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*Migration touches upon every country,
either as a place of origin, transit or destination,
or as a combination of these.*

The secretary-general of the UN, Ban Ki-moon
Message on international migrants day; 18/12/2009

1. INTRODUCTION

In the whole of human history migration has been an important factor in the life of humans. Even if there are no countries and borders as we know them today people migrated to other landscapes in the hope to find better living conditions than in their home region. Especially with globalisation and a better transport system immigration is also nowadays a hot topic. But now immigrants enter countries with existing economies, which they affect in certain ways.

Some definitions of national and international organisations should first clarify what is meant with the word migration.

“A person’s change of residence is defined as migration. Migrations can occur over variable distances: Depending on whether they cross a border, they are called either internal or international migrants. International Migration includes all changes of residence between foreign countries, thus it is also referred to as external migration.” (Statistik Austria)

“Emigration refers to people leaving a country for long periods or permanently; immigration to people coming in; international migration, or, sometimes, just migration are catch-all terms covering both phenomena [...] A migrant leaves an origin (or sending) country and goes to a destination (or receiving) country.” (OECD)

“Turning to the concept of migration, it is the crossing of the boundary of a political or administrative unit for a certain minimum period of time. It includes the movement of refugees, displaced persons, uprooted people as well as economic migrants... The UN Convention on the Rights of Migrants defines a migrant worker as a *“person who is to be engaged, is engaged or has been engaged in a remunerated activity in a State of which he or she is not a national.”* (Unesco)

This diploma thesis has a special concern for the labour market and immigration. Because immigrants search for jobs in different countries, many natives have the prejudice that migrants will take their jobs from them or have a significant negative impact on their wages. In most of the countries these prejudices are used by politicians to frighten the people and to foster xenophobia.

But the economic theory gives us the opportunity to test, whether such prejudices are really true or if these are arbitrary assumptions. There is a huge literature about this topic in labour economics and one of the most prominent exponents is George J. Borjas. He is the author of many papers and books dealing with labour economics and immigration. Because of this, many of the key assumptions of this thesis are based on his work.

Most of the available literature originates from the findings in the Anglo-American part of the world. No wonder as the most immigrants tend to go to the US, Canada or Australia, as those are the most prominent immigration countries. This will be shown more precisely in the second chapter. But it is clear that also the European countries attract many new immigrants every year and with it also new workers. The special interest of this thesis lies on Austria because it is a highly debated topic in this country. In the literature several models try to explain how immigrants affect the wages and employment opportunities of natives.

The questions to answer are which of the models fits the available data of Austria best and what they predict about how much immigrants can affect the wages of Austrian citizens. To estimate such an effect the thesis distinguishes two different models. The first one goes along the lines of the theory of Borjas (2003), who bases his estimates on the skill-cell approach. The second model is similar to the occupation approach, which is used in the papers of Orrenius & Zavodny (2007) and Steinhardt (2009). The model distinguishes the workers in education, years of experience and occupation groups. All regressions are based on the EU-SILC datasets of the Statistic Austria from the years 2005, 2006 and 2007.

The thesis is structured as follows: Chapter 2 gives an overview on immigration in the world and in Austria with a special focus on the immigration and the labour market itself. Chapter 3 covers the theoretical part of the thesis. It reviews the basic concepts about labour economics and immigration, how immigrants self-select themselves, which approaches are available and what their pros and cons are, further, which variations of models exist to rule out the cons of those. The next chapter explains the available data set for Austria and groups the population in different skill or occupation sets such as the variables and deals with the application of the chosen models.¹ Chapter 5 presents the results; compares them with other papers and also indicates some shortcomings of the analysis. At the end chapter 6 gives a summary of the findings, a conclusion and provides an outlook for further research

¹ All estimations are carried out with the statistical software package 'STATA'.

2. IMMIGRATION IN THE WORLD AND IN AUSTRIA

This chapter gives an overview about recent immigration trends in the world and especially in Austria. It is not only an overview about immigration in general, but should also provide some facts about immigration and the labour market.

2.1. Immigration in the World

The first migration flows in the world can be dated 50 000 to 60 000 years ago. In this period the “homo sapiens” moved from eastern Africa to the Middle East. It is easy to see that migration was always a part of human history, way before political borders emerged. And from that point in time migration of people has been a central theme up until nowadays. (OECD insights, 2009)

In the year 2010 around 214,000,000 people are living outside their home countries, which means that roughly 3 per cent of the world’s population are immigrants, which is less than some parts of the population are assuming. (UN, 2010)

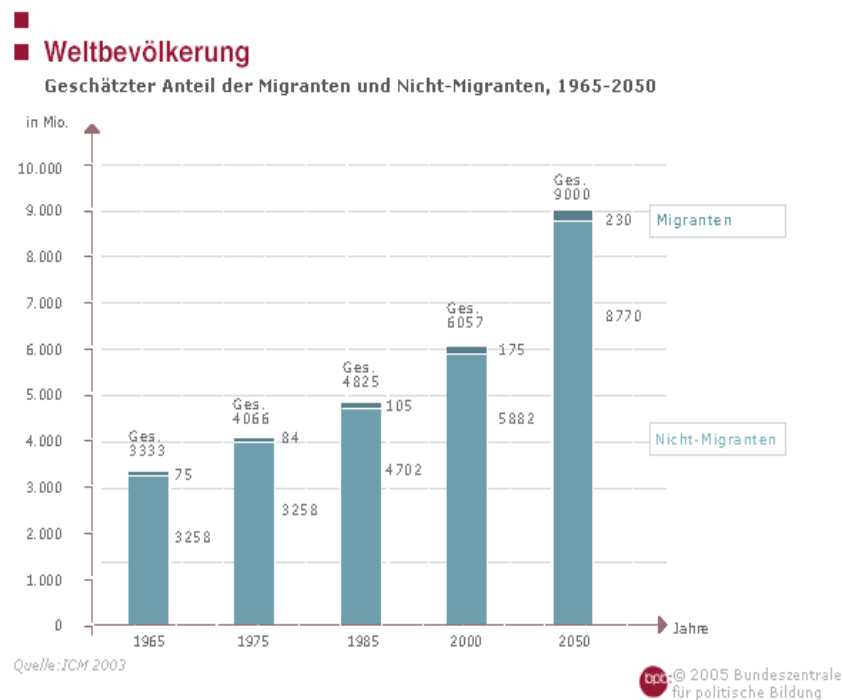


Figure 1: Estimated fraction in the world's population of migrants and non-migrants (1965-2050); source: BPB

Figure 1 shows the fractions of migrants and non-migrants in the world's population in the last years and the estimates for the next forty years. The relative number of migrants in the world is not changing significantly. The migration research has two explanations for this constant fraction of migrants:

- People prefer to stay in their home countries even if they face rough and catastrophic conditions. Most of the time a strong incentive or pressure is needed to force them to migration or escape.
- Migrants are normally not the poor and unskilled part of the population in their home countries. Most of the time they are active people, who are willing to change their lives. The most important part is that they have the financial resources, which are relevant to move from one country to the other one and most of the migrants have familiar or ethnic connections to the host country.

Every year approximately 12 million people migrate (7-8 million of these in industrialized countries), but it is important to note that there is also a number of people who return to their home countries. (BPB, 2009)

The next two tables show how migrants are distributed in the OECD countries. The first one shows, how many migrants chose to live in some of the OECD countries in 2006.² The United States admitted the highest number of immigrants in absolute terms, over 1.2 million. This is even more than the next five biggest receiving countries.

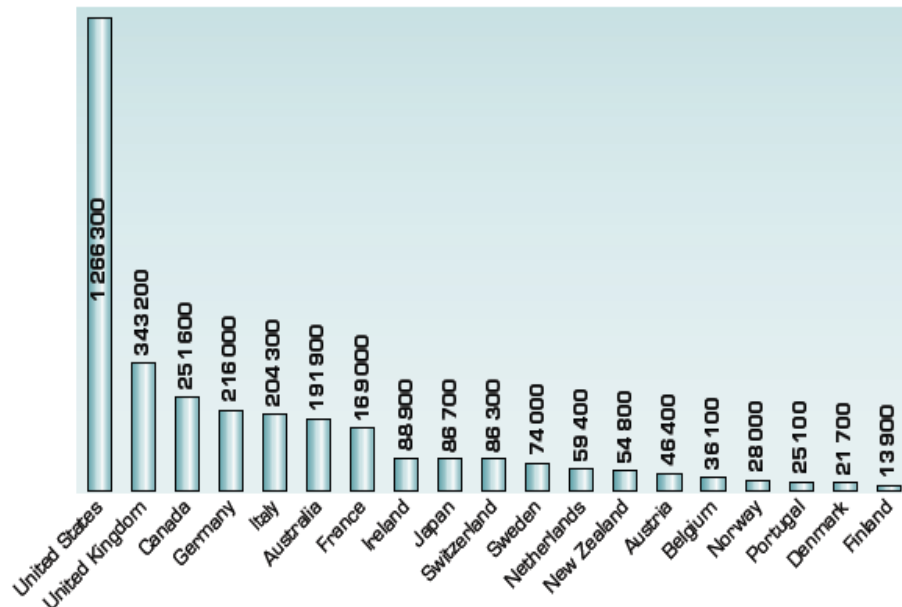


Figure 2: The number of migrants who arrived to live in some OECD countries in 2006; Source: OECD insights

The next figure shows another picture: It gives numbers for the inflows of permanent migrants per thousand people, again in 2006. In this case the US is just above the OECD middle, with 4.2 permanent migrants per thousand people. With 5.6 Austria has even more people, but the highest number of migrants per thousand people has without doubt Ireland with 21.1.

² These numbers concern only legal immigrants.

