

12-2014

Assimilation of foreigners in Germany

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ESSAYS ON IMMIGRANT ASSIMILATION
IN GERMANY

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Economics

by
Jan Schiebler
December 2014

Accepted by
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ABSTRACT

The first chapter of this dissertation is using data from the German SOEP panel, and I analyze the assimilation of immigrants in terms of initial wage gap and assimilation rate. The analysis consists of a basic assimilation model, a cohort model, and a source country specific model. The source country specific model allows us to distinguish assimilation rates for different groups of immigrants. I find that despite having the highest education of all immigrants, East European immigrants have the largest wage gap. Secondly individuals immigrating from former East Germany have a larger wage gap than immigrants from Italy and Turkey. For East Germans I find little evidence of assimilation.

In the second chapter of this dissertation is using data from the German SOEP panel, and I analyze the assimilation for immigrants in terms of initial wage gap and assimilation rate under self-selection. This paper extends the first paper by taking employment probabilities into account during the estimation process. I find that initial wage gaps in general are larger but also relative orderings between different countries of origin are different. A negative and significant lambda leads me to believe that a self-selection problem was present and was corrected by a Heckman self-selection model applied in the analysis section of this paper.

DEDICATION

I dedicate this dissertation to my grandmother Traute Schiebler, who was unable to finish her own dissertation due to the war and my grandmother Ingrid Konopacki-Konopath who has been a great spiritual inspiration throughout my whole life.

ACKNOWLEDGEMENT

I would like to thank my advisor Dr. Robert Tamura for his invaluable help and support. I would also like to thank the members of the International workshop who greatly contributed to my dissertation. Also, I am very grateful to my parents for their constant support and encouragement. Special thanks to Miren Ivankovic for his guidance and help.

Many thanks to my classmates and friends who helped me on my journey, especially Kashema Rock, Anne Anders, Martin Richenhagen, Michael Lucas, Yannik Maden and Domenique Maden.

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CHAPTER 1

Assimilation of foreigners in Germany

1.1 Introduction

When immigrants decide to migrate into a new country they often lack knowledge specific to the labor market in that new country. They start out with a wage disadvantage, but as they live in their new host country they acquire skills necessary to succeed in their new host country and their wage adapts to that of natives. This process is called assimilation by economists and has been the center of discussion when it comes to immigration policy. As economists one of the main subjects we are concerned with are incentives, in this case the incentive for a particular individual to decide which country to migrate to. Kahanec and Zimmermann (2010) point out that the immigration of highly skilled labor and their proper management and incentivisation is of key importance for Europe. Chiswick and Miller (2009) argue in a similar direction for the U.S. and also find that high skilled immigrants are not very well matched to high skilled jobs leading them to lower income and efficiency of the labor market.

In this paper three different model will be applied to better understand assimilation in Germany. The first model is the basic assimilation model that is based on the work of Chiswick (1978) and has found a lot of attention in the assimilation literature. The second model is a cohort model where the different performance of different entrance cohorts are considered that is based on the

work of Borjas (1985). The last model is a source country specific model where immigrants from each source country have their own assimilation rate and own entry wage gap. The model for this part of the analysis is based on an extension of the Ben-Porath (1967) model of human capital accumulation.

1.2. Literature Review

The literature of economic assimilation of foreigners started with a paper by Chiswick (1978) in which he finds that immigrants start out with a significantly lower income compared to natives but catch up quickly, and even exceed natives after 10 to 15 years of residence. For this paper the 1970 and 1980 cross sections of U.S. 'public use' samples were used. Research immediately following the work by Chiswick [Carliner(1980), DeFreitas(1980), Long(1980) and others] confirmed his findings by using essentially the same model and estimation method. In Chiswick's model the years since migration variable was considered the assimilation rate and the explanation for the high initial wage gap and the fast wage catch-up afterwards was that immigrants lack host country specific human capital such as language, knowledge of business practices, and conventions etc. Each year an immigrant spends in the host country, he acquires country specific skills and thus his income increases. Of course the wage of natives also increases over time, as they gain more experience, but the wage of immigrants grows faster, captured by the years since migration variable. Some papers also

argue that only a selected group of people decide to immigrate into a new country, and that this group is more ambitious and works harder compared even to the average person in their new host country. [Carliner(1980), Topel (1991)]

Borjas (1985) is the first to extend the basic model by Chiswick, and he introduces the idea of cohort effects which mean that immigrants immigrating in different time periods have different quality levels and thus different assimilation rates and entry wage gaps. His analysis also led to a different view on assimilation rates themselves and also on the size of the assimilation rate and it suggested that the rates estimated by Chiswick and others were overstating the true effect. His claim was that different cohorts during different time periods were of different quality, and more recent cohorts were of lower quality compared to those entering the country before and thus had a larger wage gap.

Borjas (1994) finds that the wage of successive cohorts in the U.S. continued to decline throughout the 1980's and the entry wage in the 1980's was 9% below that of the 1970's and the 1990's was an additional 6% lower. He also finds little evidence that immigrants ever reach income parity with natives. Even though the wage increases around 10% during the first two decades the starting point is too far away to converge. He concludes that immigrants stay around 15 to 20 percentage points below that of natives. He also especially points out that Mexicans and Asians seem to have an especially hard time to assimilate economically.

Card (2005) finds in his paper, that second generation immigrants assimilate especially well. This confirms earlier findings by Borjas (1993) and others who have done research into this aspect of assimilation theory. It seems reasonable as second generation immigrants have enjoyed the same education as their domestic counterparts. When they enter the labor market, despite some possible exceptions, they already speak the language and have the same or similar starting conditions compared to natives and thus also perform very comparably. In fact, Borjas (1992) found that second generation immigrants do better than natives in the US. There is still a negative wage gap at the beginning of the career but the second generation immigrants catch up quickly and overtake domestics of the same cohort after roughly five years. Algan(2010) on the other hand did not find this for Germany, France and the UK. However the gaps were lower than those of first generation immigrants, but there still was a gap compared to natives and they never seemed to fully catch up. In his study he focuses particularly on the UK who seems to have the largest wage gap in regards to first and second generation immigrants. He also finds that France has some immigrant groups where second generation immigrants do worse than first generation immigrants.

