The Labour Market Impact of Immigration: Quasi-Experimental Evidence

Albrecht Glitz*

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Abstract

In this paper we investigate the impact of ethnic German immigration on the German labour market. Ethnic German immigrants are exogenously allocated to local labour markets upon arrival in Germany. The ethnic German immigrant inflows therefore serve as a natural experiment of immigration, avoiding the typical endogeneity problem of immigrant inflows with regard to local labour market conditions. We analyse the effect of these exogenous inflows on wages and employment rates of different skill groups of the native population in different geographical areas between 1996 and 2001. Our results indicate negative employment effects but no effect on average wages.

*University College London, Department of Economics & CReAM, Drayton House, 30 Gordon Street, London WC1H 0AX, UK, e-mail: a.glitz@ucl.ac.uk . I am grateful to Christian Dustmann, David Card, David Lee, Kenneth Chay and Emilia Del Bono for helpful comments and suggestions, and to Stefan Bender for invaluable support with the data. Parts of this paper were written while visiting the Department of Economics at Berkeley, which I thank for the hospitality. I also thank the ESRC for funding the project (award No. RES-000-23-0332).

1 Introduction

One of the main difficulties in estimating the effect of immigrant inflows on the labour market outcomes of the native population results from the migrants' potentially endogenous choice of place of residence. This tends to lead to an underestimation of the true effect of immigration on local wages and employment rates. Only in very few instances is it feasible to view immigration as a natural experiment in which the immigrant inflows are not driven by national or local labour market conditions. In this paper we analyse one of these instances: the inflow of ethnic German migrants into Germany during the 1990s.

As a result of the political changes in the former Eastern Bloc, more than 2.8 million ethnic German immigrants moved to Germany between 1987 and 2001. In response to substantial internal migrations that led to the formation of ethnic German migrant enclaves, the German government introduced legislation in 1996 on which basis newly arriving ethnic German migrants are allocated to local counties in Germany and required to remain in those counties for the first three years after arrival. The associated substantial increase in the labour force of these counties had potentially significant effects on local labour market outcomes. In this paper we will make an attempt to quantify these effects. In particular, we will focus on the impact ethnic German immigrant inflows have had on native wages and employment.

Most empirical studies that have tried to assess the effect of immigration on labour market outcomes using spatial variation in the immigrant concentration have used instrumental variables to address the endogeneity problem of immigrant inflows. The instruments employed are often based on past immigrant concentrations (see for example Altonji and Card 1991, or Card 2001) and rely on the assumption that these are uncorrelated with current unobserved labour demand shocks. Using natural experiments to identify the causal effect of immigration does not require the imposition of this sort of restrictions. However, the instances in which immigration can be regarded as truly exogenous are very rare, the most prominent example in the literature being the Mariel boatlift analysed by David Card (1990). There are two reasons why one can consider the ethnic German inflows to Germany since 1996 as exogenous. First ethnic German migrants were allocated to particular labour markets by government authorities. Second, once in the allocated labour market, ethnic German migrants were required to remain in those areas for three years or lose substantial statutory provisions. The possibility of self-selection into booming labour markets was thus severely restricted for this group of migrants allowing us to view them as exogenous to local labour market conditions and providing a unique opportunity to study their effect on the native German population.

We have made significant efforts to obtain good quality data for this study. Basis of our analysis is the IAB Employment Subsample 1975-2001. While data on the overall (as well as foreign) population in Germany are easily accessible, this is very different for ethnic German immigrants. Since these are from a legal point of view "Germans", they are in most official statistics not dis-