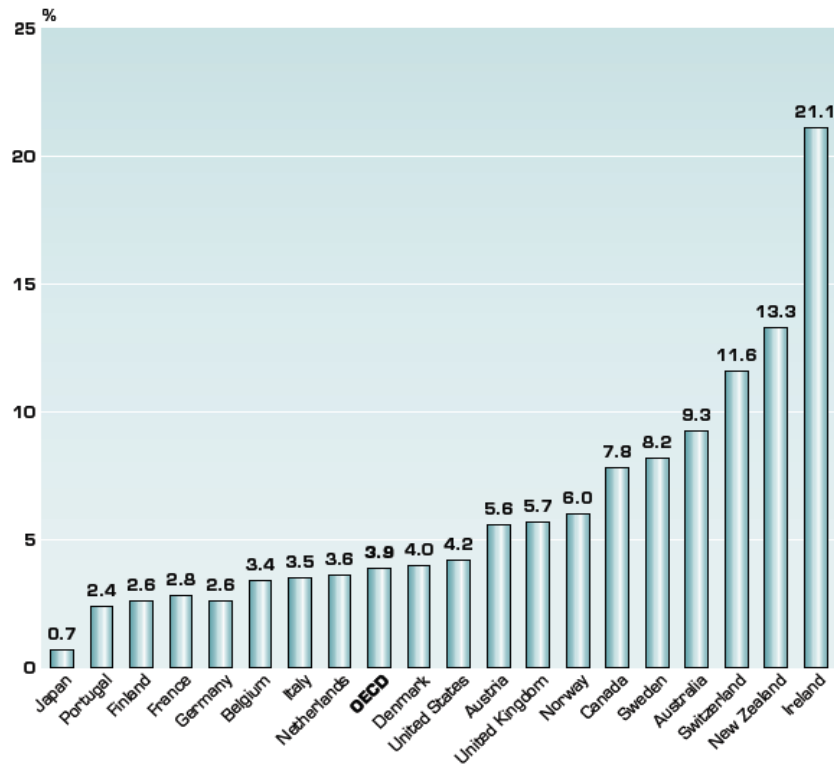


Figure 3: The number of migrants flowing into some OECD countries for every thousand people already in the population in 2006; Source: OECD insights

As these were the inflows of immigrants in the OECD in 2006 a last graph shows the stock of foreign-born immigrants in the OECD countries. The countries which gained the highest amount of immigrants in the years between 2000 and 2006 are Ireland with a 66% increase in the stock of immigrants, Finland with 40% and Austria with 34%. The OECD middle lies at roughly 12 % immigrants in the population. (OECD insights, 2009)

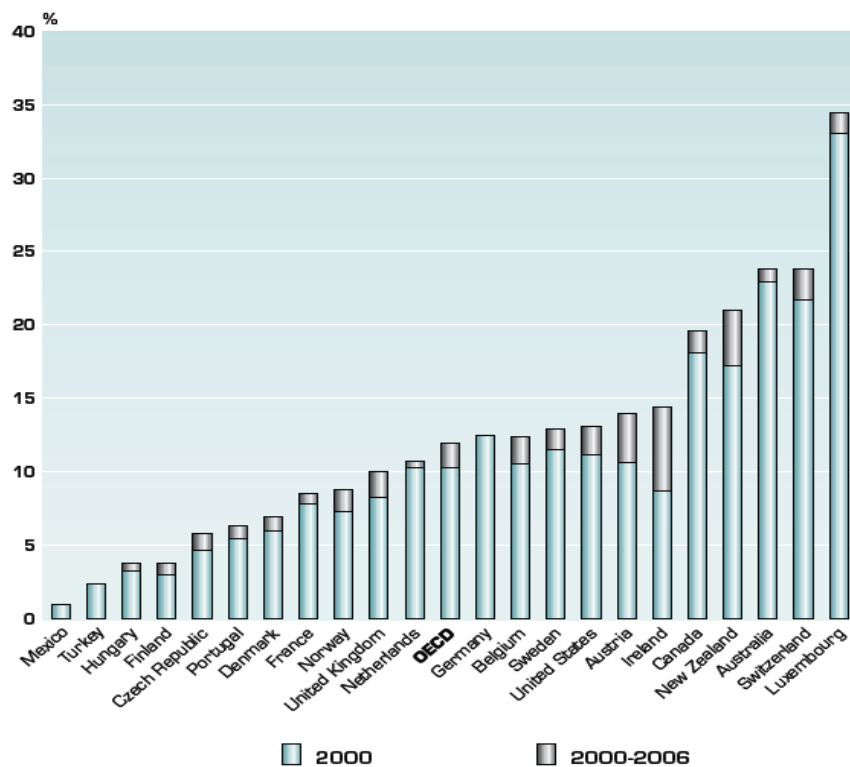


Figure 4: The percentage of the population in some OECD countries that is immigrant; Source: OECD insights

The migrants of the charts above are not a homogenous but rather a heterogeneous group, as most of them are driven by different motives. The following list gives an overview of the different types of immigrants:

Temporary labour migrants: these are workers, who are just moving for a certain period of time.

Long-term, low-skilled migrants: workers, who are appreciated only for a certain amount of time in their host countries, but are still staying there afterwards.

Highly-skilled and business migrants: people who are moving with multinational companies or where hired on the international job market.

Illegal migrants: these are migrants, who arrived without having the necessary documents. These migrants are of course not registered and do not show up in any statistics.

Refugees: The United Nations define these people as people who are not living in their home countries and do not want to return because of a “well-founded fear of persecution”³.

Asylum seekers: they are different from refugees, because they ask for protection only in the host country, but not already in the home or intermediary country. Such claims are often turned-down by the host countries.

Forced migrants: this group could include refugees and asylum seekers but also people who are fleeing from natural disasters and famine.

Family members: those are persons who are following some family members already residing in the host countries or people who are married with or going to marry somebody from the host country.

Return migrants: These are people who are moving back home after a certain amount of time spent abroad. (OECD insights, 2009)

2.2. Immigration in Austria

Austria has always been a country of high immigration and, as the births and deaths are roughly balanced since the 1970s, Austria’s population growth or decline is mostly shaped by migration. (Statistik Austria, 2010)

Two major events mainly affected the inflow of migrants to Austria: First in the post-war and reconstruction period, Austria needed foreign workers to rebuild the industries and cities. In this time period Austria established bilateral guest worker programmes. In the early 1970s Austria already counted over 200 000 foreign guest workers. As the first and second oil crisis influenced the labour market, those workers were not longer needed and the recruitment was stopped. (Bauder ,2006). These workers came especially from Yugoslavia (until 1973: 178,000) and Turkey (until 1973: 27,000). (IOM, 2010)

³ OECD insights, (2009), p.26

The second event affecting the Austrian labour market was the fall of the iron curtain. “Due to its geographical proximity and its historic ties to this region, the stock of migrants in Austria almost doubled in the period from 1989 and 1994.⁴” (Hofer, Huber, 2001).

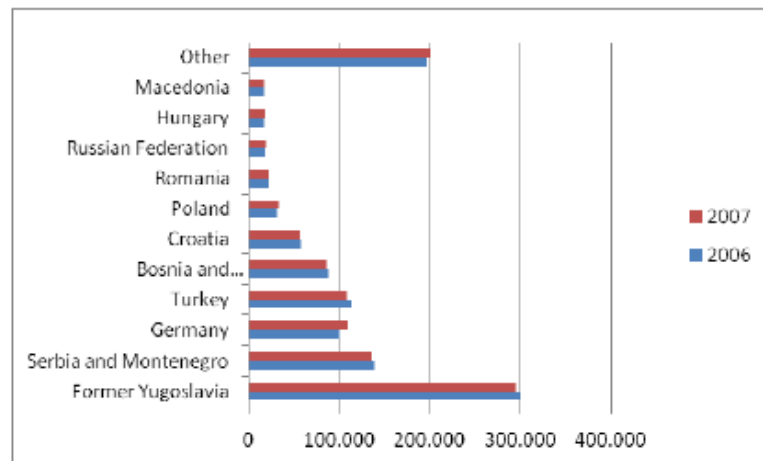


Figure 5: Foreign population in Austria by selected citizenship category 2006 and 2007. Source: IOM

Nowadays 10.7% of Austria’s population are foreigners (1st January, 2010, 895,144). The term foreigner includes people without Austrian citizenship. People with migratory background are 17.7% of the Austrian population (1,468,100)⁵. Because the data of the empirical part of this thesis focus on the period between 2005 and 2007, it is more interesting to look at the given data of this time period. As Figure 5 shows, most of the immigrants residing in Austria arrived from the countries of the former Yugoslavia, which is still a consequence of the worker recruitments in the 1970s. Taking all foreigners from the EU 26, this accounts for 32.7 % of all migrants in Austria in the year 2007 and 37.4% in 2010. The countries of origin of most immigrants in Austria are: Serbia and Montenegro (16.9% of the total immigrants), Germany (13.6%), Turkey (13.4%), Croatia (7.1%) and Poland (4.1%). A very small part of the immigrants come from countries overseas. (IOM, 2010) Immigrants settle predominantly in urban regions and particularly in Vienna. 39% or 13,262 people moved to the capital city between 2007 and 2008. (Statistik Austria, 2010)

⁴Hofer, Huber, (2001), p.1

⁵ Statistik Austria, (2010)

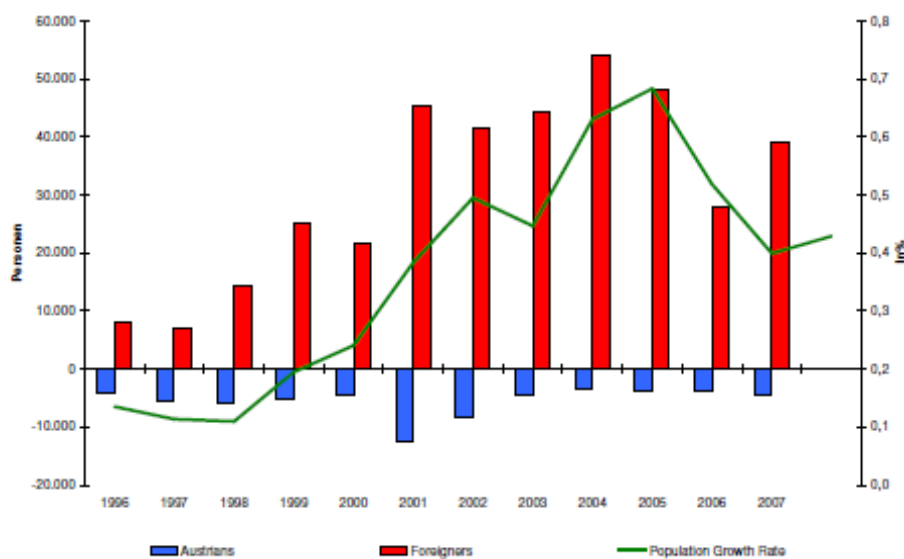


Figure 6: Net migration 1996-2007 in Austria; Source: IOM

As already mentioned before, Austria's population growth is mainly shaped by the net migration, which can be seen graphically on Figure 6. Due to more restrictive immigration policies implemented by the Austrian government, immigration decreased slightly in the years 2006 and 2007. (Statistik Austria, 2010). Because of positive economic performances and the possibility of family reunifications, immigration to Austria is rising again.

“But also the new EU member states not bordering Austria, e.g. Poland, Romania and Bulgaria, find their way into Austria in larger numbers than expected, given transition regulations. This is an indication of the flexible handling of access to the labour market of persons from these regions, giving priority to certain scarce skills on the one hand, thereby ensuring their employment, and to family ties in Austria, thereby promoting their integration into the labour market and society.”⁶(IOM, 2010)

As the thesis gives especially a focus on the labour market it is also important to look at those data. In 2009 the social security data issued the number of 430.547 foreign wage and salary earners. In total employed immigrants make up a percentage of 12. 8 (2008 12.74%) (Hauptverband der österreichischen Sozialversicherungsträger, 2010)

“The administrative data of the Federal Ministry of Labour (permit data) shows that the number of third country citizens in need of a work permit has been declining continuously since the mid 1990s.”⁷

⁶ IOM, (2010)

⁷IOM, (2010)

3. ECONOMICS OF IMMIGRATION

In this chapter the theoretical background about labour economics and immigration is presented. The chapter starts with the comparison between the labour market and the market of immigration, which have some factors in common. Afterwards the question of which persons tend to migrate to which countries will be answered. The last part of the section focuses on the literature of this topic and gives some approaches to measure wage impacts of immigrants.

3.1. The Market of Immigration

In Borjas (1990) immigration is described as a market, a similar one as for goods. This market allocates people, who want to leave their countries, to countries, which are willing to admit them. The market consists of three different players:

- The people who think about leaving their own countries
- The governments which are willing to admit them
- The governments of the home countries of the possible immigrants

Of course all three of them have different objectives with which they enter this market. Once entered the market, everyone follows his/her own strategies to get their ob-

jectives and they interact in this way with each other, generating a given sorting of immigrants.

