) studied the labor market outcomes of low skilled Danish native workers, due to an inflow of low skilled immigrants. Longitudinal data was used for the period 1991 to 2008, to be able to follow individuals over time and estimate the effect. The study focused on the effect of an inflow of non-European immigrants from countries such as Afghanistan, Iraq, Iran and Bosnia. The reason why the authors decided to only focus on the outcome of less skilled natives, is because the inflow of immigrants in Denmark consisted of mostly low educated individuals. In this paper, they also studied natives' average outcome in separate areas in Denmark, to be able to obtain different estimates. Foged and Peri found a positive effect of immigration on low skilled natives' wages and employment. They concluded that increased immigration would most likely result in natives moving out of the municipality.

People often believe that wages are being decreased and that natives' job opportunities are being crowded out by immigration. According to Peri (2014), that is not the case. He argues that natives often fear low skilled immigrants with little education, as a reaction to protect their own opportunities in the labor market. According to this study, immigration does not have a lot of effect on natives' wages when their similar skills are taken into account. Newly arrived immigrants can sometimes have a larger negative effect on earlier immigrants' wages, than those of natives. The reason for this is that new immigrants may be substitutes to earlier immigrants rather than natives, which can lead to more competition in the labor market. Peri (2014) presented a few studies in the US that analyzed the effect of immigration on the labor market with regard to skills. According to the key findings in the study, there was not much evidence on less educated native workers' wages being affected negatively by immigration. In fact, he concluded according to evidence that in the long run, immigration can increase the wages of native workers by contributing to firm growth.



Peri (2014) presented a theory which stated that immigrants often have different skills to those of natives, which results in immigrants and natives performing various tasks in the labor market. He concluded that there is not much competition since natives are being offered more communication-intensive jobs, where they also specialize, while immigrants in the host country are often offered manual jobs at a low cost.

Author	Country	Method	Data	Results
Card D. (1990)	USA	Wages were estimated for individuals in the Miami metropolitan area for each year between 1979 and 1985. The respondents were divided by race and income quartile, to analyze the effect of the Mariel boatlift. Card assumed that skill is reflected in income and therefore his study would analyze the effect of the Mariel boatlift on employment and wages, in labor that is both high-skilled and low skilled.	Used data from U.S. Census Bureau's Current Population Survey.	The Mariel boatlift did not have a negative impact on the wages or employment of whites, blacks or non-Hispanics in Miami
Borjas, G. J., Freeman, R. B., & Katz, L. F. (1996)	USA	Area approach, where a geographical area is chosen to measure the effect of immigration on the changes of wages and employment. Specific areas can be immigrant concentrated. Another method was the factor proportion analysis with the general equilibrium perspective. Immigrant was treated as a source in the study.	Cross section comparison of immigration and wages, using 1980 and 1990 censuses of population.	The area analysis yielded a negative effect on natives' labor market outcome. According to the factor proportion analysis, immigration had a slightly negative effect on some natives, depending on their education level, by reducing their wages.



Kugler A., Yuksel M. (2008)	USA	Doing OLS estimates by creating a simple OLS regression.	Using census data from a natural experiment, Hurricane Mitch.	Immigration of Latin Americans is related negatively towards the employment of natives and positively to their hourly wages.
Bratsberg B., Rauum O. (2012)	Norway	An empirical model was set up to study the Norwegian natives' wage development process in the construction sector, over a longer period of time.	Panel data from 1990 to 2014.	A 10 percent increase in immigrant employment, reduced natives' wages by 0.6 percent in the construction business. Norwegian native workers' wages are being affected negatively by immigrant workers.
Foged M., Peri G. (2015)	Denmark	Difference in difference model, to identify short and long run effects of immigration. Another implemented approach was fixed effects panel regressions.	Individual longitudinal data was used for the period 1991 to 2008.	Results showed a positive effect of immigration on low skilled natives' wages and employment.
Peri G. (2014)	USA	Instrumental variables estimation. This technique was used to track the response of wages.	Both cross-sectional data and panel data.	There was not much evidence on immigration having an effect on less educated native workers' wages. In the long run, immigration can increase native workers' wages.