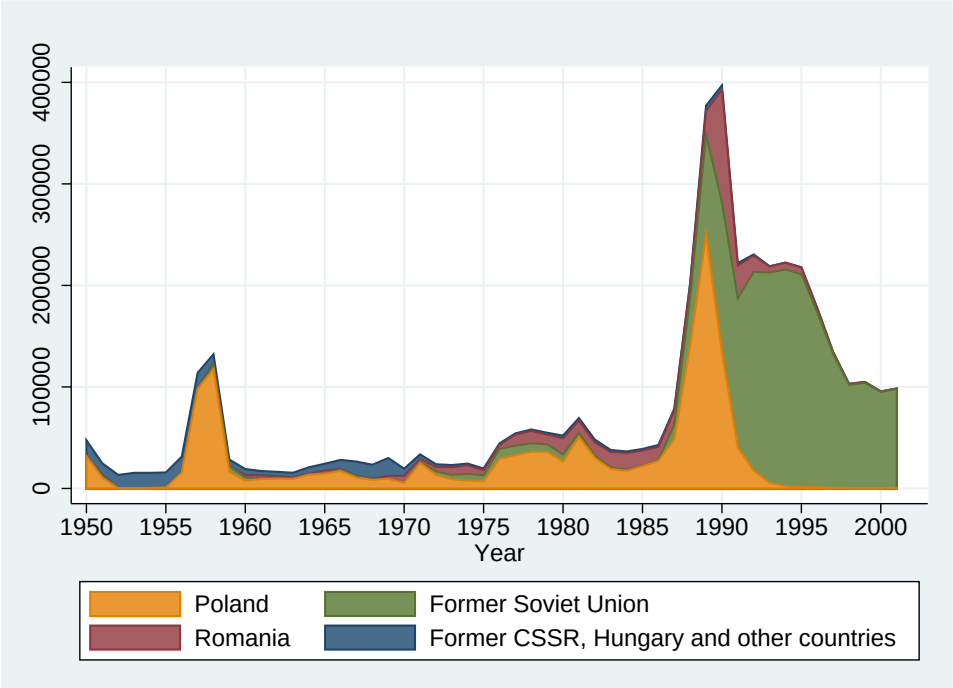
tinguishable from those Germans who were born in Germany, and to which we will henceforth refer as "native Germans". This makes it very difficult to track where the ethnic German migrants actually settled. For that reason we collected annual county-specific inflows directly from each of the sixteen federal admission centres for ethnic German migrants in Germany.

Data on ethnic German inflows are very fragmentary for East Germany. Furthermore, it is likely that there are a number of different adjustment processes at work in East German labour markets after German unification in 1990. Immigration might therefore have very different consequences in those evolving local economies compared to established West German labour markets. For these reasons our analysis will focus exclusively on West Germany (also excluding Berlin).

The remainder of the paper is organised as follows. In the next section we will provide some background information on ethnic German immigration since World War II and, in particular, since 1988. In Section 3 we describe our data. We then explain our theoretical model in Section 4 and provide some descriptive evidence in Section 5. Finally we present and discuss our estimation results in Section 6. Section 7 concludes.

2 The German migration experience - some facts

Figure 1: Ethnic German immigrant inflows by country of origin 1950-2001



Source: *Bundesverwaltungsamt*

Germany has experienced substantial immigration from ethnic Germans since the end of World

War II. In the immediate post-war years, repartitions and forced resettlements across Europe led to large inflows of German nationals from Central- and Eastern Europe. These inflows gradually ebbed away as Eastern European countries became increasingly insulated. By 1950, some 7.8 million German refugees had resettled to West- and 3.5 million to East Germany (Salt and Clout 1976). After the immediate postwar displacements came to an end, the immigration of ethnic Germans, then called *Aussiedler*, took place on the basis of bilateral agreements between Germany and the respective source countries. However, after the construction of the Berlin Wall in 1961 and the worsening of the East-West relations, these flows were severely limited. Between 1950 and 1987, the number of ethnic Germans who came to West Germany added up to 1.4 million, of which 848,000 had come from Poland, 206,000 from Romania, and 110,000 from the Former Soviet Union.[1] In 1988 travel restrictions in Central- and Eastern Europe were lifted. This caused an immediate resurgence of ethnic German migrations which had been suppressed during the Soviet era. In 1990 alone some 397,000 ethnic German immigrants, mainly from the Former Soviet Union (37%), Poland (34%) and Romania (28%), arrived in Germany (see Figure 1). Faced with these enormous movements, the government limited their inflow in subsequent years at a level of around 200,000 per year. This quota was met until 1995 after which the annual inflows gradually slowed down. From 1993 onwards more than 90% of the ethnic German immigrants originated from territories of the Former Soviet Union.[2] It is important to note that the ethnic German migrant population we analyse in this paper does not include Germans who used to live in East Germany and who moved to West Germany after unification in 1990. This latter group have had complete freedom of movement within Germany from the day of unification.