When it comes to outmigration rates, Borjas and Bratsberg (1996) find “substantial variation across origin countries” exists, meaning that different source countries have different remigration rates. They also find that Belgium has the highest remigration rate and, more interestingly, that the amount of

remigration depends on the selection that generated the immigrant flow in the first place. Further more immigrants are more likely to return to their home when it is not far away and not poor. Dustman (2000) finds that immigrants who want to return to their home country from the start are investing less into their new host countries specific human capital. And if we assume that mainly successful immigrants stay and unsuccessful ones return to their country of origin, the number of successful immigrants increases over time. This is one of the reasons why it is important to identify country of origin specific assimilation rates.

Friedberg (2000) finds in her paper that for Israel, human capital does not transfer very well for immigrants that enter Israel and she also finds that the entry wage gap of immigrants is 25% in comparison to their comparably skilled counter parts.

1.3. Data

The data used for this paper is from the German Socio-Economic Panel (SOEP) and covers the years 1984 to 2011. The SOEP is a German equivalent of the U.S. longitudinal survey and it is a nationally representative longitudinal survey with approximately 13,000 households and 25,000 individuals over the course of the 27 years of data. The variables I am using for my analysis are income, age, schooling, work experience, country of origin and years since migration.

The sample I am using for the analysis contains 154,119 individual observations of males between 25 and 65 who are fully employed and live in former West Germany, since only about 1% of all foreigners live in former East Germany. Also only fulltime employed individuals are considered, since it is uncertain for what reasons people are unemployed. If I were to include some measure of unemployment into my analysis, I would probably overestimate the effect, since a good portion of the sample are probably unemployed because they chose to be and the data does not indicate if a person is looking for a job or not.

The income used is monthly real income where 2006 Euros is the base year. The data also had a variable for weekly income data but it had too many missing or unreasonable observations so I decided to use the monthly income data. This income variable is gross income, which we are also more interested in, because when looking at economic assimilation of foreigners and domestic we are mainly interested in nominal wages rather than their after tax earnings, which could be greatly influenced by capital holdings or tax write offs etc.

For a later part of the analysis I also created country of origin (or region) specific dummy variable for Spanish/Portuguese, Italian, Turkish, Yugoslavian and east- and Westeuropean immigrants. Years since migration is calculated by subtracting the immigration year from the survey year.

The average immigrant has been in Germany for 19.44 years, and the average age at migration is 21.5 in Germany. Turkey with 27% and Italy with 16% of all immigrants are the two biggest immigrant groups in Germany. Traditionally Turkish immigrants, especially in the 1960's and 1970's were guest workers whose occupational choices were limited to blue collar jobs according to the contract between Germany and Turkey. The agreement ended 1974 and the Turkish guest workers were given the choice between returning to Turkey or staying in Germany without occupational limitations afterwards. Many of the Turkish guest workers decided to stay and they are now the biggest minority in Germany. According to the Statistisches Bundesamt¹ 6.75 Million foreigners lived in Germany of which are 1.73 Million Turks and 535,000 Italians. Turkish immigrants seem to be represented pretty well by the data, but Italians seem to be over represented since they only account for roughly 8% of the immigrant population but make up 16% in the data. This could either be because they are over represented in the data set or because of the fact that only male, working population is considered, and it is possible that a higher Italian population percentage falls into this category. Of the immigrant population 24% have acquired German citizenship, which is also in line with the German average.

The data also include a variable for being East German as of 1990. Individuals labeled as East Germans went to school in East Germany and spent their life there until the reunification. Also included is a years since moving to

¹ Equivalent to U.S. Census Bureau

West Germany for whom it applies. This variable is used to measure the labor market exposure of East Germans in West Germany and how they assimilate. So with the dummy and the years spent in West Germany, a comparison can be made to other foreigners, and we can compare the assimilation rates and wage differential levels.

Table 1 gives a summary statistic of the data. The average years since migration in the data set is 19.4 years, which is below the national average of 24 years, but that is not surprising since individuals 65 years and older are excluded from the data. The average age at migration is 21.5 years since only first generation immigrants are considered here. 24% of the immigrants have acquired the German Citizenship and about 27% of the immigrants are from Turkey; the largest immigrant population in Germany. 16% of immigrants are from Italy and also 16% from Eastern Europe. 15% are from former Yugoslavia and 8% from Portugal and Spain.

1.4. Conceptual framework and estimation

1.4.1 The basic model

The first basic model goes back to Chiswick (1978) and Borjas (1985) and is mainly there to give us a basic benchmark for later models. Its predictive powers are limited but yet give us a good starting point. In this first model we want to test the hypothesis that during different times the gap between immigrants and natives is not constant and also the assimilation rate is different.

This could be for different reasons like macroeconomic conditions or a change in the quality of immigrants. Generally we do however expect that immigrants start with a lower wage than natives and assimilate over time. This initial negative wage gap is due to the fact that they have not yet acquired the necessary country specific human capital. This means that they have a lower starting wage but their wage increases over time as they acquire skills including language, knowledge of country specific customs, etc. Another reason for the initial wage disadvantage of recent immigrants is information asymmetry due to the fact that employers have less information on the productivity of a recent immigrant compared to a native born with similar schooling and other characteristics. It is more costly for the employer to verify the quality of the schooling and the general quality of the worker. So he takes on a larger risk due to quality uncertainty by hiring a recent immigrant since the employer has to invest into on the job training and in Germany due to restrictions on firing people. This process could be lengthy and costly for the employer in Germany. We do however expect immigrants to have positive assimilation rates. As they spend time in the country they acquire country specific skills and learn the language and the quality uncertainty diminishes over time.

The model takes the form:

$$\log w_i = \beta_0 X_i + \beta_1 I_i + \beta_2 ysm_i + \epsilon_i \quad (1)$$

where w_i is the monthly wage of individual i in the host country; X_i is a vector of socioeconomic characteristics including age, years of schooling etc.; I_i is a dummy variable indicating if individual i is an immigrant; and ysm_i gives the number of years individual i has lived in Germany and this is set to 0 if individual i is a native. Since the vector X_i controls for age and schooling, β_2 measures at what yearly rate foreigners assimilate to natives.

1.4.2 Cohort model

The cohort model is an extension of the basic model introduced by Chiswick (1978). I estimate the following OLS regression:

$$\log w_i = \beta_0 X_i + \beta_1 C_i + \epsilon_i$$

(2)

where w_i represents the monthly income of person i ; X_i is a vector of socioeconomic characteristics including age, schooling etc. C_i is a dummy that indicates that person i belongs to a specific immigrant cohort. This first basic cohort model only looks at the level differences between immigrant cohorts at the time of entry. It does not allow for different assimilation rates. In the second part of the cohort model analysis we now allow the assimilation rates to vary across cohorts and giving us a better picture of the economic performance of different cohorts. Borjas (1995) found a decreasing cohort quality over time for the U.S.