The potential immigrants are searching for jobs and for countries, which match best with their characteristics and skills. But these people also have to consider further aspects in their decision to migrate. The most obvious facts here are the immigration costs, first the direct costs of immigration, e.g. transportation costs, moving costs and higher costs of living, later also the indirect costs, e.g. psychological costs, when leaving family and friends behind or searching costs of a new job, new house, new schools for their children. The decision to move can be called rational only if the benefits of moving outweigh the costs.⁸ The decision to move is clearly made with the expectation of better earning opportunities, as the possible migrant does not know the real income before moving. It is possible to write that down more formally.

“Consider an individual who anticipates two earnings prospects y_1^* and y_2^* (expressed in present-value terms) under the move ($M = 1$) and stay ($M = 2$) options, respectively, and a one-term anticipate cost of migration c^* . Letting

$$\delta^* = y_1^* - y_2^*$$

$$y^* = \delta^* - c^*$$

the migration decision is carried out according to⁹”

$$M = \begin{cases} 1 & \text{move iff } y^* > 0 \\ 0 & \text{stay iff } y^* \leq 0 \end{cases}$$

where δ^* are the anticipated earnings and c^* is the net of anticipated costs. The individual will move if y^* is positive, which means the anticipated earnings are higher than the net anticipated costs. “Thus $\delta^* > 0$ is a necessary but not sufficient condition for migration to take place.¹⁰”

⁸ This is mainly described in Tunali (2000)

⁹ Tunali, (2000), p. 894

¹⁰ Tunali, (2000), p. 895

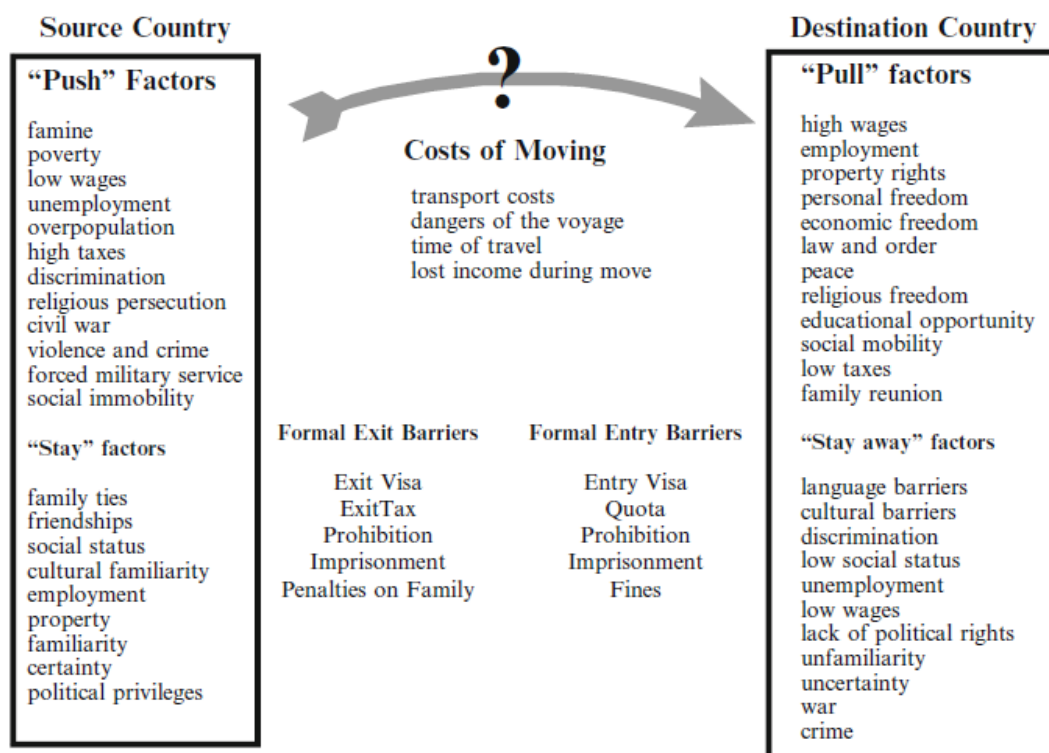


Figure 7: How migrants make their decision; Source: Bodvarsson and Van der Berg

Figure 7 shows some factors which would make people stay at home or to leave their home country. Factors which lead people to migrate can be categorized into "push", such as famine, low wages, unemployment or social immobility in the home country, and "pull" factors, such as high wages, educational opportunities, and low taxes in the host country. "Stay" and "Stay away" factors discourage people to leave their home countries. These could be family ties and friendships at home or language barriers, discrimination and low wages in the host country. The final costs of moving, exit and entry barriers also influence the decision to move or stay. (Bodvarsson and Van Der Berg, 2009)

If this decision is made by an individual, the formula is obviously just comparing costs and benefits. The following section will give a more specific model to clarify this point. If the migration decision is made by a whole family it becomes more complicated: Here we find the concepts of "tied movers" and "tied stayers". "Tied movers" are those persons in a relationship or family which move with their partners to a different country, even if their personal cost-benefit-analysis was negative. This means that their costs of moving would be higher than their benefits, or "tied movers" will earn less in this new area. But they move because the benefits for the whole family are higher than the costs, for ex-

ample if the partner earns much more in the new country. On the other hand, “tied stayers” are persons who refuse to move to another country because the family benefit does not outweigh the costs even if it did for the person himself.

The second player in this market is the potential host country. In this situation we can look at this player like firms in the labour market. The host countries are searching for workers who have the appropriate skills for their economy. They set rules and policies in order to reach the right set of workers who are willing to move in this country. Host countries are characterized by specific economic opportunities. Those can be described as different income distributions, different rewarding of skills and unemployment rates in industrial sectors or the welfare state itself. (Borjas, 1990)

The host countries are not only attracting new workers, but they can also set rules and policies in order to get those workers they really want and who are useful in their economy. In this way they can influence the size and composition of the immigrants.

The last player in this market is the home country. Of course it will try to keep the best workers at home and therefore, like the potential host country, sets certain income and employment opportunities in its economic framework. By regulating the emigration with different policies the magnitude and flow of migrants can also be affected.

In the end you can summarise the market of migration by focussing on the labour market, where different firms try to compete for specific skills and human capital of workers and workers compete for the best income and employment opportunities. Of course we have to include different factors in this decision, when it comes to migration, but at a whole these decisions are similar. We see immigration as the search for better economic opportunities.

3.2. The Self-Selection of Immigrants (Roy-Model)

Roy (1951) describes a selection process especially for income distribution. People can decide whether they want to be hunters or fishers. Who is best at hunting becomes a hunter, who is best at catching fish becomes a fisher. You can also use this simple model to explain how immigrants self-select themselves. The next section will mainly discuss, which

immigrants are migrating and also to which countries. As we can find in Borjas (1994) the immigration flow is not random. Starting with the more formal way, “suppose that residents of country 0 consider migrating to country 1. Assume also that migration decisions are irreversible so that no return immigration occurs.

If they stay:

$$\log w_0 = \mu_0 + \varepsilon_0 ;$$

if they go:

$$\log w_1 = \mu_1 + \varepsilon_1 .^{11}$$

In this case w_0 is the individual wage in the home country and w_1 is the individual wage in the potential host country. The variable μ indicates the population mean for each given country. “The population mean μ_1 need not equal to mean earnings of native workers in the host country. The average worker in the source country, for instance, might be less skilled than the average worker in the potential host country. A worker migrates if

$$I = \log \left(\frac{w_1}{w_0 - c} \right) \approx (\mu_1 - \mu_0 - \Pi) + (\varepsilon_1 - \varepsilon_0) > 0 .$$

where $\Pi = C/w_0$ gives a "time-equivalent" measure of migration costs. A worker migrates to the host country if $I > 0$ and remains in the source country otherwise. The immigration rate is negatively correlated with mean earnings in the source country and the migration costs, and it is positively correlated with mean earnings in the host country.¹²

¹¹ Borjas, (1994), p. 1687

¹² Borjas, (1994), p.1688

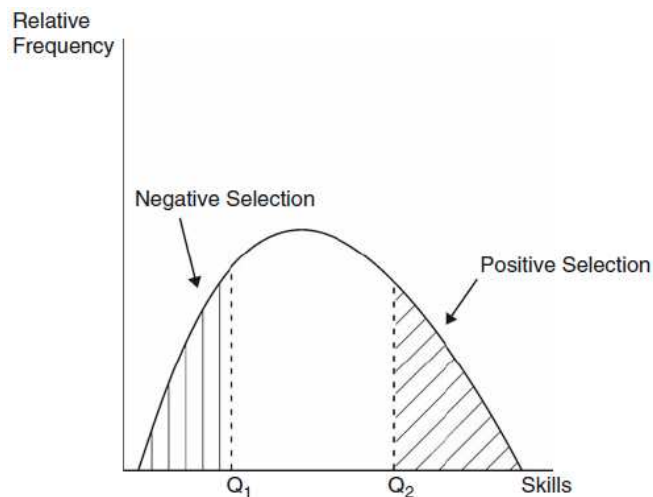


Figure 8: The distribution of worker skills in the source country; Source: Bodvarsson and Van der Berg

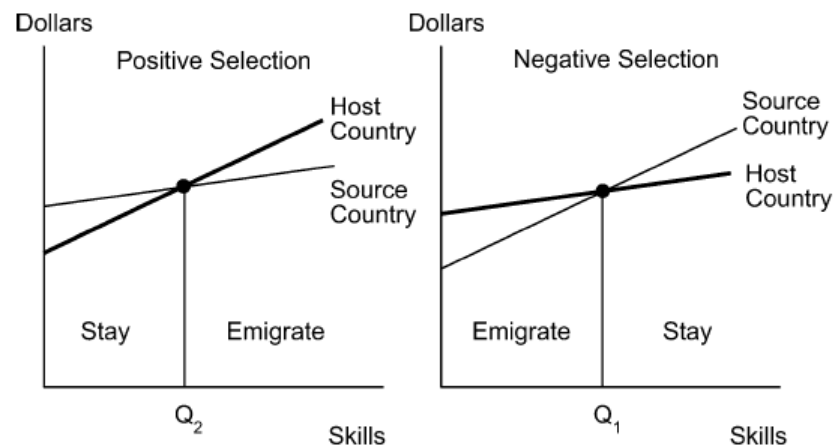


Figure 9: Selection bias in immigrant flows, Source: Bodvarsson and Van der Berg

Figure 8 highlights again, what is meant by positive and negative selection. Positive selection means, that highly-skilled workers tend more to migrate than low-skilled workers, negative selection means the opposite. As the first graph in figure 9 shows, immigrants are positive selected when the return to education in their home countries is less than in the possible host countries. Highly-skilled workers earn less in relative terms in the home country. We can find such possible immigrants especially in Europe in comparison to the US. Borjas (1991) describes for example that the European countries are taxing highly-skilled workers more than the US does. These workers have an incentive to migrate, because in relative terms they are better off moving to the US. The second graph in figure 9 presents the opposite view. If the return to education is higher in the home country than in the possible host country, of course the highly-skilled workers have no incentives to migrate. In

this case we can see a negative selection. In countries where the return to education is higher, especially low-skilled workers tend to migrate, because the host country gives more securities even if their labour market outcome is not the expected one. An example would be Mexican workers in the US labour market. In relative terms the return to education is higher in Mexico than in the US. This means that especially low-skilled Mexicans tend to migrate to the US, because their social system is not catching them, if they failed in getting a job. In this case the US American system is helping them more than the Mexican system.