4. Theoretical Framework

4.1 The immigration impact on labor demand and labor supply

Increasing immigration to a country can have various effects on the foreign labor market outcomes, such as natives' wages. If, for instance, a labor supply shock occurs due to increased immigration, this will result in a new equilibrium with different native workers being affected differently. A theory in Borjas (1994) study, implies that native workers can be affected negatively due to immigration by analyzing their wage development. Immigration can lead to a labor supply shock in the host country by increasing the workforce. This can further result in different outcomes. If for instance natives and immigrants share similar skill-levels and compete for the same jobs on the labor market, they will be categorized as substitutes according to the neoclassical theory (Gordon et al, 2007). On the other hand, if they have different skill levels and don't compete for the same jobs, they will instead complement each other (Borjas, 1994).

When assuming that natives and immigrants are substitutes in a fully competitive labor market, immigration can lead to an increasing workforce, which further results in a shift to the right of the supply curve for labor. The effect of the supply curve shifting out will consequently lead to an increase in total employment in the host country and a wage reduction. As the total employment increases in the country, native workers employment level will decrease because of the wage reduction (see figure 2). This can occur due to the unwillingness of natives working for a reduced wage level, and therefore being at a risk of getting replaced by immigrant workers (Borjas, 1994).

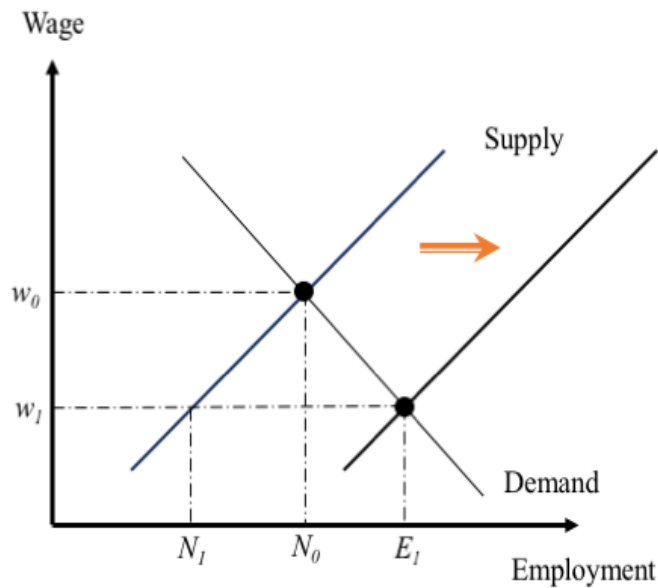


Figure 2: Perfect substitutes. Competition between natives and immigrants occur in the labor market when they are perfect substitutes. The supply curve will shift out to the right due to immigration and lead to a wage reduction from w_0 to w_1 . The total employment level increases to E_1 , which causes native employment to decrease from N_0 to N_1 .

When assuming that immigrants and native workers are being complementary in a country with increasing immigration, it can have a different outcome compared to the assumption of them being perfect substitutes. For instance, if immigrants are less educated than natives, this can result in immigrants performing different tasks than natives on the labor market, which can turn out to be more productive. This can result in natives specializing in some type of job positions, which can further increase their marginal product. An increase in natives' marginal product will shift the demand curve to the right. Borjas postulates that when natives' productivity in the labor market increases, their wage level will also rise as a result. Since natives' wages are now at a higher level than previously, native born find it more useful to work and enter the labor market, which further raises the level of employment (see figure 3) (Borjas, 1994).