His claim is that since the 1960's when many immigrants from Cuba immigrated, following cohort were of lower quality and thus had lower assimilation rates than earlier cohorts. In this section I estimate the following OLS regression:

$$\log w_i = \beta_0 X_i + \beta_1 C_i + \beta_2 C_i YSM_i + \epsilon_i$$

(3)

where w_i represents the monthly income of person i : X_i is a vector of socio economic characteristics including age, schooling etc. C_i is a dummy that indicates that person i belongs to a specific immigrant cohort. $C_i * YSM_i$ is an interaction term between the different cohorts and years since migration. β_2 represents the different assimilation rates of the different arriving cohorts. In most studies of cohort effects multiple cross sections are considered which pose an identification problem since it is not possible to separately identify the effects of assimilation, cohort differences and macroeconomic effects without posing some restrictions on those relationships. In the assimilation literature, when using cross sectional data the standard assumption is that macroeconomic effects impact natives and immigrants in the same way. With this restriction macroeconomic effects have the same impact on natives and immigrants and thus assimilation and cohort effects are fully identified. It appears as if panel data has an advantage over cross sectional data in this matter, but the problem with panel data is that it could possibly introduce a time effect bias. That means it is impossible in a panel dataset to distinguish between assimilation, cohort and

time effects which leads us to the identifying assumption that time effects are the same for immigrants and natives. However, as Lalonde and Topel (1990) point out, this assumption of same time effects for natives and immigrants can be tricky. In their study they find that the earnings distribution in the U.S. has widened in the 1970's and 1980's leading to a higher wage growth at the top and lower wage growth at the bottom of the earnings distribution. However the earnings distribution in Germany has remained constant in the observation period and 20 years prior, so it is unlikely that this restriction will be an issue in this analysis.

1.4.3 Source country specific assimilation model

One of the draw backs of the cohort model is that the immigrant composition is not constant over time, and it is in fact changing. It cannot be determined if a different entry wage of, for example, the 1996 – 2000 arrivals and the 2001 – 2005 arrivals is due to macroeconomic conditions, or different skill levels or simply a different immigrant composition and thus the entry wage difference would be driven by wage premium differentials between different source countries.

The model used for the analysis in this section is based on the Ben-Porath (1967) model of human capital accumulation and considerations of Borjas (2000, 2013). It is a two period lifecycle model where an immigrant arrives with K units

of human capital that he acquired in his source country. However, only a fraction of the workers human capital is useable in the new host countries labor market. There are two depreciation factors used here are δ and γ , where δ represents a depreciation factor related to the general fact of the immigrant being a foreigner like quality insecurity upon arrival, and γ is a depreciation factor that is specific to the country of origin of the immigrant. This factor is for example influenced by language or the schooling system in that country. So an immigrant from for example Austria is going to have a smaller γ because he already speaks German. It could also relate to visa related issues. A worker that comes for example from another country within the EU does not need a visa, and thus it is less complicated to hire him. $\delta, \gamma = 0$ for natives and $0 < \delta, \gamma < 1$ for immigrants.

After immigration, an immigrant lives for two periods. In the first period the immigrant makes the decision to invest a fraction π of his full human capital into the creation of new human capital and that increases his payoff in the second period by $I \times 100$ percent. The marketable human capital for the immigrant is then: $E = (1 - \delta - \gamma)K$. And the present value of his income stream upon arrival is:

$$PV = (1 - \delta - \gamma)K(1 - \pi) + \rho((1 - \delta - \gamma)K(1 + I))$$

where ρ is a discount factor for future earnings. The human capital production function representing the increase in human capital is given by:

$$IE = (\pi K)^\alpha K^\beta$$

where $\alpha, \beta < 1$. In contrast to Ben-Porath and taking on the adaptations of Borjas (2000), a worker uses his entire human capital stock, rather than his human capital marketable in Germany to produce human capital marketable in Germany. A lawyer for example is not able to practice his profession in Germany, but we expect him to acquire human capital faster than an immigrant with less human capital, or schooling for that matter. This also relates back to the importance of the source country specific factor γ which could also mean that degrees required for specific jobs are or are not accepted in the new host country. As in the Ben-Porath model, preexisting human capital is an independent input in the production of new human capital. However we do not know if immigrants with higher rates of preexisting human capital acquire additional human capital at a faster rate, or maybe at the same rate, or possibly even at a slower rate than immigrants with lower levels of preexisting human capital.

We can use the model to think about these questions; it is easiest to see the implications of the model, if we rewrite the human capital production function to the following form:

$$I = (1 - \delta - \gamma)^{-1} \pi^\alpha K^{\alpha+\beta-1}$$

This equation relates the production of human capital useable in the host country to the proportion of investments into human capital undertaken and the existing total human capital stock. The rewritten human capital production

function lets us separate three different cases of human capital accumulation. The first case is when $\alpha + \beta = 1$, in which the production of additional human capital is independent of the preexisting human capital stock. This means that all foreigners assimilate at the same rate. The second case is when $\alpha + \beta < 1$, this means that immigrants with lower levels of initial human capital gain additional human capital at a faster rate than immigrants with high levels of starting human capital. This also means that low human capital immigrants assimilate faster than those with high levels. The last case is when $\alpha + \beta > 1$, this means that individuals with higher levels of starting human capital gain human capital at a faster rate than those with lower levels, and thus also assimilate faster.

The only thing immigrants have influence on at migration is π and they maximize their post migration earnings through the optimal human capital accumulation rate given by:

$$I = (\alpha\rho)^{\frac{\alpha}{1-\alpha}} \left(\frac{1}{1-\delta-\gamma} \right)^{\frac{1}{1-\alpha}} K^{\frac{\alpha+\beta-1}{1-\alpha}}$$

If $\alpha + \beta > 1$ more highly skilled immigrants acquire more additional human capital than lower skilled immigrants, and when $\alpha + \beta < 1$ more skilled immigrants acquire less additional human capital than lower skilled immigrants. If $\alpha + \beta = 1$, the additional capital accumulation is independent of the starting level of human capital. The formula has another important implication, and that is the positive relationship between I and the two depreciation factors, δ and γ which implies that the higher the depreciation of foreign skills the higher the optimal investment

will be for the immigrant, and thus the faster his assimilation. This relationship exists for both of the depreciation factors and through this all sources of wage loss post migration. The relationship between I and δ , γ becomes interesting for natives, since for them δ , $\gamma = 0$ and immigrants will invest more into additional human capital than comparative natives, which makes sense because the opportunity cost for immigrants is lower than for natives, and in fact the higher the depreciation, δ and γ the more will be invested by an immigrant. This implies for one that immigrants will assimilate in general, and also the higher the initial wage gap the faster the assimilation. Since in the empirical part of this paper I will be looking at different assimilation rates for different countries of origin this prediction is especially interesting.