All ethnic German immigrants coming to Germany have to go through the central admission center in the city of Friedland where they are initially registered. In case they do not have a job or other source of income that guarantees their livelihood, which applies to the majority of migrants at the time of arrival, they are then allocated to one of the sixteen federal states according to pre-specified state quotas.[3] Within each state they are subsequently further allocated to particular counties, in most cases using some state-specific allocation key as a guidance. By far the most important factor determining the final destination of the ethnic German immigrants is the proximity of family members or relatives. The responsible authority at the Ministry of the Interior puts the estimate where this has been the decisive factor in making the allocation decision at around 90% of all cases.

Legal basis for this system is the so called *Wohnortzuweisungsgesetz* (law for the allocation of the place of residence), which was introduced in 1989 in response to the enormous inflows experienced after 1988. These inflows tended to be concentrated towards a few specific regions where

[1] Source: Bundesverwaltungsamt, Jahrestatistik Aussiedler 2003.

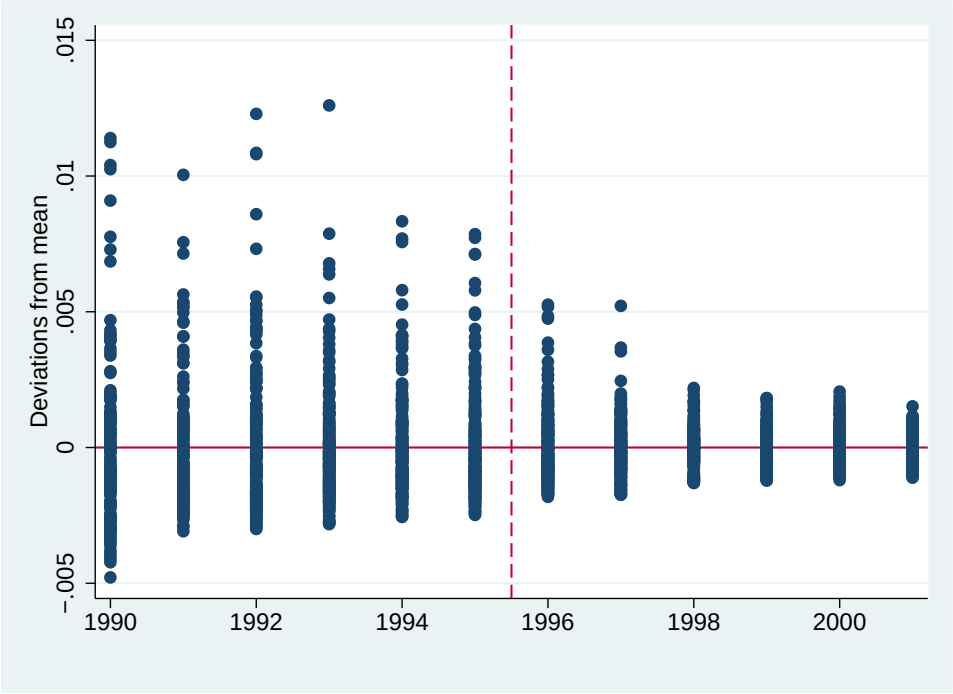
[2] From 1993 onwards, Aussiedler are officially referred to as *Spätaussiedler*.

[3] According to the so called *Königsteiner Distribution Key*, the respective quotas between 1996 and 2001 were: Baden-Württemberg 12.3%, Bavaria 14.4%, Berlin 2.7%, Brandenburg 3.5%, Bremen 0.9%, Hamburg 2.1%, Hesse 7.2%, Mecklenburg-Pomerania 2.6%, Lower Saxony 9.2%, North Rhine-Westphalia 21.8%, Rhineland Palatinate 4.7%, Saarland 1.4%, Saxony 6.5%, Saxony-Anhalt 3.9%, Schleswig-Holstein 3.3%, and Thuringia 3.5%. These quotas were very closely adhered to during this period with the absolute deviation from the norm being larger than 1 percentage point only in three cases, all in 1996.