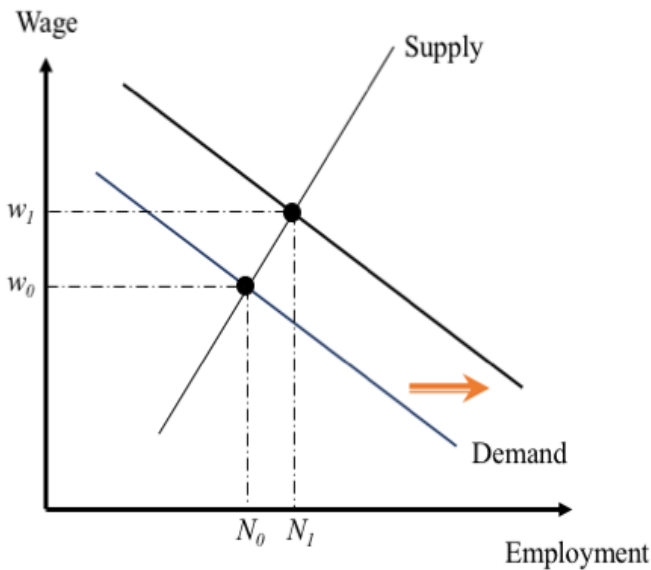


Figure 3: Complements. When natives and immigrants do not compete in the same labor market, they are complements. The supply and demand curve show the labor market for native workers. The demand curve shifts out to the right, due to immigration and makes natives more productive. This leads to an increase in wages from w_0 to w_1 , which causes native employment to increase from N_0 to N_1 .

5. Methodological framework

The overall aim of this study was to examine any direct effects of immigrants' influence on natives log hourly wages and employment. More specifically, the effects of immigration on the labor market of natives was calculated by studying 16 different regions in Germany and five education groups in those regions. The calculation was done by using a simple OLS (Ordinary Least Squares) regression model with outcome variables such as natives' log hourly wages and employment. The simple OLS (Ordinary Least Squares) regression model calculates how the share of immigrants in different regions in Germany influence the natives, who are divided into five different levels of education. Jaeger (2007) concludes that natives with different levels of education are affected differently by immigration. Another observation in his article was that natives with higher skills could be less affected by immigration itself.



An OLS regression model and area analysis was used to check the possible impact on the natives' log hourly wages and employment. Area analysis was taken into consideration in accordance to the study in Borjas et al (1996). It was also noted in the study that immigration flows in the host country can affect native-born differently in various regions. The results regarding natives' wages and employment can be quite different across areas in the country.

The analysis was done in two different steps in order to examine the impact on the outcome variables for natives. In the first step, the Stata command "collapse"⁴ was used before the original regression model to specify the groups which were included in the estimation. This method was used to create a new dataset that contained the statistics from the original data's summary. The new dataset was based on the skill-region category for natives. Additionally, the syntax collapse took a share of the variables which included mean values of all the variables in the regression model and calculated these.

In the second step of the empirical analysis an OLS (Ordinary Least Squares) estimation was used to calculate the outcome variables by controlling various factors such as region and education. In the cross-sectional data three different years were included, 2005, 2009 and 2015 in Germany. The OLS regression was based on Borjas et al (1996) and is written as follows:

$$\text{Logwage}_{ij} = \alpha_0 + \gamma_2 \left(\frac{I}{N} \right) + \beta_3 i. (\text{Educ})_i + \beta_4 i. (\text{Region})_j + e_{ij} \quad (1) \quad ^5$$

$$\text{Empl}_{ij} = \alpha_0 + \gamma_2 \left(\frac{I}{N} \right) + \beta_3 i. (\text{Educ})_i + \beta_4 i. (\text{Region})_j + e_{ij} \quad (2)$$

Where α_0 is a constant term, and $\left(\frac{I}{N} \right)$ measures the ratio of the share of immigrants to natives in the relevant area. Share of employment and the share of log hourly wages for natives are two dependent variables in the analysis.

⁴ Make dataset of summary statistics syntax collapse (stata.com)

⁵ See definition of variables in A2 (appendix).



The logged form of hourly wages is defined as Logwage_{ij} . The log hourly wages for natives were estimated and transformed into a percent form to simplify the interpretation of the results. Percent changes also simplify the comparison of hourly wages between the years 2005, 2009 and 2015. The second dependent variable Empl_{ij} represents natives who currently are employed in Germany. The variables that were used in this regression analysis were natives' mean of hourly wages and employment within the control variables natives' education and region. In this model, the effect of the share of immigrants is represented by the parameter γ_2 , which could either have a positive or a negative value. This parameter describes the impact that the share of immigrants can have on natives' hourly wages and employment. An increase in the share of immigrants will decrease the hourly wages, and employment for natives' first when the parameter, γ_2 is negative. If the parameter γ_2 has a positive value, the effect will also be positive which further increases natives' hourly wages and employment.