In my empirical strategy I estimate the following OLS regression

$$\log w_i = \beta_0 X_i + \beta_1 source_i + \beta_2 source_i YSM_i + \epsilon_i \quad (4)$$

where w_i represents the monthly income of person i : X_i is a vector of socio economic characteristics including age, schooling etc. Source is a dummy variable for the country of origin of person i . This means that β_1 would measure the different entry wages for the different countries of origin. $source_i * YSM_i$ is an interaction variable of source country multiplied by the years since migration variable. This interaction means that β_2 measures the different assimilation rates for different countries of origin. For people from former East Germany the interaction dummy is setup in the same way so that β_1 also measures their initial

wage gap and β_2 measures their respective assimilation rate. This specification allows me to observe a different growth path for different countries of origin and also compare them to the growth path of former East Germans.

In this regression no further restrictions are required to identify β_2 . The only assumption is the one that was introduced earlier that time effects are the same for natives and immigrants to estimate the level and growth effects for immigrants.

The second empirical model is applied to test the model estimated by the following OLS regression:

$$\log w_i = \beta_0 X_i + \beta_1 \text{foreigner}_i * \text{edugroup}_i + \beta_2 \text{edugroup}_i YSM_i + \epsilon_i$$

(5)

where w_i represents the monthly income of person i : X_i is a vector of socio economic characteristics including age, schooling etc. Edu group is a dummy variable depending which educational group immigrant i belongs to and it is multiplied with the foreigner dummy variable. Educational group 1 is less than high school, educational group 2 is high school and/or vocational training and educational group 3 is a university degree. Through this β_1 measures the initial wage gap of immigrants of the respective educational groups and β_2 measures the assimilation rate of immigrants depending on their educational group.

1.5 Results

1.5.1 Results of the basic assimilation model

The regression in the basic assimilation model is broken up into five pieces, or more specifically five different time periods in order to get a first impression of how assimilation rate and initial wage gap behave over time. The results of the regression estimated through equation (1) are summarized in Table 3 and include monthly income as the dependent variable and schooling, a foreign dummy, years since migration and other covariate control variables as independent variables. Through all the different time periods the coefficient β_1 is always negative indicating that for the same levels of schooling and other controls immigrants earn less than comparable natives at the time of their arrival. This is in line with the finding of Chiswick (1978) and later papers following the same model. Going back to the original model which is the one of Chiswick is based on, the Mincer-Becker model of human capital accumulation this result was predicted by the model as immigrants lack host country specific human capital at the time of their arrival. However the model also predicts that immigrants would catch up to natives as they spent more time in their new host country and assimilate in terms of income. This is indicated through the years since migration variable that is generally seen as the assimilation rate which is positive for all the observed periods, meaning that immigrants catch up to their native counter parts over time.

The 1984 – 1990 period is the pre-unification period and the following periods are all post-unification. In the period before reunification we see an initial wage gap of roughly 9% points and an assimilation rate of .4% per year which is both comparable to what comparable with studies of the U.S. labor market find. In the 1991-1995 time period that gap widens to 16.6% and peaks at 22.9% in the 1996 – 2000 period. However, when the initial wage gap widens, the assimilation rate usually also increases so also in this case. In the 1991 – 1995 the assimilation rate increases from .4% to 1.1% effectively reducing the overtaking time from 22.5 years to 15 years. The assimilation rate contracts in the 2001 – 2005 period to 19.1 % and 17.3% in the 2006 – 2011 period. As noted by Borjas (1985,1995), both the initial wage gaps and assimilation rates are highly unstable and change dramatically from time period to time period.

1.5.2 Results of the cohort model

Table 3 reports the results of the cohort specific model estimated by equation (3). As in the section before the time periods are split up to give us an idea of the performance of different entrance cohorts at different time periods. In Table 3 the wage gaps at entrance are estimated and unsurprisingly all cohorts are experiencing a negative entry wage gap compared to natives of similar age and education. Also, as expected, the wage gap between natives and immigrants narrows over time. For the 1980 – 1990 arrivals for example the initial wage gap is -12%. After an average of 10 years in the country that gap has contracted to -

9% and continues to decline to -5% in the last time period. All of the cohorts experience wage growth or stable wage gaps compared to Germans except for the 1970 – 1980 cohort whose differential contracts to only 1% in the 1991 – 1995 period before extending back to 5% in the next time period. This could mean that there is a problem in the data for this particular time period or an unusual high demand for this immigrant cohort during this time period. Apart from this, all coefficients behave the way we would expect them to. Another significant finding is that the wage gap between natives and immigrants never seems to go below 5% except for the 1960 – 1970 arrival cohort.

Another interesting finding is that the initial wage gap widens in the observed time periods. The most drastic increase is for the 2001 – 2005 cohort which starts at a disadvantage of -31% compared to -22% of the 1996 – 2000 cohort.

1.5.3 Results of the source country specific assimilation model

It is instructive to begin this section with a summary statistic of educational levels represented by Table 4. East Germans living in West Germany have the highest average schooling of the sample with 12.94 years and a median of 12 years of schooling. Second highest is West Germans with a mean of 12.56 and a median of 11.5 years, closely followed by eastern Europeans with a mean of 11.77 and a median of 11 years. The gap to all the other immigrants is quite substantial as they have a mean of around 9 years of schooling. However the

percentage of blue collar workers among the eastern European immigrants is roughly the same as for the other immigrants that have around 9 years of average schooling according to the Statistisches Bundesamt. I will come back to this fact and the issue this fact might create in the estimation process at a later time.

For the empirical analysis I separated the immigrants into different countries of origin or tabulated them into a group of immigrants with similar characteristics. The different groups are Eastern Europe, Yugoslavia, Italy, Spain/Portugal, Turkey, East Germany, and all others are listed under other.² For the actual estimation process dummy variable were created for the different country groups to measure the initial wage gap at arrival of the different sending countries and an interaction term between country of origin and years since migration gives the source country specific assimilation rate.