they caused considerable shortages in available housing space while in other, particularly rural areas facilities remained empty. The intention of the law was to ensure a more even distribution of ethnic German immigrants across Germany and avoid a capacity overload of local communes, who are responsible for the initial care of the migrants. However, in practice, the introduction of this law turned out to be ineffective because the entitlements to considerable statutory provisions such as financial social assistance, free vocational training courses, language classes etc. were not affected should the ethnic German migrant choose to settle in a region different from the one allocated upon arrival. As a consequence, unregulated internal migration of ethnic Germans led to the creation of a few enclaves, in some of which the concentration of ethnic German migrants reached up to 20% of the overall population (Klose 1996). In response to these developments, the law for the allocation of the place of residence was substantially modified on 1 March 1996. As a key feature of the new law, ethnic German immigrants would now lose all their statutory entitlements in case of non-compliance with the allocation decision. There are no reliable data available but the general perception at both the Ministry of the Interior as well as the *Association of German Cities and Towns* is that the new provisions and sanctions have ensured very high compliance with the initial allocation decision since 1996.[4] If we add up the annual inflows reported at the county level for each of the 9 federal states for which we have data and compare these sums to the corresponding state allocations made at the central admission centre in Friesland for the period 1996 to 2001, the average absolute deviation amounts to 4.6%. Before the introduction of the new legislation, between 1988 and 1995, this figure was more than twice as high at 11.2%. Although a low average deviation does of course not necessarily imply compliance with the actual allocation decision on the local level, it does show that, at least at the state level, the ethnic German migrants do by and large adhere to their allocation and do not leave the administrative system by choosing to settle in an alternative location in Germany. Figure 2 shows the variation of ethnic German immigrant inflow rates for the period 1990 to 2001. With the passing of the new law in 1996 there is a significant reduction in the variation of the reported regional inflow rates although it seems to take until 1998 for this aligning process to be completed. The regional allocation becomes void if the ethnic German migrants can verify that they have sufficient housing space as well as a permanent job from which they can make a living; at the latest three years after initial registration when they obtain unrestricted freedom of movement. This suggests that after arrival in the allocated place of residence there is some scope for endogenous self-selection. However, it is likely that the migrant will predominantly search for job opportunities in the vicinity of his or her place of residence. In fact, the difficulties of searching for a job in a different locality arising from the legal provisions of the *Wohnortzuweisungsgesetz* were acknowledged by the legislator and led to an amendment of the law on 1 July 2000 that explicitly allowed for temporary residence in alternative localities for the purpose of job search activities without loss of entitlements as long as it did not exceed 30 days.

[4] See statement in a related judgment by the Federal Constitutional Court: BVerfG, 1 BvR 1266/00 vom 17.3.2004, Absatz-Nr. (1 - 56).

Figure 2: Variation in the ethnic German immigrant inflow rate 1990-2001



Note: The values depicted here are deviations from the mean ethnic German inflow rate in each year. The inflow rates are calculated as the number of allocated ethnic German immigrants divided by the overall population in the county at the end of the previous year. The sample size is 145 for 1990/1991, 204 in 1992-1994, and 230 in 1995-2001.

3 The data

Due to the decentralised allocation process, data on the regional distribution of ethnic German immigrant inflows were recorded separately in each of Germany's sixteen federal states. From the respective admission centers we obtained annual county-level inflows for all ten West German states for various periods between 1988 and 2001.[5] We are quite confident that the obtained figures for the period 1996 to 2001 overall reflect the ethnic German migrant inflows into each county accurately, last but not least because they have been collected directly from the responsible decision makers.

We obtain data on the labour market outcomes of the native German population from the Employment Subsample 1975-2001 which is made available by the Institute for Employment Research (IAB). This administrative data set comprises a 2% subsample of all dependent employees subject to social security contributions in Germany. This includes all wage earners and salaried employees but excludes the self-employed, civil servants and the military. It furthermore includes all

[5] Hamburg, Lower Saxony, Bremen: 1988-2001; Rhineland-Palatinate: 1989-2001; North Rhine-Westphalia, Saarland: 1990-2001; Schleswig-Holstein, Baden-Württemberg: 1992-2001; Hesse: 1995-2001; and Bavaria (only for larger regional units): 1988-2001.

unemployed who receive unemployment compensation.[6] The data is collected directly on the employer level by the Federal Institute of Employment and provides detailed employment histories of 460,000 individuals in West Germany and, after 1992, 110,000 in East Germany. For a detailed description of the data set see Bender et al. (2000). From this data set we construct county level aggregates of the composition of the local native German workforce by sex, age, education and occupation for each year between 1996 and 2001. For each of these groups we also obtained the average wage of full-time workers and the number of registered unemployed from which we calculate the employment/labour force rate. The micro-level data is aggregated to the local level annually for the 31st of December.[7]

For our analysis the IAB sample has two major advantages compared to other data sources. First, since we are dealing with administrative data which is used to calculate health, pension and unemployment insurance contributions, the precision of the data is very good. In particular the wage data are unlikely to suffer from any measurement error or reporting bias typical in many survey data sets.[8] Second, the sample size is large and includes detailed regional identifiers. This is necessary because we want to look at different subgroups of individuals in Germany's local labour markets. Even with an annual sample size of 460,000 observations, cell sizes quickly become rather small when disaggregating the workforce by locality, education levels or occupations.