It is important to mention that the Roy-Model says nothing about the size of the immigration flow. This is explained by the level of immigration costs and the income level of the countries. The Roy-Model can only explain which type of workers tends to migrate to which country. It is also possible to extend the model, by allowing return migration. This can happen because of two main factors:

- The return to the home country was planned right from the beginning. The migrating person wanted to earn enough money in the host country to come back to the home country. This can lead some persons to higher utility levels, as if they stayed in the host country for their life-time.
- The expected outcome (no job opportunities or less income than expected) in the host country was not fulfilled. In this case and as long as the return migration costs are low, the return is the best decision.

3.3. Economic Theory

The main concern of this thesis¹³ is to look at the effect of immigration on the employment opportunities of the natives (including wages and unemployment effects). As in Borjas (1990) we can find that there are two opposing views about migrants in the population.

- One part believes that migrants tend to take the jobs away from natives when they enter the labour market, for example, because they work in the same jobs for lower wages. This is somehow unrealistic as migrants most of the time are low-skilled, so they can not do these jobs.
- The second part of the population assumes that migrants have no impact on the native's job opportunities. In particular they assume that migrants will just do the jobs, which no native worker wants to do. But these assumptions are quite arbitrary: When all immigrants would take the jobs natives would not want to do, the wages for these jobs would rise and then the jobs would also become attractive to native workers.

We look at the “labour market as a closed economy, where a single competitive industry uses a linear homogenous production function to produce Q units of a good¹⁴”. In this case, migrants and natives can have two possible relationships. Whether they are substitutes, which means natives can be easily substituted by immigrants. In such a situation immigrant would have a negative effect on the utility of natives as they lower the wages. Or

¹³ A big part of the literature on the economics of immigration deals with the adaption of immigrants in the host country labour market. As this thesis is not mainly concerned with this topic it will just give some further literature on this topic, for example:

- CARLINER G. 1980, “Wages, earnings and hours of first, second and third generation American males”
- CHISWICK B. 1978 “The effect of Americanization on the earnings Of foreign-born men”
- BORJAS G.J., 1994. "The Economics of Immigration

¹⁴ Borjas, (1994), p. 1696

they are complements, which means they raise “the marginal product of labour¹⁵” (Borjas, 2008). In this case immigrants would increase the utility of natives.

“The elasticity of substitution between comparably skilled immigrants and natives is a critical parameter for assessing the wage effect of immigration. [...] The estimated substitution elasticity is sensitive to whether we use annual earnings or weekly earnings to define wages, whether we focus on men or include women in the sample, and to the extent to which part-time workers are represented in the sample.¹⁶”

Filer (1992) asks two questions to understand the effect of immigrants:

- Are immigrants choosing the cities, where they want to move on the basis, of the same criteria as natives?
- Are immigrants and their skills complements or substitutes to native workers?

Depending on how these questions are answered, one can get four possible results.

1. Immigrants make their moving decisions based on the same criteria as natives and they are complements to native workers, which mean they have a positive effect on the natives’ utility. In this case we have a strong positive correlation between immigrants and natives’ utility. As immigrants prefer the same areas as natives and influence the welfare of natives, even more natives choose to move to this area.
2. Immigrants choose the geographic areas based on other criteria than natives, but they are still complements to native worker. Even here we have a positive correlation between native’s earnings and immigrants but it is not as strong as before, as the immigrants are now not located where the most of natives reside.
3. The mobility decision of the immigrants is based on the same criteria as the native’s decision, but in this case the immigrants are substitutes, which mean that they have negative effects on the wages of native workers. The correlation of the migrant concentration and native’s earnings in this case is undefined. It is not sure in which direction the utility goes.
4. The last possibility is that the decision on the geographic area is based on different criteria and the immigration concentration gives negative utilities for natives.

¹⁵ Borjas, (2008), p. 2

¹⁶ Borjas, (2008), p. 3-5

The correlation here is negative. Even if immigrants choose the settlement on different criteria, once they are settled and have negative effects on natives, some of the natives will also relocate or some natives who wanted to move in this area now revise their decisions.

Of course these assumptions can not hold for the whole population as it is not a homogenous group. For some of the native population immigrants will have a positive effect on their utility, for some a negative one. Some migrants will choose their location on the basis of the same criteria as natives, some not.

In conclusion the literature tends to assume that native and immigrant workers are weak substitutes. It is more likely that immigrants have an adverse impact on the earnings of other immigrants than on the earnings of native workers. (Borjas, 1990)

3.4. The Factor-Proportion Approach

According to the Handbook of Labor Economics¹⁷ “the “factor-proportion approach” compares a nation’s actual supply of workers in particular skill groups to those it would had in the absence of immigration, and then uses outside information on the elasticity of substitution among skill groups to compute the relative wage consequences of the supply shock.¹⁸” We look at different skill cells in the labour market to estimate the impact of immigrants on the employment opportunities of natives.

Okkerse (2008) describes the factor-proportion approach in three steps

1. Estimate the amount and educational composition of immigrated labour.
2. Calculate the percentage growth in the ratio of highly educated to less educated labour attributable to this flow.
3. Assess the potential effect of changes in these skill endowments on earning differentials by education.

¹⁷ Handbook of Labor Economics, Vol 3A, Chapter 28, Borjas 1999

¹⁸ Handbook of Labor Economics, Vol 3A, Chapter 28, Borjas 1999, p.46

To write this in a more formal way we can use the description of Borjas in the Handbook of Labour Economics¹⁹:

“Suppose the aggregate technology in the host country can be described by a linear homogeneous constant elasticity of substitution (CES) production function with two inputs, skilled labour (L_s) and unskilled labour (L_u):

$$Q_t = A_t [\alpha L_s^\rho + (1 - \alpha) L_u^\rho]^{1/\rho}$$

The elasticity of substitution between skilled and unskilled workers is given by $\sigma = 1/(1 - \rho)$. Suppose further that relative wages are determined by the intersection of an inelastic relative labour supply function with the downward-sloping relative labour demand function derived from the CES. Relative wages in year t are then given by:

$$\log(w_{st}/w_{ut}) = D_t - \frac{1}{\sigma} (L_{st}/L_{ut})$$

where D_t is a relative demand shifter.

The aggregate supply of skill group j at time t is composed of native workers (N_{jt}) and immigrant worker (M_{jt})

$$L_{jt} = N_{jt} + M_{jt} = N_{jt} (1 + m_{jt})$$

where $m_{jt} = M_{jt}/N_{jt}$.

The predicted impact of the immigrant supply shock on the relative wage of skilled and unskilled workers equals:

$$\Delta \log(w_{st}/w_{ut}) = -\frac{1}{\sigma} \Delta \log \left[\frac{1 + m_{st}}{1 + m_{ut}} \right]$$

The calculation implied by requires:

(a) the aggregation of heterogeneous workers into two skill groups;

¹⁹ Handbook of Labor Economics, Vol 3A, Chapter 28, Borjas 1999

- (b) the assumption that natives and immigrants within each skill group are perfect substitutes;
- (c) information on the change in the relative number of immigrants for each skill group; and
- (d) an estimate of the relative wage elasticity $(-1/\sigma)$.²⁰

Okkerse (2008) points out two main problems with this approach.

First it is important to mention that an interpretation of the results of this approach is not easy. As all workers are aggregated in some skill groups and it is assumed that these skill groups are perfect substitutes, interpreting the results could be very delusive. Because if they are not perfect substitutes the “depressing effect on wages may be overestimated by the factor proportion approach.”²¹

The second problem is that the factor-proportion approach relies too much on theoretical models. As the main feature of this approach is to work with the elasticities of substitution to describe the effects of immigrants in the labour market and not the impacts on the wage structure itself, the approach is prone to some estimation risks. (Okkerse,2008)

”If the model of the labour market underlying calculations or estimate of the relative wage elasticity is false, the estimated impact of immigration is also false. Nevertheless, much evidence shows that relative supply does affect relative wages and the factor proportion approach is a valuable instrument to gain insights in the wage effects of immigration.”²²

3.5. The Area Approach

The area-analysis approach is one of the most common empirical methods to estimate the labour market effects of immigrants. Borjas, Freeman and Katz (1996) mention that this approach shows only a “slight effect on native outcomes”²³ As we find in Okkerse (2008), we can assume that migrants tend to cluster in one specific area. The area analysis uses this effect to get information about natives and their labour market opportunities. If we find lower wages or higher unemployment in geographic areas with a high concentra-

²⁰ Handbook of Labor Economics, Vol 3A, Chapter 28, Borjas 1999, p.46-47

²¹ Okkerse, (2008), p. 4

²² Okkerse, (2008), p. 4

²³ Borjas, Freeman and Katz, (1996), p. 246

tion of immigrants, we could assume that immigrants have a depressing effect on the labour market opportunities for natives.

“Given an exogenous flow of immigrants to areas that is uncorrelated with levels/changes in native labour supply or labour demand among the areas, and given sufficient time for wages of native workers to adjust to the change in supply, comparisons of wages between immigrant-intensive and non-immigrant-intensive areas should yield valid estimates of the effect of immigrants on native wages”²⁴ (Borjas, Freeman, Katz, 1996)

In a more formal way we can describe this in the following regression model:

$$Y_i = \alpha + X_i\beta + \gamma P_i + u_i$$

Y_i is a measure of labour market performance of some native groups in area i : for instance average wages, participation rates or unemployment rates. X_i is a vector of regional explanatory variables such as population size, population density, average education and age, share of female workers and so on. The key explanatory variable is the proportion of migrants in the regional labour force P_i .

When individual cross-section data are available the regression model can include explanatory variables at an individual level such as educational attainment, age and experience:

$$Y_{il} = \alpha + Z_l\delta + X_i\beta + \gamma P_i + u_{il}$$

Y_{il} is the labour market performance of individual l in area i , X_i and P_i are the same like above and Z_l is a vector of explanatory variables for individual l ²⁵

We find a more simplified model in Borjas (1996):

$$\log w_{ijk} = \alpha (\text{AGE})_i + \beta (\text{EDUC})_i + \gamma \frac{1}{N_k} + e_{ijk}$$

Where w_{ijk} is the weakly earning of person i in education group j in area k . AGE is a vector of age dummies (“18-24”; “25-34”; “35-44”; “45-54”; “55-64”) that trans-

²⁴Borjas, Freeman, Katz, (1996), p.246

²⁵Okkerse, (2008), p.7

forms the data into age-adjusted weekly earnings; EDUC is a vector of dummies for the education group (“high-school dropouts”; “high-school graduates”; “some college”; “college graduate or more”); and $\frac{1}{N}$ measures the ratio of immigrants to natives in the relevant area²⁶.”