Table 5 reports the results of the source country specific assimilation model estimated through equation (4). It appears that Eastern Europe has the largest initial wage gap of all other countries. As mentioned earlier this result could be due to the fact that Eastern Europeans in the sample have a high education level but are performing similar jobs as immigrants from other countries of origin. However in the estimation process, the Eastern European immigrants are essentially compared to Germans with higher levels of education and most likely also higher paid jobs. If we see this result in light of our model,

² The exact composition can be found in the appendix

immigrants from Eastern Europe have a higher γ and are not able to use their full human capital. On the other hand immigrants from Eastern Europe do assimilate at the highest rate which was also predicted by that model that immigrants that are not able to use their full human capital assimilate faster, because a higher human capital level means that they can probably acquire new host country specific human capital at a faster rate than immigrants with lower levels of human capital, and their opportunity cost to acquire more host country specific human capital is lower than that of immigrant who are earning more.

The two countries with the smallest initial wage gaps are Turkey and Italy, which also represent the two largest immigrant populations. Zhu, Liu, Painter (2013) find in their paper that immigrants that join larger ethnic communities do better than those who do not have any of their countrymen living in their new host country. In terms of our model that means that the depreciation factor γ is lower for immigrants of Turkey and Italy because they possibly have smaller language adjustment period since a person coming from Turkey for example can move to Berlin and find a job without speaking German, because the Turkish speaking community there is so large. Also consistent with the model is that finding that immigrants from Italy and Turkey have the lowest assimilation rates of all immigrants.

Another interesting finding is that East Germans have a higher initial earnings gap than Turkish, Italian and even immigrants from Yugoslavia. I was

also not able to measure an assimilation rate for them, as the assimilation rate for East Germans is insignificant. This is especially surprising since East Germans already speak German upon arrival.

The second column of Table 5 reports the results of equation (4) with the addition of experience as another control variable. The results change slightly, East Germans now have a positive and significant assimilation rate and some of the initial wage gaps change slightly but generally the results stay very comparable.

Table 6 reports the results of the educational specific assimilation model estimated through equation (5). The results indicate that immigrants of educational group 3 have the highest initial wage gap. Relating this result back to the original model means that high education immigrants have the highest depreciation factor and thus their income is penalized the most. Immigrants of educational group 2 perform better than immigrants from educational group 3 but worse than immigrants from educational group 1. It seems that the higher the education the higher the initial wage gap to comparable natives.

However the higher the educational level the higher is the assimilation rate. In terms of the model this means that $\alpha + \beta > 1$ and individuals with higher starting levels of human capital acquire additional human capital faster.

1.6. Conclusion

This paper discusses a broad spectrum of assimilation analysis for immigrants in Germany and presents a series of results. The data used for this paper is drawn from the rich panel dataset of the SOEP and includes the years 1984 – 2011. The analysis includes the basic assimilation model where the findings in the existing literature are confirmed that immigrants experience a rather large initial wage gap and close that gap over time. As has also been documented before the initial wage gap and the assimilation rate are unstable overtime. In the cohort model we find sizeable cohort effects with the entry wage gap widening for later cohorts but the wage gap closing as time is spent in the new host country. However, this change in the initial wage gap may very well be caused by a change in the composition of the immigrant cohorts, and in fact, the country of origin composition is changing over time in the data set. This leads me to the adaption of the source country specific assimilation model where each country of origin has its own initial wage gap and own assimilation rate. One of the biggest and most surprising findings was that people migrating from former East Germany in fact have a larger wage gap than immigrants coming from Turkey and Italy.

The predictions of the model presented for the source country specific assimilation have been fulfilled as immigrants that start at a greater wage disadvantage assimilate faster than those with a smaller initial wage gap and immigrants from different countries of origin have different wage gaps leading us

to believe that the depreciation factors for human capital in the new host country do in fact depend on the source country.

The finding that immigrants from Eastern Europe which have high values of human capital start at a much greater wage disadvantage than immigrants with low values of human capital is however troubling since Germany relies on the influx of high skill labor. Germany in particular, but Europe in general, both have more restrictive laws when it comes to hiring new labor such as a higher minimum wage which makes Germany especially attractive for immigrants with low levels of human capital.³ However, in this social market economy the upwards earning potential is lower than in for example the U.S. which means that high human capital immigrants are more likely to immigrate into the U.S. Roy (1954) wrote in his paper that the chances of high incomes attract high skill immigrants and higher job security tends to attract low skilled immigrants.

The EU has undertaken steps to make migration between its member countries easier by reducing barriers of inflow and recognizing each others qualifications. In terms of policy it is crucial to continue to reduce barriers of entry to attract more high skill labor. The necessity for these reforms can especially be seen in the educational group specific assimilation model where immigrants with the highest levels of human capital have the largest entry wage gap which is troubling when a country tries to attract high human capital immigrants.

³ For comparison, according to the U.S. census bureau 30% of immigrants immigrating into the U.S. belong to educational group 3, compared to roughly 10% for Germany.

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Table 1.1.
Summary statistics

Years since migration	19.44
Age at migration	21.5
German Citizenship	0.24
Country of origin	
Turkey	0.27
Italy	0.16
Eastern Europe	0.16
Former Yugoslavia	0.15
Other Western	0.04
Asia	0.05
Spain / Portugal	0.08

Table 1.2.
Basic assimilation model

Variable	1984 - 1990	1991 - 1995	1996 - 2000	2001 - 2005	2006 - 2011
Schooling (Years of education)	0.076 (0.0011)	0.072 (0.0013)	0.069 (0.0012)	0.080 (0.0010)	0.0822 (0.0010)
Foreign Dummy	-0.0956 (0.019)	-0.166 (0.0217)	-0.229 (0.022)	-0.191 (0.025)	-0.173 (0.032)
Years in Germany	0.0047 (0.0013)	0.011 (0.0024)	0.011 (0.0025)	0.0055 (0.0025)	0.0041 (0.0013)
Years in Germany squared	-0.000011 (0.0000722)	-0.00026 (0.00006)	-0.00019 (0.00006)	- (0.00005)	- (0.00005)