4 Statistical model

4.1 Theory

We will base our empirical analysis on a theoretical model derived by Card (2001). In this model immigration impacts local labour markets by changing the relative supplies of different skill groups. Suppose that a single output good Y is produced in labour market region r in a given year t with a production function

$$Y_{rt} = F(K_{rt}, L_{rt}),$$

where K_{rt} are non-labour inputs and L_{rt} is a nested CES production function of different skill groups j that are imperfect substitutes:

[6] In 2001, 77.2% of all workers in the German economy were covered by social security and 78% of unemployed individuals in West Germany received official unemployment compensation - mostly (89%) either unemployment benefits (*Arbeitslosengeld*) or unemployment assistance (*Arbeitslosenhilfe*) and are hence recorded in the IAB data (Bundesagentur für Arbeit 2004). The data set does not provide information on the out of labour force population and those individuals which are currently actively looking for a job but have not yet paid into the social security system.

[7] We chose the 31st of December to conform with the available data on annual inflows of ethnic German migrants, as well as the reference date used in official data of the German Statistical Office which we merged with the IAB data.

[8] Wage records in the IAB data sample are top coded at the social security contribution ceiling. We impute those wages using a method developed by Gartner (2004).

$$L_{rt} = (\sum_j (e_{jrt} N_{jrt})^{(\sigma-1)/\sigma})^{\sigma/(\sigma-1)}.$$

Here N_{jrt} is the number of individuals with skill level j employed in region r at time t and σ is the elasticity of substitution between the different skill groups. e_{jrt} reflects unobserved region- and skill-specific productivity shocks. If the wage rate of skill group j in region r at time t is now given by w_{jrt} and the selling price of output from region r in time t by q_{rt}, equating the marginal product of a skill group with its real product wage then leads to the following expression:

$$\log N_{jrt} = \theta_{rt} + (\sigma - 1)\log e_{jrt} - \sigma \log w_{jrt}, \tag{1}$$

where $\theta_{rt} = \sigma \log [q_{rt} F_L(K_{rt}, L_{rt}) L_{rt}^{1/\sigma}]$ is a region- and time- specific component shared by all skill groups. Let P_{jrt} be the labour force of individuals in skill group j in labour market region r in year t and assume a log-linear labour supply function

$$\log (N_{jrt}/P_{jrt}) = \varepsilon \log w_{jrt} \tag{2}$$

with $\varepsilon > 0$. Then using Equations 1 and 2 we can obtain the following expressions for the wage and employment/labour force rate of skill group j in region r at time t:

$$\log w_{jrt} = 1/(\varepsilon + \sigma)\{(\theta_{rt} - \log P_{rt}) + (\sigma - 1)\log e_{jrt} - \log (P_{jrt}/P_{rt})\},$$

$$\log N_{jrt}/P_{jrt} = \varepsilon/(\varepsilon + \sigma)\{(\theta_{rt} - \log P_{rt}) + (\sigma - 1)\log e_{jrt} - \log (P_{jrt}/P_{rt})\},$$

where P_{rt} is the overall labour force in labour market region r at time t.[9] Both local wages and employment rates are determined by three factors: a common region- and time-specific component, a skill-, region- and time-specific productivity component, and the relative labour force shares of the different skill groups. If we decompose the unobserved productivity component into four parts

$$\log e_{jrt} = e_{jr} + e_{jt} + e_{rt} + e'_{jrt},$$

where e_{jr} represents skill- and region-specific effects, e_{jt} is a skill- and year-specific effect, e_{rt} is a region- and year-specific effect, and e'_{jrt} is a skill-, region- and year-specific effect, we can obtain

[9] Driven by our data, we use the labour force rather than the working age population for P_{jrt} and P_{rt}. We are therefore not able to capture responses through entries to or exits from the labour force which, while less an issue for men, may be problematic when looking at female labour market outcomes.

two regression models for the wage and employment rates:

$$\log w_{jrt} = u_{jr} + u_{jt} + u_{rt} + \beta_1 \log f_{jrt} + u_{jrt}, \tag{3}$$

$$\log (N_{jrt}/P_{jrt}) = v_{jr} + v_{jt} + v_{rt} + \beta_2 \log f_{jrt} + v_{jrt}, \tag{4}$$

where $f_{jrt} = P_{jrt}/P_{rt}$ denotes the fraction of the overall labour force in labour market r at time t that falls into skill group j These equations are the basis for our empirical analysis.