But these models could omit some regional fixed variables. As it is described again in Okkerse (2008), if data for more than one year is available, it makes more sense to estimate in first differences. By doing so, we compare the changes in wage or employment with the change of the immigrant fraction. If higher wages depend on other, regional variables, the comparison between changes could avoid these omitted variables. This is especially true if the share of immigrants and wages or employment opportunities are correlated with each other, which means that immigrants choose the geographical area because of better job conditions.

This endogenous problem is one particular shortcoming of this approach. As the OLS estimation needs exogenous variables a solution has to be found to avoid this problem. Here Okkerse (2008) proposes some approaches of different papers. The first one would be to use instrumental variables. But in this case it is hard to find variables which are highly correlated with the concentration of immigrants but not correlated at all with wages or employment. One possible instrument could be the share of immigrants at the beginning of the period. An application of this instrument is possible as we can that immigrants make their settlement decision, apart from on employment opportunities, also on the fact of how many immigrants, especially from the same state or culture, are living already in this area. This assumption is based on the fact that migrants find it easier to catch up in areas where they already know somebody or they can at least talk in their mother tongue.

A second approach to avoid the endogenous problem would be to look at natural experiments, but those are quite unlikely to happen. The most prominent exponent is the paper of Card (1990) where he examines the effects of the “Mariel Boatlift” (Cubans in Miami).

The second main problem of the area analysis is the fact that natives may respond to a high concentration of immigrants by moving away from this area, taking their labour

²⁶ Borjas, Freeman, Katz, (1996), p. 247

and capital with them. This would soften the impact of immigrants on the labour market of this area, because there would be nearly as many workers as before and the equilibrium of the labour market would be maintained, without reducing the wages. Immigrants would still have some effects on the labour market, but not only in the area where they are settling, but on the national area. (Okkerse, 2008) To avoid this problem some authors tried to change the approach from an area analysis to “education, experience and other characteristics.”²⁷ Some of those variations are presented in the next section.

3.6. Variations of the Area Approach

The Area Approach has some shortcomings, which different authors try to avoid in the following variations of the area approach. One of the critical points is the possible response of natives by an immigrant supply shock. The following two models should show how it is possible to circumvent the mentioned problem.

3.6.1. The Skill-Cell Approach

In Aydemir and Borjas (2006), the area approach is altered in a skill-cells experience approach. This means that the authors define different skill groups on a national level. These skill groups are divided into groups with the same schooling and work experience. By defining the skill groups in this way, the assumption holds that workers with the same educational attainment and different levels of experience are imperfect substitutes in the production function. To measure afterwards the impact of immigrants on the labour market by using “the time-variation in the share of immigrants within each skill group”²⁸. The authors split the education groups into five groups:

- high school dropouts
- high school graduates
- workers who have some college education
- college graduates
- workers with post-graduate education

²⁷Ottaviano and Peri, (2006), p.8

²⁸Aydemir and Borjas, (2006), p.8

The experience groups are divided into “years-of experience cohorts by using potential experience, roughly defined by Age – Years of education – 6.”²⁹ The 6 is subtracted because it can be assumed that children start their schooling at this age. The workers are also included in five-year experience intervals, assuming that workers with nearly the same amount of experience have also the same wage outcomes.

“The skill-cells corresponding to educational attainment (s), experience (x) and calendar year (t) define a skill group at a point in time for a given national labour market. Define the immigrant supply shock by:

$$p_{sxt} = \frac{M_{sxt}}{(M_{sxt} + N_{sxt})}$$

where [...] M_{sxt} gives the total number of immigrants in the particular skill group; and N_{sxt} gives the total number of native workers in that group. The variable p_{sxt} then gives the skill-cell-specific immigrant share.³⁰

From this we get the following regression model:

$$y_{sxt} = \theta p_{sxt} + S + X + T + (S \times X) + (S \times T) + (X \times T) + \xi_{sxt}$$

where y_{sxt} denotes the mean value of a particular labour market outcome for men who have education s , experience x and are observed at time t . S is a vector of fixed effects indicating the group’s educational attainment; X is a vector of fixed effects indicating the group’s work experience; and T is a vector of fixed effects indicating the time period. The linear fixed effects control for differences in the labour market outcomes across schooling groups, experience groups, and over time. The interactions $(S \times T)$ and $(X \times T)$ allow for the impact of education and experience to change over time and the inclusion of the interaction $(S \times X)$ implies that the labour market impact of labour supply shocks is identified by using time-variation within education-experience cells. All regressions are weighted by the number of observations used to calculate the dependent variable y_{sxt} . The

²⁹Aydemir and Borjas, (2006), p.11

³⁰Aydemir and Borjas, (2006), p.12

standard errors are clustered by education-experience cells to adjust for possible serial correlation.”³¹

3.6.2. The Occupation-Cell Approach

The second approach doesn’t classify workers in educational skill cells anymore but in occupational skill cells. Orrenius and Zavodny (2007) “use occupation as a proxy for skills”³². To estimate the effect of immigrants on the native wages the authors estimate the following equation:

$$\ln w_{o,s,t} = \alpha + \beta I_{o,s,t} + \gamma X_{o,s,t} + \omega O_o + \sigma S_s + \tau T_t + \varepsilon_{o,s,t}$$

The indexes o, s, t represent the occupational groups, area and time. The dependent variable is the log real hourly wage of natives in a given group. I gives the share of immigrants, X controls for demographic specifications of native-born workers, like female, black and union-members. O controls for the fixed effects of occupation, which are distinguished in the following occupation groups:

- Professionals (executives/managers and professionals such as teachers and doctors)
- Service workers (clerical workers, which include all administrative support workers; sales and service workers)
- Manual labourers (precision production, craft, repair, which consists of more skilled blue-collar jobs, operators, fabricators, and labourers, which are composed of less skilled blue collar jobs; and farm workers.)

Furthermore the variables S and T represents fixed effects for unobservable determinants within an area and time period.³³

It is easy to see that both variations of the area approach are quite similar and are based on the substitutability of immigrants and workers. The following chapters applies these two models on the Austrian labour market.

³¹ Aydemir and Borjas, (2006), p.17

³² Orrenius and Zavodny, (2007), p.7

³³ A similar paper was also written by Steinhardt (2009), examining the wage effects of immigrants in Germany.

4. APPLICATION OF THE MODEL

Because the “Area Approach” has some shortcomings, as mentioned before, the skill-cell approach by Borjas (2003), which was also explained in the previous chapter, is used in this thesis. To give a broader view an application of the occupational-cell approach as in Orrenius and Zavodny (2007) will also be included.

The data used for the application of the model come from the “Statistik Austria EU-SILC” data set from the years 2005 (1844 data points), 2006 (2120 data points) and 2007 (2306 data points). The dataset is limited to these three years, because of the availability of data. The EU-SILC data are available for the years 2003 until 2007. But as in the first two years persons were not asked for their monthly wages (which are the dependent variable in this thesis), it was necessary to exclude this years from the sample, because yearly earnings are not as specific as monthly earnings. Only the data of the full-time employed population is used. The age of the sample lies between 16 and 64. People are classified as immigrants if their nationality is not Austrian, all the other persons are classified as natives.

In this chapter the impact of immigrants on the wage of native workers in Austria during the years 2005 to 2007 will be examined, beginning with the model of Borjas (2003), in which the wage is explained by the share of immigrants in the different skill groups. The second approach will follow to estimate this effect using occupation-experience groups.

4.1. *The Skill-Cell Groups*

To establish the different skill-cells it is important to clarify how the educational attainment and the proxy for experience look like. As the Austrian education system is very complex it is hard to classify the population in different schooling groups. Because of this the years of schooling were used as the schooling variable. The approach from Borjas (2003) who distinguishes the single educational attainments in the following groups, calculating them by the age of the last achieved education, was inserted here:

- High school dropouts (less than 17 years old)
- High school graduates (between 18 and 19 years old)
- Some college education (between 20 and 23 years old)
- College graduates (older than 24 years)

To group the population in different work experience groups the variable of how many years the persons were engaged in the labour force was needed. As this variable is already in the data set it is easier to have a reference for labour experience. Borjas estimated this experience by subtracting years of schooling plus six years from the age. In this case it would have been necessary to exclude women from the regression, because most of the time women have less years of work experience because of staying at home and taking care of children. As the maximum experience is 49 years, five experience groups of ten years each were distinguished in the thesis. This approach is based on the fact that “workers in adjacent experience cells are more likely to influence each other’s labour market opportunities than workers in cells that are further apart³⁴” Borjas (2003).

The different skill groups are then defined by the educational attainment (s), the experience (x) and the time period (t). As also stated in the theoretical part of the thesis, the immigrant share in a particular skill group at a certain time is calculated in the following way:

³⁴ Borjas, (2003), p.9

$$p_{sxt} = \frac{M_{sxt}}{(M_{sxt} + N_{sxt})}$$

As noted in the previous chapter, M_{sxt} gives the number of immigrants in a particular skill group, N_{sxt} the number of natives and p_{sxt} should describe the share of immigrants. The immigrant shares for the years 2005 until 2007 lies on average between 6.53% (2005) and 7.32% (2007). The following table shows the average monthly earnings of natives in the different skill cells in the years 2005 to 2007, in brackets we see the percentages of immigrants in the specific time and skill group and the data points of every group.

Education	Years of Experience	2005	2006	2007
High-school dropouts	1-10	1073.93 (14,55% of 110)	920.95 (18,66% of 134)	944.77 (16,58% of 169)
	11-20	1627 (17,57% of 73)	1647.61 (21,79% of 78)	1796.41 (15,38% of 77)
	21-30	1997.59 (12,2% of 90)	1915.10 (21,36% of 102)	1874.87 (4,7% of 107)
	31-40	1810.50 (8,2% of 61)	2105.01 (6,85% of 73)	2144.34 (8,57% of 80)
	41-50	2080.85 (10,05% of 19)	2720.83 (3,85% of 26)	2357.66 (4,17% of 20)
High school graduates	1-10	1752 (5,5% of 253)	1695.42 (3,93% of 279)	1726.40 (6,3% of 274)
	11-20	2131.93 (4,17% of 263)	2125.36 (5,3% of 302)	2232.52 (8,92% of 305)
	21-30	2254.50 (5,22% of 287)	2407.24 (4,41% of 340)	2442.36 (3,95% of 379)
	31-40	2461.73 (1,79% of 167)	2359.05 (2,83% of 212)	2685.20 (4,56% of 223)
	41-50	2302.38 (0% of 13)	2121.59 (0% of 23)	2941.56 (2,94% of 26)
Some college education	1-10	2000.35 (6,06% of 66)	1967.42 (5,63% of 71)	1924.36 (8,04% of 104)
	11-20	2254.34 (2,99% of 67)	2542.98 (6,33% of 79)	2528.94 (8,26% of 78)
	21-30	2767.25 (4,34% of 69)	2976.77 (5,55% of 72)	3050.64 (3,7% of 69)
	31-40	3073.92 (0% of 23)	3679.47 (0% of 34)	3493.92 (7,69% of 33)
	41-50	5750 (0% of 2)	3900 (0% of 2)	4149.01 (0% of 8)
College graduates	1-10	2530.41 (7,4% of 53)	2501.59 (6,9% of 58)	3035.03 (10,75% of 83)
	11-20	3383.46 (9,78% of 92)	3326.47 (3,23% of 93)	3448.55 (8,22% of 119)
	21-30	3104.19 (2,77% of 72)	3308.18 (5,32% of 94)	3718.57 (2,54% of 106)
	31-40	3358.34 (2,08% of 48)	3977.93 (0% of 38)	3224 (5% of 37)
	41-50	3229.54 (0% of 8)	3270.29 (0% of 10)	3426.20 (0% of 9)

Table 1: Log monthly earnings of native workers grouped by skill cells.