Notes: Standard errors are reported in parantheses

Table 1.3.
Cohort model

	1984 - 1990	1991 - 1995	1996 - 2000	2001 - 2005	2006 - 2011
cohorts					
2001 - 2005 arrivals	---	---	---	---	-0.317 (0.0509)
1996 - 2000 arrivals	---	---	---	-0.222 (0.0339)	-0.191 (0.0335)
1991 - 1995 arrivals	---	---	-0.24 (0.0173)	-0.166 (0.0170)	-0.140 (0.0181)
1980 - 1990 arrivals	-0.128 (0.0211)	-0.0906 (0.0179)	-0.077 (0.0159)	-0.0669 (0.0166)	-0.0589 (0.0177)
1970 - 1980 arrivals	-0.074 (0.008)	-0.0146 (0.0102)	-0.0530 (0.0129)	-0.0524 (0.0144)	-0.0752 (0.0178)
1960 - 1970 arrivals	-0.0374 (0.0086)	-0.0400 (0.0127)	-0.0562 (0.0179)	---	---

Notes: Standard errors are reported in parantheses

Table 1.4.
Education summary

Educational levels by country of origin (In years of education)	Mean	25 percentile	75 percentile	Median
West Germans	12.56	10.5	14.5	11.5
Eastern Europe	11.77	10.5	12	11
Yugoslavia	9.88	9	11	10.5
Italy	9.29	7	10.5	9
Spain	9.44	9	11	9
Turkey	9.7	9	10.5	9
Other	11.15	9	13	10.5
East Germans in West Germany	12.94	11.5	14.5	12

Table 1.5.
Source country specific assimilation model

Initial wage gaps by country of origin	(1)	(2)
Eastern Europe	-0.24 (0.012)	-0.24 (0.012)
Yugoslavia	-0.115 (0.02)	-0.14 (0.02)
Italy	-0.055 (0.019)	-0.07 (0.018)
Spain	-0.132 (0.03)	-0.15 (0.03)
Turkey	-0.083 (0.0148)	-0.09 (0.014)
Other	-0.112 (0.0143)	-0.11 (0.014)
Eastern Germans	-0.128 (0.019)	-0.17 (0.019)
Assimilation rate by country of origin		
Eastern Europe	0.0055 (0.0007)	0.006 (0.00070)
Yugoslavia	0.0042 (0.00093)	0.0019 (0.00092)
Italy	0.0021 (0.00083)	0.0010 (0.0008)
Spain	0.0043 (0.0013)	0.0053 (0.0012)
Turkey	0.0028 (0.0007)	0.003 (0.00072)
Other	0.0023 (0.00061)	0.002 (0.00060)
Eastern Germans	-0.0004 (0.001)	0.0026 (0.0013)

Notes: Standard errors are reported in parantheses

Table 1.6.
Educational assimilation model

Initial wage gaps by educational group	(1)	(2)
Education group 1	-0.059 (0.011)	-0.053 (0.011)
Education group 2	-0.181 (0.009)	-0.173 (0.0092)
Education group 3	-0.236 (0.018)	-0.229 (0.018)
<hr/>		
Assimilation rate by educational group		
Education group 1	0.0018 (0.00053)	0.0017 (0.00053)
Education group 2	0.0045 (0.00042)	0.044 (0.00042)
Education group 3	0.0065 (0.00084)	0.0066 (0.00084)

Notes: Standard errors are reported in parantheses

CHAPTER 2

Assimilation of foreigners under self-selection

2.1.Introduction

The estimation of labor market performance of immigrants once they enter their new host country has been performed by many scholars starting with the human capital theory of Mincer (1974) that incorporated schooling in a regression analysis. The human capital theory was then transformed by Chiswick (1978) and Borjas (1985) to estimate and explain the labor market performance of immigrants. In the early papers by Chiswick and Borjas immigrants assimilated rather quickly in their new environment and some concern was raised about the estimation methods as cross section data was used that did not allow it to follow an immigrant over a time span and that was only available every ten years. The cross section could give biased results if remigration is not taken into consideration or, as pointed out by Borjas, a quality change in the immigrants is observed and not corrected for. Borjas (1985) has argued that the decline in cohort quality was responsible for a biased increase in estimated assimilation rates for immigrants. This interpretation has however been disputed by Duleep (1996), Regets (1997), and other researchers.

Most economic papers written about economic assimilation use an OLS approach in their empirical model where wage is regressed on personal covariates and a years since migration variable that is capturing the economic

adjustment immigrants are experiencing while in their new host country. The problem with these standard models is that it does not take account of a self selection bias that is caused through the decision that the immigrant makes when he self-selects himself into either employment or unemployment. In the classical papers that use OLS, unemployment is not considered because only individuals that are fulltime employed are included in the sample.

Neuman and Oaxaca (2003) find a substantial self-selection bias in their paper where they estimate the wage discrimination against foreigners in Israel. They found that not only the magnitude of the discrimination was changed but in some cases even the direction of the effect.

The problem when these kind of issues are addressed by an empirical research approach is that to really determine income growth, longitudinal data is required and most data sets available do not have enough observations to perform a statistically sound analysis. The SOEP dataset used for the analysis in this paper is a yearly panel where immigrants and natives can be tracked over long time periods and labor market adjustments by immigrants can be observed. This makes this a very unique data set that can help us understand the economic integration process of foreigners in Germany. The quality of the data and richness of variables make this dataset a valuable source for the analysis of immigrant assimilation. This paper adds to the existing literature by creating a source country specific assimilation model and an educational assimilation model that are enhanced by a Heckman selection model. These models can help us

understand what the current entry wage gaps and assimilation rates for immigrants. Especially in the case of Germany where the population is shrinking and policy makers have declared that their goal is to maintain or even expand the inflow of high human capital immigrants. And when looking at wage assimilation unemployment is an important factor, because immigrants that do not find a job shortly after arriving have a high chance of getting discouraged and possibly even migrate back to their country of origin or another country with better job opportunities.

2.2.Data

The data used for this dissertation chapter comes from the same source as the data used in the previous chapter but is compiled differently. The data come from the German Socio-Economics Panel and includes the years 1984 – 2011. The sample used for analysis includes a total of 180,659 individuals between the ages of 25 and 65 who live in former West Germany. 21.9% of the observations are immigrants from various countries of origin. Only first generation immigrants are considered and the immigrants are selected into one of the six following groups depending on their country of origin: Turkey, Italy, Spain/Portugal, Eastern Europe, Ex-Yugoslavia and all other countries of origin. Only individuals living in former West Germany are considered since 99% of foreigners live in former West Germany. Natives are individuals born in Germany

and having the German citizenship. In this respect Germany is different from the U.S. since not everybody that is born in Germany automatically receives the German citizenship which makes it easier to identify natives and second or third generation immigrants.