The reason why different levels of education for natives were taken into account is due to the fact that education is a measure of skill. Another step was to divide the skill levels into five different categories, $i. (\text{Educ})_i$ where the share of individuals with the skill level i in the country, was $i = 1, 2, 3, 4, 5$ (primary education, upper secondary education, non tertiary education, bachelor level and masters level). The control variable $i. (\text{Educ})_i$ contributes to getting results in the outcome variables hourly wage and employment, by taking different education groups for natives into account. Another control variable in the analysis was $i. (\text{Region})_j$, where $i = 1, 2, 3, 4, 5, \dots, 16$, which was distributed in the 16 different regions within Germany. Regions are according to Germany's administrative departments declared as higher-level areas than municipalities or geographical areas. The survey was restricted by including natives who live in one of the 16 regions, and who belong to one of the five skill levels. The estimated regression was expected to show the effect of immigration on the natives' log hourly wages and employment, through cross-sectional comparisons in 2005, 2009 and 2015.



6. Data

Microdata for Germany was collected from the largest income database of harmonized microdata, Luxembourg Income Study Database (LIS), in order to analyze if immigration has an effect on natives' wages and employment. Data was collected for three different years, 2005, 2009 and 2015 for a comparison of the outcomes between the selected years.

The cross-sectional data contains information about German native workers' educational level attainments, in 16 different regions, which concludes that the study was conducted at a regional level. The data was aggregated and contains native workers divided into education-region groups. The aggregated form of data was obtained to create a local labor market with regard to native skills. The main variable share of immigrants varies not only across education but also across regions. That way, the effect of immigration on natives' log hourly wages and employment could be identified. The dataset of the original data was converted into a new smaller dataset of means by applying the syntax collapse.

Moreover, cross section data were used to summarize the variables that are collected at the same point in time. However, there could be some problematic income statements for this type of data, which explain why the labor market results in the future may vary over time. The analysis of cross section data does not provide an estimated amount of the future market (Gujarati et al, 2009).

In order to obtain the effect of immigration on natives' labor market outcome, data had to be restricted in this essay. One restriction was that natives were selected based on their contribution to the labor market. Other restrictions that were made for the chosen years were employment and age. According to the Youth Labor Protection Laws, teenagers in Germany at the age of 15 years are allowed to enter the labor market following education. The age of 64 is when many approach retirements, and therefore the age group for the data was restricted between 15 years and 64 years (OECD, 2018).



6.1 Data source and data selection

The variables used in this essay are:

- Hourly wage for natives
- Employed natives
- Share of immigrants
- Education levels for natives
- Regions in Germany

The dependent variable log wage shows the average of log hourly wages for natives at a regional level for the dataset in the years 2005, 2009 and 2015. The employment variable shows the employment status for natives, which is, natives that are currently employed in Germany. The independent variable immigrant is the share of immigrants in the population. Data was obtained for five different education levels in Germany for all three years⁶. In the descriptive statistics, the different levels of education were clustered into three subgroups, low educated, medium educated and high educated. The category for low education contains primary education. The medium level education includes an upper secondary education and non-tertiary education. The category for highly educated contains bachelor level and master level (Metis, 2016).

There was a total number of 80 observations obtained in each of the selected years 2005, 2009 and 2015. In order to generalize 16 different regions, 80 observations were created by selecting people from five different educational levels in each of the 16 regions. Germany is divided into many regions, which means that there could be different outcomes for natives, due to the fact that immigrants can have a different effect in the various regions.

⁶ See systems of educational levels for years 2005, 2009 and 2015 in Table A1 (appendix).



6.2 Descriptive statistics

Table 1

Descriptive Statistics for year 2005, 2009 & 2015						
Summary Statistics for native's wages and employment in Germany						
Variables	Observations	Low education	Medium education	High education	Min	Max
Share of immigr 2005	80	0.2281 (0.1642)	0.1093 (0.1002)	0.0988 (0.0846)	0.004	0.504
Share of immigr 2009	80	0.2505 (0.1858)	0.1335 (0.0943)	0.0906 (0.0706)	0.004	0.583
Share of immigr 2015	80	0.3832 (0.1754)	0.2062 (0.1201)	0.2094 (0.1419)	0.013	0.613
Log wage 2005	80	1.769 (0.396)	2.427 (0.183)	2.769 (0.206)	0.9016	3.0055
Log wage 2009	80	1.705 (0.538)	2.427 (0.183)	2.770 (0.206)	1.1320	3.0363
Log wage 2015	80	2.043 (0.204)	2.560 (0.157)	2.976 (0.153)	1.6862	3.2499
Employment 2005	80	0.4838 (0.0999)	0.7236 (0.0893)	0.8087 (0.0769)	0.24	0.96
Employment 2009	80	0.4301 (0.0971)	0.6980 (0.0458)	0.8121 (0.0937)	0.26	0.92
Employment 2015	80	0.5029 (0.0977)	0.7941 (0.0740)	0.8447 (0.0475)	0.36	0.93