Share of immigrants and the given data points in the specified skill groups given in brackets

It is interesting to note that immigrants are mainly situated in the first two skill groups (high-school dropouts and less than 20 years of work experience). In this case they show a much higher density than on average. The percentages lie between 14.55 % (high-

school dropout, less than 10 years of experience, 2005) and 21.79% (high-school dropout, between 10 and 20 years of experience, 2006). The most striking fact is that in some skill-cells there are no immigrants, especially those with more years of experience and higher school degrees, for example high-school graduates and between 41 and 50 years of experience (2005), or, college graduates and between 31 and 40 years of work experience (2006). But it has to be mentioned that in those cases there were not that many natives either, because it is nearly impossible to have a college degree and more than 40 years of work experience.

Another interesting fact is that the immigrant share is also higher for college graduates than for the groups with only some college education or high school degree. And at least for the first ten years of experience, those percentages are always higher for college graduates. This leads to the conclusion, that there are also some young, highly educated migrants

The equation used for the estimation, taken out from Borjas (2003), is as follows:

$$y_{sxt} = \theta p_{sxt} + S + X + T + (S \times X) + (S \times T) + (X \times T) + \xi_{sxt}$$

The dependent variable is the log monthly wages and in a different regression also the log yearly income of the native workers. p_{sxt} represents the share of immigrants in the specific skill cells. As already described in the theoretical part the other variables are the fixed effects of schooling (S), years of experience (X), time (T) and the cross-terms of each other. This leads to the following first results:

	Dependent variables			
	log monthly wages of native male workers	log monthly wages of native male and female workers	log yearly income of native male workers	log yearly income of native male and female workers
Share of Immigrants	-0.8488249** (0.1935017)	-0.7807038** (0.1506854)	-1.022026** (0.2675023)	-0.9922995** (0.213492)
Education	0.4019673** (0.0238153)	0.3579813** (0.0198339)	0.4452117** (0.032932)	0.4071551** (0.0281178)
Experience	0.2899345** (0.0204716)	0.275324** (0.0172448)	0.3610341** (0.0282753)	0.3587064** (0.0244317)
Time	0.0545759 (0.0279313)	0.0475049 (0.0232242)	0.0867742 (0.0386207)	0.1003457** (0.0328851)
Education* Experience	-0.0622241** (0.0061049)	-0.0472158** (0.0052652)	-0.0706224** (0.0084332)	-0.0570683** (0.0074594)
Education*Time	-0.0140638 (0.0087323)	-0.0105954 (0.0072958)	-0.0176822 (0.0120641)	-0.0165384 (0.0103299)
Experience* Time	-0.0198016** (0.0070736)	-0.0200179 (0.0060134)	-0.0263819* (0.0097733)	-0.0308303** (0.0085124)
constant	6.513461** (0.0757883)	6.499883** (0.0618231)	8.841516** (0.1047682)	8.77991** (0.0876017)
R ²	0.3127	0.3116	0.2440	0.2345

Table 2: Coefficients of the variables in the different regression approaches for the skill cell model. Standard deviation of the coefficients given in brackets

Table 2 represents the coefficients of all variables with the associate standard deviation. It clearly shows that there are some major differences between the impact of the share of immigrants on monthly earnings and yearly income. However monthly wages are more precise, because yearly incomes can also refer to time periods, where the workers were unemployed or were engaged in other occupations. The interesting fact is that the inclusion of the female workers is actually lowering the impact of immigrants. One of the main reasons could be that women with migration background are not as engaged in the labour market as native women. To give a broader view the following results will always be given for male workers and both male and female workers. The impact of estimation biases for women's

wages is expected to be small, as the years of experience are stated by the interviewed persons and are not subject to some estimation as it is the case in some other papers.

Borjas (2003) shows an easier approach for a better understanding of this coefficient. “By converting it to an elasticity that gives the percent change in wages associated with a percent change in labour supply Let $m_{s,x,t} = M_{s,x,t} / N_{s,x,t}$ or the immigrant-induced percentage increase in the labour supply of group (s, x, t) . We define the “wage elasticity” as:

$$\frac{\delta \log w_{sxt}}{\delta m_{sxt}} = \frac{\theta}{(1 + m_{sxt})^2} \quad \text{„35}$$

For the year 2007 this means that the wage elasticity of the monthly earnings for male worker averages -0.73. In other words, with a 10 percent increase in immigrant workers the monthly wages of male native workers will be reduced by 7.3%. If we take all native workers into consideration the monthly wages will be reduced by 6.7%. As the workers are split up by education, it shows that the coefficient of the variable “share of immigrants” is highly positive for persons with high-school degree. On the other hand it is the lowest for persons with only some college.

Another possibility to estimate the immigrants’ impact on the wages would be to modify the regression slightly. Instead of the cross-term $(X \times T)$ the variable X^2 is introduced to catch the impact of years of experience more precisely. In this case the impact of immigrants would be estimated with a coefficient of -1.117839 for male, native workers and -1.091796 for all native workers. In terms of wage elasticity this will equal a reduction of 9.6% or 9.4% respectively.

A last variation of the previous model can be done by using the log share of immigrants instead of the absolute numbers of the share. In this case the coefficient of the “share of immigrants” for male native worker would be -0.0469553. Including also female workers gives a coefficient of -0.0544288.

³⁵ Borjas, (2003), p.14

	Dependent variables			
	log monthly wages of native male workers (substituting Ex- perience*Time by Experience ²)	log monthly wages of native male and female workers (substituting Ex- perience*Time by Experience ²)	log monthly wages of native male workers (substituting share by log share)	log monthly wages of native male and female workers (substituting share by log share)
Independent variables	Share of Immigrants	-1.117839** (0.1906388)	-1.091796** (0.1504702)	-
	log share of Immigrants	-	-	-0.0469553** (0.0155018)
	Education	0.3842869** (0.0234679)	0.3460171** (0.0196266)	0.4242739** (0.0243295)
	Experience	0.5477142** (0.029173)	0.497161** (0.0253008)	0.3203075** (0.0213423)
	Time	0.0007204 (0.0210956)	-0.0047464 (0.0175298)	0.0672937 (0.0288301)
	Education* Experience	-0.0618608** (0.0060054)	-0.0484313** (0.0052087)	-0.0685968** (0.0069147)
	Education*Time	-0.0139733 (0.0085895)	-0.0103198 (0.007215)	-0.0156464 (0.0088453)
	Experience* Time	-	-	-0.0240161** (0.0075169)
	Experience ²	-0.0566553** (0.0048062)	-0.050936** (0.0042926)	-
	constant	6.359341** (0.0684989)	6.385848** (0.0561308)	6.237486** (0.0738116)
	R ²	0.3349	0.3266	0.3106

Table 3: Coefficients of the variables in the different regression approaches for the skill cell model, including log share of immigrants and Experience². Standard deviation of the coefficients given in brackets

4.2. The Occupation Groups

The occupation groups are distinguished in three categories, like in the papers of Orrenius and Zavodny (2007) and Steinhardt (2009). As “Statistik Austria” divides the occupational activities in ten categories, they are summarised here in the following three groups:

- Professionals (politicians, executives/managers and academics)
- Service workers (clerical workers; sales and service workers and qualified personal)
- Manual labourers (precision production, craft, repair, operator, fabricators, and labourers, farm workers and soldiers.)

In the paper of Steinhardt (2009) the occupation groups are also connected with the work experience of the native workers. Those experience groups will be the same as in the skill-cell groups, which means that there are five experience groups including ten years each as well. Experience and education were introduced as well to have a better comparison between the two models and it better represents the skills of each workers. The following table should represent the average monthly incomes of native workers distinguished by occupation groups and years. The number in brackets shows the share of immigrants in the specific occupation group.

Education	Years of Experience	Occupation	2005	2006	2007
High-school dropouts	1-10	Professional	0	1446.29 (100% of 1)	0
	11-20	Professional	1201.29 (0% of 1)	1000 (100% of 1)	2400 (0% of 1)
	21-30	Professional	3896.05 (33.33% of 3)	2624.76 (0% of 2)	1307.33 (0% of 3)
	31-40	Professional	0	6107.8 (0% of 1)	0
	41-50	Professional	0	4500 (0% of 1)	0
High school graduates	1-10	Professional	4612.21 (0% of 2)	1850 (0% of 2)	2292.84 (0% of 5)
	11-20	Professional	2614.08 (0% of 15)	2723.56 (0% of 9)	2443.38 (11.11% of 9)
	21-30	Professional	3780.72 (5.56% of 18)	3775.82 (0% of 18)	3208.21 (0% of 20)
	31-40	Professional	2887.95 (0% of 9)	3809.15 (0% of 18)	3835.16 (6.25% of 16)
	41-50	Professional	5200 (0% of 1)	2300 (0% of 1)	3689.98 (0% of 2)
Some college education	1-10	Professional	2335.81 (0% of 13)	2260.24 (0% of 9)	1738.03 (10% of 10)
	11-20	Professional	2784.23 (7.14% of 14)	3043.38 (4.35% of 23)	3140.49 (10% of 20)
	21-30	Professional	3230.08 (0% of 25)	3397.47 (6.45% of 31)	3646.55 (4% of 25)
	31-40	Professional	3153.65 (0% of 5)	4004.95 (0% of 13)	4576.75 (0% of 8)
	41-50	Professional	10000 (0% of 1)	0	3500 (0% of 1)
College graduates	1-10	Professional	2776.23 (0% of 23)	2761.64 (9.1% of 33)	3292.59 (7.69% of 39)
	11-20	Professional	4030.59 (8.7% of 46)	3713.01 (4.26% of 47)	4139.55 (4.84% of 62)
	21-30	Professional	3980.9 (4.35% of 23)	4143.2 (2.94% of 34)	4633.72 (0% of 52)
	31-40	Professional	4342.41 (0% of 17)	4607.45 (0% of 19)	4023.49 (0% of 13)
	41-50	Professional	3950 (0% of 2)	4145 (0% of 1)	5013.67 (0% of 2)