Also In this data set, unemployed individuals are included as unemployment is not uniformly distributed across different nationalities and the analysis used in this paper is taking that fact into consideration. The employment averages by country of origin are listed in table 1. The global average is 76.6% of people in the sample are fulltime employed. Turkish immigrants have the lowest average employment with 71.8% and they are the only country of origin that has a lower average employment than Germans. All the other countries of origin have higher average employment rates than Germans which is not really surprising since the opportunity cost for immigrants of not working is higher than it is for Germans because Germans receive social security if they are not working.

For purposes discussed later in the paper I divided the sample into three categories of educational attainment. The division was done through the International Standard Classification of Education (ISCED) values provided in the data. Educational group 1 is only primary and secondary school but less than high school which refers to ISCED groups 1 and 2 and represents low levels of education. Educational group 2 is a high school degree and or basic level vocational training and refers to ISCED groups 3 and 4 and represents a medium level of education. Educational group 3 is a university degree or higher vocational

training and refers to ISCED groups 5 and 6 and represents high levels of education. Table 2 gives a summary statistic of the distribution and averages of educational attainment as a sample average and averages by country of origin. It is interesting to note that native Germans have the highest average educational attainment with 32% in the highest category. Eastern Europeans have the highest educational attainment of immigrants with an average of 24% in the highest educational group. All the other immigrant populations have a very similar distribution into the three different educational groups with the highest percentage of immigrants in category one and two.

Table 3 gives a summary statistic on the percentage of individuals employed as a sample average and as an average by source country. I can't call it unemployment rate since by definition an individual is only marked as officially unemployed if he is actively searching for a job, however I do not have that information in the data but the model in the empirical section presented later will take this into consideration. The total average of fulltime employment is 76.6% and German natives have an average employment of 77%. Most immigrant source countries have averages around the same level with Spain having the highest average employment level at 86.03% and Turkey the lowest with 71.80%. Especially in the case of Turkey the results from the previous chapter might be understating the true effect of initial immigrant wage gap if employment levels are not taken into consideration.

Table 4 gives a summary statistic on the percentage of individuals employed grouped by the educational group they belong to. What is interesting to see is that immigrants have slightly higher employment averages in educational groups 1 and 2 but significantly lower employment averages in educational group 3. This seems to be especially troubling in light of the proclaimed goal of the German government to attract high skill labor as Germany is a producer of high human capital products. In light of the model presented in the previous chapter this result is not too surprising though since immigrants with high human capital are more likely to have a higher depreciation factor to their skills, this could for example be due to the fact that their school degrees might not be recognized. Germany is especially restrictive in the reorganization of higher vocational degrees earned abroad. Immigrants from category 3 that have earned higher vocational degrees are most likely not able to use those in Germany and they are often required especially in the opening of a new business.

Figure 1 gives a graphic representation of net immigration in Germany between the years 1991 through 2013. Net immigration hit a high in 1992 and decreased in the following years with a slight recovery between 1999 and 2002. Net immigration was even negative for the years 2008 and 2009. After 2009 net immigration seems to be rising again which could be due to new immigration policies including active recruitment or the economic climate in other EU countries that were hit harder by the 2008 recession than Germany was.

2.3.Model

In the previous chapter of this dissertation I estimated initial wage gaps and assimilation rates of immigrants that moved to Germany. Two different models were looked at where the first one estimated the initial wage gap and assimilation by country of origin and the second that was estimated using different educational groups. As is standard in the literature I only kept immigrants in my sample that were fulltime employees. However, not all source countries, nor all educational groups have the same employment levels as natives and disregarding this fact could lead to biased results due to self-selection or possibly the ability to find a job.

The most commonly used method to deal with this kind of endogeneity is a Heckman two stage approach often referred to as Heck-it that was introduced by Heckman (1979). This approach makes it possible to estimate the probability of having a job in the first stage using a variety of individual characteristics that are endogenous to the obtained income. In the second stage this result, often called the Heckman's lambda which was obtained from the inverse Mills ratio, is then included as a regressor in the second stage of the estimation. Here the first stage is used to predict the probability of an individual having a job.

The outcome variable wage is only observed if the individual decided to work which is represented by the variable P . The variable P is equal to 1 if person i is employed in period t and P is equal to 0 if he is not employed. The participation equation can then be written as:

$$P_i^* = Z_i' \theta_i + \epsilon_i \quad (1)$$

where P_i^* is a latent variable indicating employment, Z_i' is a vector of variables that influence the decision of an individual to self-select into employment or unemployment. In the employment decision probability model the regressors of the earnings equation are included and also variables that are related to an individual's family situation that do not directly enter the earnings equation. These variables are his marital status and if he has children or not.

In the second stage of the Heckman selection model an OLS regression is applied that takes the following form and includes the Heckmans lambda as a regressor:

$$\log w_i = \beta_0 X_i + \beta_1 source_i + \beta_2 source_i YSM_i + \epsilon_i + \rho_1 \lambda_i \quad (2)$$

where w_i represents the monthly income of person i: X_i is a vector of socio economic characteristics including age, schooling etc. Source is a dummy variable for the country of origin of person I and λ_i is the Heckmans lambda. This model lets me separate the initial wage gap and assimilation rate depending on the country of origin.

Additionally to the model represented above (2) another second stage OLS model is run that uses the same first stage setup as mentioned above but in the second stage the following regression:

$$\log w_i = \beta_0 X_i + \beta_1 foreign_i * edugroup_i + \beta_2 edugroup_i YSM_i + \epsilon_i + \rho_1 \lambda_i \quad (3)$$

where w_i represents the monthly income of person i : X_i is a vector of socio economic characteristics including age, schooling etc. Edu group is a dummy variable depending which educational group immigrant i belongs to and it is multiplied with the foreigner dummy variable and the YSM variable to obtain initial wage gap and assimilation rates depending on the educational group individual i belongs to.

2.4.Results

2.4.1.Results of the source country specific assimilation model

Table 5 reports the results of the source country specific assimilation model estimated through equation (2) in the second stage and equation (1) in the first stage of the estimation process. The initial wage gaps overall are a lot larger than those in the model discussed in the previous chapter. Turkey's initial wage gap for example rose from roughly 8% to 37.8% which is the largest jump of all immigrant groups. What is interesting to see is that the initial wage gap of Eastern Europe was the largest under the uncorrected model and has actually decreased in size especially relative to other countries of origin. Yugoslavia's initial wage gap increased from 11.5% in the uncorrected model to 31.9% in the corrected model which is the second largest increase in the sample. Especially in the case of Turkey the lower average employment is probably responsible for this increase in initial wage gap but also the quality of the workers that do not work has an influence on the increase in wage gap. For Yugoslavia, the average

employment can't be taken as a reason for their large wage gap increase, but immigrants from Yugoslavia do assume jobs relatively late after arrival which means that their average employment upon arrival is lower than from other countries and especially compared to natives. The wage gap of Spanish immigrants increased from 15% to 27.3% which is almost a double in the wage gap. However, the time it takes to reach native income decreased from 28.3 years to 19.22 years because even though the wage gap increased so did the assimilation rate which means that Spanish immigrants were able to catch up faster.