NOTE: All predictors at their mean value
Source: LIS database, own calculations

Table 1 summarizes the dependent and independent variables that were divided into three different levels of education groups, low, medium and high. The descriptive statistics table summarizes the skill-region category of natives log hourly wages and employment for the years 2005, 2009 and 2015, which is a sample of 80 observations. The table also presents a summary of the share of immigrants' education level in 16 different regions. Observations, mean values, standard deviation, min and max values are also presented in the table for each of the mentioned variables in the dataset. The share of immigrants in 16 different regions differs between the lowest and highest levels. In 2009, the lowest share of immigrants in the regions was 0.4%, while the highest level of immigrants was at 58%.



When observing the log hourly wages and employment for the different years, results showed an increase in the mean value for hourly wages and employment as the level of skill raises. The standard deviation (in the parenthesis) shows the sampling variation of the variables. A further analysis of the share of immigrants shows that with an increasing level of skills from low education to higher education, the share of immigrants' means decreases. The share of immigrants among low skill workers was approximately 23% in 2005. The rest of the low skilled workers in Germany were natives, which is 77%. In 2015, low skilled immigrants in the labor market increased by 15.51% from 2005 to 2015.

There was approximately 38% of low skilled immigrants in 2015, and the share of immigrants decreased with a raised education level to 21% in the same year. There was a similar pattern of the decreasing effect for the share of immigrants with a high education level in 2005 and 2009 (see table 1). The difference between the three years according to the statistics is that the mean value for the share of immigrants increased with each year. The share of immigrants shows that the proportion of low skilled immigrants in the country's labor market was higher than the proportion of high skilled immigrants. An explanation for this can be that the high number of immigrants who came to Germany were low skilled.

According to the summary statistics in Table 1, the average hourly wages for low skilled natives in the year 2005 was 5.86 dollars⁷. The hourly wage level increases in parallel to the level of education, which can be interpreted as individuals with higher skill levels earn more in an hour than individuals with lower skill levels. As a result, the minimum and maximum wages, differed in Germany for each year. Compared to the two other years, natives had a higher minimum and maximum wage in 2015, which corresponds to a minimum hourly wage of 5.40 dollars and a maximum hourly wage of 25.79 dollars.

⁷ Interpretation of coefficients according to Benoit (2011).



The average employment among low skilled natives in 2005 was approximately 48% and for high skilled natives it was approximately 81%. Table 1 shows that employment level goes up with an increased education level. The minimum share of employed native-born in 2005 was 24%, while the maximum share of employed was 96%. In the year 2015 the minimum share of employed was 36% while the maximum share of employed native-born was 93%.

7. Results and analysis

The results of previous studies that have examined the effect of immigration on natives' labor market, have shown either a small effect or no effect at all in the host country.

Our study on the other hand showed different effects depending on the analyzed year. The results of this study with cross-sectional data for the years 2005, 2009 and 2015 were based on the outcome variables hourly wage and employment. The results are presented in the cross-sectional regression (table 2). In the method section, two different equations (1) and (2) are presented, which explain the starting point of the regression analysis. Table 2 presents the results of the estimations for the years 2005, 2009 and 2015 respectively. As shown by Table 2, the share of immigrants for the years 2005 and 2009 had a positive effect on the hourly wages and employment of natives. However, the 2015 results showed that the share of immigrants in Germany had a negative impact on natives' hourly wages and employment.