Education	Years of Experience	Occupation	2005	2006	2007
High-school dropouts	1-10	Service Workers	1186.29 (13.33% of 45)	966.03 (23.73% of 59)	839.7 (17.57% of 74)
	11-20	Service Workers	1611.42 (11.54% of 26)	1923.22 (20% of 25)	1895.22 (4.35% of 23)
	21-30	Service Workers	2433.55 (8.57% of 35)	2100.82 (11.11% of 54)	2186.93 (4% of 50)
	31-40	Service Workers	1739.44 (4.17% of 24)	2326.87 (0% of 28)	2281.03 (0% of 38)
	41-50	Service Workers	2237.73 (11.11% of 9)	2643.23 (0% of 16)	2354.72 (0% of 11)
High school graduates	1-10	Service Workers	1692.57 (5.41% of 148)	1693.31 (2.75% of 182)	1720.68 (7.43% of 175)
	11-20	Service Workers	2173.29 (2.14% of 140)	2215.06 (3.3% of 182)	2368.09 (5.95% of 168)
	21-30	Service Workers	2276.55 (2.8% of 143)	2427.20 (3.89% of 180)	2537.56 (2.83% of 212)
	31-40	Service Workers	2709.91 (0% off 95)	2420.64 (0% of 107)	2815.19 (0.92% of 109)
	41-50	Service Workers	1675 (0% of 4)	2413.96 (0% of 8)	3213.75 (0% of 14)
Some college education	1-10	Service Workers	1935.40 (2.22% of 45)	1914.93 (5.88% of 51)	2020.86 (3.9% of 77)
	11-20	Service Workers I	2168.71 (0% of 35)	2511.25 (4.55% of 44)	2471.58 (6.97% of 43)
	21-30	Service Workers	2665.14 (0% of 51)	2877.02 (3.13% of 32)	2937.58 (2.7% of 37)
	31-40	Service Workers	3515.72 (0% of 11)	3889.57 (0% of 16)	3212.4 (11.11% of 18)
	41-50	Service Workers	0	3900 (0% of 2)	4632.02 (0% of 6)
College graduates	1-10	Service Workers	2321.06 (14.81% of 27)	2269.85 (4.35% of 23)	2803.97 (9.52% of 42)
	11-20	Service Workers	2803.90 (10.53% of 38)	3186.84 (2.78% of 36)	2778.97 (11.11% of 45)
	21-30	Service Workers	2730.83 (2.44% of 41)	2966.54 (8.16% of 49)	2938.13 (2.5% of 40)
	31-40	Service Workers	2964.03 (4.17% of 24)	3651.76 (0% of 15)	2761.72 (6.25% of 16)
	41-50	Service Workers	3321.84 (0% of 4)	3351.12 (0% of 7)	2936.45 (0% of 5)

Education	Years of Experience	Occupation	2005	2006	2007
High-school dropouts	1-10	Manual Labourers	994.26 (15.38% of 65)	889.25 (13.51% of 74)	1023.9 (14.74% of 95)
	11-20	Manual Labourers	1648.77 (21.74% of 46)	1513.17 (21.15% of 52)	1728.66 (22.64% of 53)
	21-30	Manual Labourers	1603.20 (13.46% of 52)	1570.65 (34.78% of 46)	1598.28 (11.11% of 54)
	31-40	Manual Labourers	1860.03 (10.81% of 37)	1843.09 (11.36% of 44)	2000.05 (14.29% of 42)
	41-50	Manual Labourers	1941.41 (10% of 10)	2653.66 (11.11% of 9)	2361.71 (11.11% of 9)
High school graduates	1-10	Manual Labourers	1778.8 (5.83% of 103)	1696.14 (6.32% of 95)	1705.23 (4.26% of 94)
	11-20	Manual Labourers	2002.95 (7.41% of 108)	1915.75 (9% of 111)	2018.58 (15.62% of 128)
	21-30	Manual Labourers	2004.42 (7.94% of 126)	2197.64 (5.63% of 142)	2187.42 (6.8% of 147)
	31-40	Manual Labourers	2004.83 (4.76% of 63)	1955.44 (6.9% of 87)	2337.55 (8.16% of 98)
	41-50	Manual Labourers	2253.87 (0% of 8)	1941.78 (0% of 14)	2410.82 (0% of 10)
Some college education	1-10	Manual Labourers	1699.75 (37.5% of 8)	1955.82 (9.1% of 11)	1560.08 (11.76% of 17)
	11-20	Manual Labourers	2025.42 (5.56% of 18)	1575.33 (16.67% of 12)	1906.54 (6.67% of 15)
	21-30	Manual Labourers	1926.74 (23.08% of 13)	1838.25 (11.11% of 9)	1588.97 (0% of 7)
	31-40	Manual Labourers	2322.71 (0% of 7)	2160.89 (0% of 5)	2800.88 (14.29% of 7)
	41-50	Manual Labourers	1500 (0% of 1)	0	1900 (0% of 1)
College graduates	1-10	Manual Labourers	1200 (0% of 1)	1150 (0% of 2)	2543 (50% of 2)
	11-20	Manual Labourers	2315.64 (12.5% of 8)	2075.72 (0% of 10)	2177.14 (8.33% of 12)
	21-30	Manual Labourers	2560.04 (0% of 8)	2200.69 (0% of 11)	2289.36 (14.29% of 14)
	31-40	Manual Labourers	2264 (0% of 7)	2210.81 (0% of 4)	2729.86 (12.5% of 8)
	41-50	Manual Labourers	2324.48 (0% of 2)	2550 (0% of 2)	3063.11 (0% of 2)

Table 4: Log monthly earnings of native workers grouped by education, experience, years and occupation
Share of immigrants and the given data points in the specified skill groups given in brackets

Table 4 represents the log monthly incomes of native workers split into education, years of experience and occupation. Again the share of immigrants in each group is represented in brackets.

The first notable fact in this table is that there are no professional high-school dropouts, which is obvious, as you need specific education to get those jobs. Most immigrants who are engaged in professional occupations have at least some college education or are even college graduates. The share of immigrants in each occupation groups varies over time, which could again be due to the data set, as in some groups only a few people were interviewed. The highest share of immigrants can be found in the occupation of manual labourers. This is again in line with the skill-cell groups, as many of them can be found in the sector of high-school dropouts. In the year 2006 for example we can even find a share of 34% of immigrants in the occupation-skill group of high-school dropouts with 21 to 30 years of experience and manual labourers. Having such a detailed classification of workers makes it more likely that workers in given groups are substitutes.

The second approach of this thesis summarizes all available information and grouping workers by education, years of experience, occupation and time. This led to the following regression:

$$y_{soxt} = \theta p_{soxt} + S + O + X + T + (S \times X) + (S \times T) + (X \times T) + (S \times O) + (X \times O) + (T \times O) + \xi_{soxt}$$

In this case the variables have again the same meanings as before, including also occupation. The regression of the variables leads to the following results for the coefficients:

	Dependent variables			
	log monthly wages of native male workers	log monthly wages of native male and female workers	log yearly income of native male workers	log yearly income of native male and female workers
Share of Immigrants	-0.5631458** (0.14364)	-0.6757905** (0.1210803)	-0.6998158** (0.2027869)	-0.8750422** (0.1739436)
Education	0.3679088** (0.0332029)	0.4299024** (0.0278962)	0.407582** (0.0468731)	0.4834347** (0.0400733)
Occupation	-0.0824222 (0.0462937)	0.1195948** (0.0399674)	-0.0927818 (0.0653595)	0.1237874 (0.0574191)
Experience	0.3862638** (0.0341923)	0.4292899** (0.029469)	0.4429375** (0.0482726)	0.4952239** (0.0423375)
Time	0.064039 (0.0478549)	0.0723372 (0.0399466)	0.1237443 (0.0675507)	0.1237874* (0.0574191)
Occupation* Experience	-0.0350417** (0.0094011)	-0.0572529** (0.0083774)	-0.0301591 (0.0132667)	-0.0513864** (0.0120317)
Occupation* Education	-0.0060786 (0.0103691)	-0.0373197** (0.0092967)	-0.0060707 (0.0146323)	-0.0399376** (0.0133489)
Occupation*Time	-0.0007449** (0.012756)	-0.0092116 (0.0112398)	-0.009046 (0.0179996)	-0.0188377 (0.0161333)
Education* Experience	-0.0664264** (0.006469)	-0.0584664** (0.0056878)	-0.0729437** (0.0091327)	-0.0662246** (0.0081715)
Education*Time	-0.0135669 (0.0093557)	-0.0125556 (0.0079463)	-0.0201665 (0.013208)	-0.0216159 (0.011407)
Experience* Time	-0.0212476** (0.0067071)	-0.0189139** (0.0058348)	-0.0281407** (0.0094634)	-0.0297065** (0.0083723)
constant	6.769061** (0.1431444)	6.231589** (0.118032)	9.123012 (0.2020925)	8.502703** (0.1695576)
R ²	0.3800	0.3514	0.2887	0.2591

Table 5: Coefficients of the variables in the different regression approaches for the occupation-skill cell model. Standard deviation of the coefficients given in brackets

In comparison with the results before the most striking fact is that the coefficient has again a negative sign, which means that the share of immigrants have once again a negative effect on the working force of natives. But this time it isn't as high as in the first approach, where workers were just grouped into skill-cells. In this situation an increase of the share of immigrants by 10% would lead to a decrease in male native worker wages by 4.84%. This is much less than the first regression shows. For all workers this reduction would be 5.8%. The interesting fact is that in this case the inclusion of women in the regression leads to a higher reduction in wages by immigrants as in the skill-cell approach. Such an effect could be due to a general underestimation of wages for women in different occupations.

5. RESULTS

The range of the results are rather similar. The effect of the share of immigration varies from nearly -10% to -6%. From a statistical viewpoint it is difficult to decide which of the models is approaching reality the best. All coefficients (except of “time” and “edutime”) were significant with a p-value of 0. As the highest adjusted R^2 was obtained by the second model (just slightly) and the effect of the share of immigrants sounds plausible it is more likely that this model reflects the real effect the best.

The following chapter is divided into three different parts. The first part deals with the differences between the used models and specifies why there are such differences between the estimated effects of the share of immigrants on the wages of native workers.

In the second part the results obtained are compared with the results of other papers. Even though the papers focus on other countries an application to Austria should produce results that are within a certain range around the results of those from other authors. The obtained results will also be compared with results of other Austrian authors.

The third part gives some shortcomings of the models especially of the given data. As the data set was limited it would produce better outcomes on the topic including more and better datasets.

5.1. Skill-Cell Approach vs. Occupation-Cell Approach

The previous chapter showed that the two approaches lead to rather similar outcomes, even though some differences were located. But why do we find such differences? To recall the facts from the previous chapters it is important to outline the differences between the approaches.

The skill-cell approach originates from the idea to eliminate the endogenous problem from the area approach, which was mentioned before. Workers have the possibility to self-select themselves into different areas. This means that they can, up to a certain degree, decide where to go. If people are selected into skill-cells there is no self-selection, because at the moment you can choose a job or an area to work, but your education is already determined.

The occupation-cell approach at the other hand tries to avoid shortcomings, which were found in the skill-cell approach. For example that there are “differences in the quality and relevance of education and experience acquired abroad also make skilled immigrants less substitutable for skilled natives³⁶” or “skill transferability, the degree to which immigrants can use human capital acquired in their home country at [host country] jobs, tends to be higher for unskilled jobs than for skilled positions³⁷”. Because of these shortcomings the approach uses occupation as a proxy for skills.

Exactly those reasons produce again a coincidence of the occupation-cell approach with the area approach. Workers are able again to choose between jobs and industries. This leads once more to an endogenous problem, as workers base their decisions on different factors, for example how well the industry works. Because of this, it is probable that the regressions overestimate again the positive effect of the share of immigrants on the wages of native workers.

³⁶ Orrenius and Zavodny, (2007), p.7

³⁷ Orrenius and Zavodny, (2007), p.7

5.2. In Comparison with Others

Because the results are rather similar it makes sense to look at the original papers to compare the results and see if the obtained ones are lying within a certain range. But it is important not only to compare the results with the papers, which used the same model approaches but also with other estimations of the effect of immigrants in Austria.