In the case of immigrants from Italy their initial wage gap also increases through the introduction of the selection model but they still have the lowest wage gap of all immigrants in the sample. Their wage gap increased from 7% to 12.5% but their assimilation rate also increased from 0.2% to almost 1% which actually reduces the time to catch up to natives from 35 years to roughly 15 years. Even in the case of Yugoslavia the overtaking time decreased from 28 years to 23 years. This result is consistent through the whole sample, that except for Eastern Europe, initial wage gaps were larger but time to catch up decreased.

Another important result is that λ is negative and significant which means that a selection issue is present that was corrected by the two stage Heckman model.

2.4.2. Results of the educational assimilation model

Table 6 reports the results of the educational assimilation model estimated through equation (1) in the first step and equation (2) in the second step of the estimation process. The initial wage gap of educational group 1 increased from 5.3% in the non-corrected model to 11.4% in the corrected model but catch-up time decreased from roughly 30 years to 12 years. The initial wage gap of immigrants from wage group 2 increased from 17.3% to 25%. Educational group 3 is the only group where the wage gap actually decreased through the introduction of the two stage model. It decreased from 22.9% to 20% and is most likely caused by the fact that educational group 3 has the highest average employment percentage of all immigrant groups. However educational group 3 also has the highest assimilation rate of all three educational groups. The assimilation advantage is small but present and when I link this model back to the model presented in the first part of the dissertation, I can say that $\alpha + \beta > 1$ and immigrants with higher starting levels of human capital acquire additional human capital at a faster rate than immigrants with lower starting levels of human capital do. This means they adapt faster to a new environment and acquire skills required for integration and to succeed in their new environment faster.

After applying the two stage estimation process educational group 2 now has the largest wage disadvantage upon arrival and low skilled workers from educational group 1 skill have the smallest wage gap.

In the educational assimilation model, lambda is -0.29 and statistically significant as was the case in the source country specific assimilation model

which means that a selection bias was present that was corrected by the Heckman two stage approach.

2.5.Conclusion

This paper analyzes the topic of economic performance of immigrants in terms of entry wage gaps and assimilation that has found attention in the economic literature as immigration is becoming more and more important. This paper uses a longitudinal data set to measure immigrant performance rather than simple cross-sections or repeated cross sections which is used in most papers regarding this topic. The data are from the SOEP a yearly panel that is collected on a yearly basis in Germany.

The statistical analysis is build around Heckman's two-stage model that corrects for selection bias which in this case is the self selection of individuals into employment or unemployment.

The results clearly indicate that by ignoring the sample selection bias the true effect of entry wage gaps is underestimated. The first section of this dissertation analyzed immigrant performance based on an OLS model which delivered lower entry wage gaps for immigrants compared to the Heckman two-stage model used in this section. However, even though entry wage gaps widened, assimilation also increased which actually makes the outlook for newly arrived immigrants better since the general time it takes to catch up decreased.

However one of the interesting findings of this paper is that a large proportion of immigrants are from educational group 1 and this group performs comparatively well compared to the other two. But this just means that these immigrants perform well compared to natives of similar human capital and age. Yet the low educational levels are still a cause of concern because even if these immigrants earn as much as comparable natives they are still at risk of poverty, especially in light of the direction the German labor market is taking. Higher educated individuals have received a comparably steep increase in income premium and real wages at the bottom of the distribution have declined.

Understanding assimilation better can be crucial toward policy makers in their decision-making process, even though in the case of Germany the tools available are very limited due to regulations within the EU. Most prior research in the area of assimilation has been performed analyzing data from the U.S. labor market and far less is known about the immigration and assimilation process in Germany. This paper helps shine some light on the assimilation of immigrants from different countries of origin and educational groups.

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Table 2.1.
Employment by country of origin

Total average	76.60%
Germans	77%
Turkey	71.80%
Italy	80.60%
Spain	86.03%
Eastern Europe	78.53%
Ex-Yugoslavia	78.98%
Other	75.34%

Table 2.2.**Educational attainment by country of origin**

	Educational group 1	Educational group 2	Educational group 3
Total average	18%	53%	29%
Germans	13%	55%	32%
Turkey	49%	43%	8%
Italy	55%	39%	6%
Spain	48%	43%	9%
Eastern Europe	14%	62%	24%
Ex-Yugoslavia	36%	56%	8%
Other	41%	40%	19%

Table 2.3.
Employment by country of origin

Total average	76.60%
Germans	77%
Turkey	71.80%
Italy	80.60%
Spain	86.03%
Eastern Europe	78.53%
Ex-Yugoslavia	78.98%
Other	75.34%

Table 2.4.

Average Employment levels by educational group

	Edu group 1	Edu group 2	Edu group 3
overall	71.50%	74.63%	85.07%
German	69.70%	74.10%	85.84%
foreign	73.61%	76.50%	77.81%

Table 2.5.
Source country specific assimilation model

Initial wage gaps by country of origin	
Eastern Europe	-0.132 (0.0151)
Yugoslavia	-0.319 (0.0274)
Italy	-0.125 (0.0248)
Spain	-0.273 0.041
Turkey	-0.378 (0.0181)
Other	-0.105 0.020
Assimilation rate by country of origin	
Eastern Europe	0.00711 (0.000855)
Yugoslavia	0.0144 (0.00122)
Italy	0.0096 (0.0010)
Spain	0.0142 (0.0017)
Turkey	0.017 (0.00087)
Other	0.0032 (0.00083)
Inverse-Mills ratio	-0.3086 (0.010)

Notes: Standard errors are reported in parantheses

Table 2.6.
Educational assimilation model

Initial wage gaps by educational group	
Education group 1	-0.114 (0.016)
Education group 2	-0.25 (0.011)
Education group 3	-0.20 (0.020)
Assimilation rate by educational group	
Education group 1	0.00925 (0.000716)
Education group 2	0.01 (0.00055)
Education group 3	0.011 (0.00085)
Lambda	-0.295 (0.0105)

Notes: Standard errors are reported in parantheses

Figure 2.1