Table 2

Cross-section model						
Cross-section regression on the effect of immigration on native's wages and employment						
Variables	Log wage 2005	Log wage 2009	Log wage 2015	Employment 2005	Employment 2009	Employment 2015
Share of immigr 2005	0.632** (0.2841)			0.093 (0.1364)		
Share of immigr 2009		0.414* (0.2698)			0.202* (0.1139)	
Share of immigr 2015			-0.419** (0.1763)			-0.009 (0.0853)
Constant	1.752*** (0.1339)	1.821*** (0.1296)	2.397*** (0.1072)	0.487*** (0.0643)	0.421*** (0.0547)	0.560*** (0.0519)
Natives' education FE	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES
Observations	80	80	80	80	80	80
R-squared	0.8930	0.8803	0.9080	0.7756	0.8389	0.8535
Adj R-squared	0.8615	0.8449	0.8808	0.7094	0.7914	0.8103
Standard errors in parentheses *** p < 0.01, ** p < 0.05, * p < 0.1						
NOTE: All predictors at their mean value						

Source: LIS Database, own calculations

According to the coefficient results from equation (1) in 2005 (table 2), they can be interpreted as if the share of immigrants increased by 10 percent, the hourly wages for natives are expected to increase by 6.3 percent at a 5% significance level. According to the results of equation (2) which is employment in 2005, if the share of immigrants increases by 10 percent, natives' employment will increase by 0.93 percent which is not significant. Also, high R-squared values were obtained for the hourly wages for each year. A high R-square value indicates that a high proportion of the variance in the dependent variable is explained by the independent variables in the regression.

The results from the year of 2009, from equation (1) are presented in Table 2. The results show a decrease in the coefficient for the share of immigrants.



The positive coefficient decreased by 2.18% between 2005 and 2009. These results can be interpreted as if the share of immigrants increases by 10 percent, the hourly wages for the natives are expected to increase by 4.1 percent at a 10% significance level. The employment level in 2009 increased for natives by 2 percent with a 10 percent increase in the share of immigrants. The significance level for employment in 2009 was at 10%. The R-square value of equation (2) was as high as in equation (1), indicating that more of the variance in the employment variable was explained by the independent variable.

The positive values in the years 2005 and 2009 showed that immigrants and natives are complementary to each other. The estimates can be in line with Peri (2014), where he concluded that many immigrants were being offered manual jobs at low cost, which further resulted in native workers being employed in communication-intensive jobs. When natives specialize in their jobs, their wages will be protected and not decreased by immigration. Peri (2014) further postulated that immigrants may not depress natives' wages, if firms employ immigrants at lower wages compared to those of natives', thereby reducing costs and creating new complementary jobs for natives instead. This would then result in natives' wages not being depressed or affected negatively by immigrant workers. The results in this essay show an impact similar to Peri (2014), in terms of the positive effect on natives' hourly wages.

One possible explanation for the results in 2005 and 2009 was that the share of immigrants had a positive effect on the natives' labor market outcomes. It might have been due to the fact that immigrants on average had a lower level of education than natives, hence, immigrants might have only been substitutes for low educated natives. As noted earlier, Germany has received a large inflow of low-skilled immigrants in recent years. One possible explanation for this, based on the results of 2005 and 2009 may be that less educated immigrants increase the productivity of natives. Marginal productivity increased for the natives and shifted demand to the right in the labor market, which increased the wage level as a result. The theory by Borjas (1994) demonstrates that an increase in natives' wages will cause more natives to enter the labor market which leads to a rise in natives' employment level. Thus, our results are supported and in line with the article by Borjas (1994).



Furthermore, for 2015, we found a negative effect on the hourly wages and employment for native workers which indicates that immigrants had a substitution effect on natives. This implies that if the share of immigrants increased by 10 percent, the hourly wages for the natives decreased by 4.2 percent at 5% significance level. The employment for natives decreased by 0.9 percent in 2015, when the share of immigrants increased by 10 percent. The coefficient for employment in 2015 was however not statistically significant at a conventional level. There is reason to believe that in 2015, the supply curve in the labor market shifted out to the right for natives, which decreased their hourly wages and employment between the selected years, (see table 2). In Borjas (1996) a similar negative effect was found on the labor market outcome for natives. A possible interpretation for this can be based on a report by OECD (2017) where in 2015, the level of immigration to Germany was one of the highest in history. Registrations showed that 1,091,900 million asylum seekers, contributed to an increased total employment level in the German labor market. Therefore, it can be stated that as total employment increased in the country, native workers employment level decreased because of the wage reduction.