The first focus lies on the paper of Borjas (2003). He obtained a value for the coefficient of the share of immigrants of -0.606 and a wage elasticity of -0.42. As his paper focused on the skill-cell approach it is necessary to compare his numbers with the first model of this thesis. With the coefficient of -0.849 and a wage elasticity of -0.73 the effect of immigrants nearly doubled. This means that immigrant would have a greater impact on the wages of natives in Austria than in the US. To compare this also with Canada it is possible to use the data results of the paper of Aydemir & Borjas (2007). As this papers shows only weekly and annual earnings, it is better to compare annual earnings with each other, but also here there is a huge difference between the wage elasticity of -3.9% for Canada and -8.78% for Austria.

To compare the occupation-cell approach it is necessary to look at the papers of Orrenius & Zavodny (2007) and Steinhardt (2009). The first paper also shows a positive correlation between wages of native workers and the share of immigrants. But the positive effect regards only highly skilled workers whereas for lower skilled workers it has a negative impact. This sustains the assumption that immigrants are more likely to be complements than substitutes for native workers. The second paper shows a slight negative effect of immigrants on native wages, which is also in the line of the results.

The last comparison of the results is made with three Austrian papers. Because the approaches show some differences, it is plausible to give a short introduction to each paper before comparing the results. The first paper from Hofer & Huber (2001) is based on data from 1991 to 1994. Workers are classified into different regions and sectors. Overall immigration shows a slight negative effect but is not significant at a 10% level. "An increase in the share of foreigners in a particular industry by one percentage point reduces the wage

growth of blue-collar workers by 0.2 percentage points over the time period. This effect, however, is only marginally significant.”³⁸

The paper of Winter-Ebmer & Zweimüller (1996) focuses on wage effects of immigration on young (under 31) native workers in Austria. The empirical analysis is based on human capital variables and the share of immigrants in a region or an industry. “At the regional level, a 1% increase in the share of foreign workers increases earnings by 2.2-3.7%, at an industrial level between 0.2 and 1%.”³⁹ Those results are different to both models used in this thesis, as there are measured no positive effects.

A second paper of Winter-Ebmer & Zweimüller (1995) focuses more on the effect of immigration in combination with international trade on the length of unemployment of native Austrian workers. It concentrates on the period 1988 to 1991 to examine the effect of the fall of the iron curtain on Austria. The empirical analysis is based on the social security data base of 2% of the blue collar workers under 57. The results show that an increase of the immigrant share by 1 % leads to a significant increase of the duration of unemployment by 4 to 6 days. Even if the thesis deals with wage effects rather than employment effects, the comparison still shows that in both cases there is a slight but negative effect of immigration.

5.3. Shortcomings

Regarding models and data, there are some shortcomings, which are important to note in order to put the obtained results into perspective. The dataset was in some specification very good, for example it was not necessary to estimate years of work experience, as persons from the data set were asked for it, in other points it had some lacks. The dataset was just composed for five years and even in those five years the dataset was not congruent, which lead to a cut out of the first two years 2003 and 2004. It would have been necessary to get more years, as all other papers have at least 20 years of data to compare with each other. In this case it also makes more sense to put a time trend into the regression, which was somehow obsolete when the regression only runs over three years. The dataset

³⁸Hofer & Huber, (2001), p.13

³⁹ Winter-Ebmer & Zweimüller, (1996), p.477-478

was also too small in comparison with the datasets of the other papers, as in their countries a higher percentage of the population was included.

The shortcomings of the models were for example the rather arbitrary arrangements of educational groups. Some distortions of the model can also be produced by using the age, when the highest education was acquired, be the proxy for education. Especially concerning immigrants it is hard to distinguish at what age someone has a specific education. In some countries you get the high-school graduation at 18 in some at 19 and it could also be the case that someone needed more time to get a high-school graduation.

Another fact, which is related to the prior one are the proxies for education and work experience. It can be argued, as also seen in Borjas (2003), that acquired education and years of experience in a foreign country are not the same as in the home country. It is possible that degrees of foreign countries are not recognised in Austria or years of experience in a foreign country are not as highly valued by companies as years of experience in the home labour market. Because the dataset did not include for how many years people had stayed in Austria and if the highest education was achieved in Austria or another country, it was not possible to adjust the variables.

Another interesting fact would also have been to take into account persons with migration background or illegal immigrants. For the first aspect “Statistik Austria” now provides some data, but surely not enough to include this fact in the regression models as well. The later aspect of course can’t be included as there is no real information about illegal immigrants and taking into account illegal immigrants had lead to an even bigger problem including the whole black market, which is not manageable.

6. CONCLUSION

This thesis gave an overview of economic literature about immigration and analyzed the effect of immigration on the wages of native workers in Austria. As immigration is an important topic in every modern political environment it was interesting to find out which real effect immigration has on the wages of native workers. The large amount of literature on this topic constituted a good base for the empirical work in this thesis.

Austria has a crucial geographical and historical background because immigrants account for over 10 percent even if only three percent of the world's populations are migrants. The need of foreign workers in the 1960's and the brake down of the iron curtain in 1990 strongly enlarged the amount of immigrants in the Austrian society. Nowadays Austrians population growth is mainly shaped by the net migration. The percentage of immigrants in the Austrian labour market is about 12.8%.

The literature on this topic suggests that immigrants have a slight but insignificant effect on the wages, but also on the unemployment length and employment possibilities of native workers. These findings of course depend on the used approaches. The thesis analysed the existing literature on this topic, described some of the most prominent models to examine wage effects and tried to find the best approach to estimate the wage effects of immigrants in Austria.

The data used in this thesis for calculations came from “Statistik Austria” and included the time period between 2005 and 2007. Even though the data set contained important numbers, for example the work experience and the monthly wages, it also lacked some facts, which would have been useful for this thesis, especially concerning migrants and their stay in Austria. With this data set it was tried to answer the main question in this thesis, the effect of immigrants on native wages. To give a broader perspective on this fact, different approaches were used.

The first model, the skill-cell approach, showed a negative effect of immigrants on wages, to be more precise, a reduction of 6.7% on native wages when the share of immigrants increased by 10%. The second approach introduced also the variable “occupation” and split the workers in Education-Occupation-Experience groups, which gave a high classification of the work groups. The results in this case showed a slight negative effect of immigrants on native wages. A 10% increase in the immigrant share led to a decrease in monthly wages by 5.8%.

The results showed that the findings of these papers are in line with other papers examining wage effects in the US and in Austria. The differences between the approaches are quite similar, but the classification also into occupation tends to give a better view on the wages and possible wage effects than only education, especially as some higher education is not acknowledged in Austria.

Some improvements and further research can be done in this area. As the shortcomings already suggested the approaches and the data set struggle with problems, which could be reduced or even cancelled in further researches. Three ideas should be mentioned, which could help to get an even better overview of the effects of immigrants on wages.

- The data set can be improved, especially concerning data on immigration. Important questions about this topic should be asked. How long are persons already staying in Austria? Where did they conclude their education? Which work experience was achieved in Austria, which in other countries? Did they already have relatives in Austria or not? Was it job offers which led to migration or were there other factors? Such questions could give a better view of immigrants and could help to better examine the wage effects. A longer time period of data would have been desirable too.

- The approaches showed some shortcomings, for example the arbitrary arrangement of the education groups. An idea for further research could be to also include the different industry sectors, which has been done by Hofer & Huber (2001).
- A third improvement could be to examine the effects of immigration on the Austrian welfare state. Are immigrants more likely to be unemployed than natives and do they receive more or less unemployment benefits? How much tax are they paying? How are they influencing the host economy? Such research could give a better overview in this topic.

Immigration is and will be an important topic in Austria. Further research in this sector is necessary and will hopefully be done soon.

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APPENDIX A: ABSTRACT

English:

Immigration is an interesting and largely debated issue in modern society. Because of that fact, this thesis gives an overview of data and facts about immigration in the world and in Austria. The next step is to provide an overlook of the existing literature on this topic with a special concern on immigration and the labour market. The concepts of immigration as a market and the Roy-Model on self-selection of migrants are discussed. The main part of the thesis deals with the question of the effect of immigrants on the wages of native workers. After the main approaches, namely the factor-proportion approach and the skill-cell approach were explained and discussed; the empirical part tries to answer the question about the size of the wage effects of immigrants in the Austrian labour market. The used “EU-SILC” data set is from “Statistik Austria” and covers the period between 2005 and 2007. Two different models were used to examine the wage effect, the skill-cell approach and a variation of the occupation-cell approach. The results show different effects, namely a decrease in monthly wages by 6.7% with an increase of the immigrant share of 10% using the skill-cell approach and a decrease of 5.8% using the occupation-cell approach. As the results are so rather similar the thesis also provides a comparison with other papers and an explanation of possible shortcomings.

Deutsch:

In der heutigen Gesellschaft ist Immigration ein interessantes und heiß diskutiertes Thema. Aus diesem Grund beschäftigt sich diese Diplomarbeit mit dem Thema der Immigration und gibt einen Überblick über Daten und Fakten zur Immigration in der Welt und in Österreich. In einem zweiten Schritt wird die Literatur zu diesem Thema diskutiert und dabei ein spezieller Fokus auf Immigration und Arbeitsmarkt gelegt. In diesem Teil werden die Konzepte von Immigration als Markt bzw. des Modells nach Roy zur Selbst-Selektion von Immigranten präsentiert. Der Hauptteil der Arbeit beschäftigt sich mit der Frage, welchen Effekt Immigranten auf das Einkommen von Einheimischen haben. Nachdem die wichtigsten Konzepte zu diesem Thema, der “Factor-Proportion Approach” und der “Skill-Cell Approach”, erklärt wurden, versucht der empirische Teil der Diplomarbeit die Frage zum Einkommenseffekt von Immigranten in Österreich zu beantworten. Hierfür würde der „EU-SILC“ Datensatz der “Statistik Austria” herangezogen, welcher den Zeitraum zwischen den Jahren 2005 und 2007 abdeckt. Zwei verschiedene Modelle wurden verwendet, um diesen Einkommenseffekt zu bemessen, nämlich der „Skill-Cell Approach“ und eine leichte Abänderung des „Occupation-Cell Approach“. Die Resultate zeigen ähnliche Einkommenseffekte und zwar eine Verringerung des monatlichen Gehaltes eines Einheimischen von 6,7% bei einem Zuwachs von 10% Immigranten beim “Skill-Cell Approach“ und eine Verringerung des monatlichen Gehaltes von 5,8% beim „Occupation-Cell Approach“. Da die Ergebnisse ähnlich sind, bietet diese Diplomarbeit auch einen Vergleich zu weiteren Artikeln und eine Erklärung zu möglichen Defiziten dieser Arbeit.

APPENDIX B: CURRICULUM VITAE

Name:

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Education:

October 2005 to July 2010: Studies of Economics at the University of Vienna

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June 2005: Matura (84 of 100 points), Realgymnasium Bozen, Italy

Language Skills:

German: mother tongue

Italian: First foreign language; fluent in speaking and writing skills

English: Second foreign language; fluent in speaking and writing skills

Spanish: Third foreign language; intermediate in speaking and writing skills