One of the reasons for the substitution effect in 2015, may have been increased supply in Germany due to a large increase in immigration flows in the labor market. The consequence of an increased supply possibly led to immigrants competing for the same jobs as the indigenous workers with equal skills. We thus opined another possible explanation for these results in 2015, which may be that the negative coefficient did not affect natives with high skills as much as the low skilled natives, where the impact was larger in the labor market. In 2015, when immigrants sought asylum in Germany, the majority were very low skilled. The OECD (2017) report showed that 11% lacked any type of formal schooling and 20.5 % had a maximum of four years of primary school.

With these background facts about low skilled immigrants, it did not make sense that low-skilled immigrants should compete with native workers in Germany. Instead, competition took place largely between workers with low-skilled occupations in Germany. Based on that scenario, the analysis would be improved if it was instead divided by different skill groups



and each group of the sample was analyzed separately. It could be that the skills that natives had in qualified professions could affect the results differently, where the same skill groups between natives and immigrants compete with each other. In this case, we took natives' skills levels into account as a control effect. This statement could be reinforced by the theory in Peri (2004) where the article analyzed the different skills group between immigrants and natives.

It is worth noting that in a few years, the effect of immigration on natives' outcome could change in Germany, due to the new immigration law that will come into effect in 2020. The law is supposed to attract more high skilled immigrants to the country, and it remains to be seen how it will affect German natives' wages and employment in the future.

Conclusion

The purpose of this essay was to analyze the extent to which immigration has an impact on natives' wages and employment in Germany. Microdata was obtained from the Luxembourg income study database (LIS) for the years 2005, 2009 and 2015 in order to examine the effect on the outcome variables, natives' hourly wages and employment. The effect of immigration was conducted by cross-sectional data which contained information about German native workers' educational level attainment, in 16 different regions in Germany.

A simplified OLS regression model together with an area analysis, calculated how the share of immigrants in various German regions influence natives, who are divided into five different education levels.

The results from the measures showed that in 2005 and 2009, the share of immigrants had a positive effect on natives' wages and employment. The positive effect indicates that immigrants and natives were complementary to each other.

However, in 2015 a negative effect was found by immigration on German natives' wages and employment. The negative effect of immigration implies that immigrants had a substitution effect on natives.



There is reason to believe that the high level of immigration to Germany in 2015 with about 1,091,900 million asylum seekers, could have contributed to a wage reduction and a decreased employment level for natives.

There are some restrictions in regard to using cross-sectional data since the outcome of immigration only was compared between the three selected years. If instead a longer period of time was analyzed with for instance panel data, the effect of immigration on natives' labor market outcome could have been presented in a more detailed way, with changes over time.



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Appendix

A1: Education levels

International Standard Classification of Education (ISCED) is an organization that qualifies the education level in Europe. The education system in Germany varies from those of other European countries.

Education levels in Germany				
Education		Percent		
		2005	2009	2015
ISCED	Primary education	12,72%	12,23%	13,97%
ISCED	Upper secondary education	51,13%	49,85%	46,21%
ISCED	Post-secondary non-tertiary education	6,54%	8,38%	14,38%
ISCED	Bachelors or equivalent level	7,81%	6,69%	15,51%
ISCED	Masters or equivalent level	21,80%	22,85%	9,93%
Total		100%	100%	100%

Source: LIS database, own calculations



A2: Definition of variables

Explanatory Variables	
Variables	Definition
Share of immigrant	Immigrants include all persons who are defined as immigrants by the data provider. Who define themselves as immigrants are citizens of another country, and were born in another country. Share of immigrants is used as a variable, which is based on the variable immigrant.
Employed	Employed is defined as being an indicator in the current period of any type of employment activity.
Hourly wage	It is a rate for the main or second job's basic hourly wage. The calculations of basic gross hourly wage exclude bonuses, overtime payments, social security payments by employers or family allowances. The variable gross basic hourly wage is further used in a logarithmic form in the data.
Education	The highest completed level of education is categorized into three groups; low, medium and high. The five different levels of education are categorized according to the ISCED. Low: less than secondary education completed. Medium: secondary education completed. High: tertiary education completed.
Region	The household's region of residence at the interview date. The country is divided into administrative division which regions refer to. Germany is divided into 16 different regions.

Source: LIS database

Note: All variables used in this essay are in mean values.