We will estimate these models in first differences

$$\Delta \log w_{jrt} = u'_{jt} + u'_{rt} + \beta_1 \Delta \log f_{jrt} + \Delta u_{jrt}, \tag{5}$$

$$\Delta \log (N_{jrt}/P_{jrt}) = v'_{jt} + v'_{rt} + \beta_2 \Delta \log f_{jrt} + \Delta v_{jrt}, \tag{6}$$

where u'_{jt}, v'_{jt}, u'_{rt}, and v'_{rt} are interactions of skill and year fixed effects, respectively region and year fixed effects, and Δu_{jrt} and Δv_{jrt} are unobserved error components that depend on the productivity terms e'_{jrt} and e'_{jrt-1}. The coefficients β_1 and β_2 are functions of the elasticities of substitution and supply; specifically, $\beta_1 = -1/(\varepsilon + \sigma)$ and $\beta_2 = -\varepsilon/(\varepsilon + \sigma)$.

Equations 5 and 6 relate changes in the native wage and employment rates to changes in the relative factor shares in a locality. Any skill-specific local productivity shocks in a given year are captured in the error component. If these shocks raise wages and employment rates and at the same time lead to an increase in the share of a particular skill group, the estimates of β_1 and β_2 will be upward biased. We will estimate this model first by OLS and then by IV, using the skill specific ethnic German immigrant inflow rate as an instrument for the change in the skill-group specific factor share. In this model, immigrant inflows thus affect native labour market outcomes by changing the relative factor supplies in a locality. As robustness checks we will estimate for differently sized labour markets. The issue of interregional migration of the ethnic German immigrants after being allocated will be reflected in a weaker first stage of our IV estimations. Finally, we will also take account of potential selectivity bias in the wage regressions that arises if immigration pushes individuals into unemployment by focussing on the effect on natives that were also employed in the previous year. Because of the time dimension in our data we are able to control for skill-region specific fixed effects (which we difference out).

We obtain skill-group specific average employment/labour force rates and wages by regressing for each year and skill group separately the individual level outcomes, either log wages or an employment indicator, on a set of observables including a cubic of potential experience, a set of education,

respectively occupation group fixed effects and a vector of region fixed effects. We then use the estimated coefficients on the region dummies as the dependent variable in our regressions of Equations 5 and 6. They reflect the average log wage and employment rate in each locality, adjusted for observable differences in experience and educational (occupational) composition within each skill group across local labour markets.

An important issue in this context is that, by construction, the exogenous allocation of ethnic German migrants over the German labour market ensures that the variation in the overall regional inflow rates $\Delta I_t/P_{t-1}$ is very small (see Figure 2). In fact, if the allocation had been exclusively based on the relative population share of a region and strictly adhered to, there would be no variation in the overall ethnic German immigrant inflow rate and simply regressing local labour market outcomes on the overall immigrant inflow rate, as done in many impact analyses, would have been impossible. Furthermore, if the allocation decision is based, as in our case, to an overwhelming extent on family ties, the skill distribution of the newly arriving ethnic German immigrants is also going to be homogeneous across different regions. However, even with the same inflow rate and skill composition of the arriving ethnic German immigrants in each region, the effect on the labour market outcomes of the native German population of a particular skill group will still differ dependent on the existing pre-migration skill distribution in each region. In particular, the percentage change in local skill share f_{jrt} after an inflow of ethnic German immigrants of $\Delta I_t/P_{t-1}$ into region r of which $v_r = v\%$ are of the same skill j is given by

$$\%\Delta f_{jrt} = \frac{f_{jrt-1} + v\% \frac{\Delta I_t}{P_{t-1}}}{f_{jrt-1}(1 + \frac{\Delta I_t}{P_{t-1}})} - 1.$$

The first derivative of this term with respect to the initial skill share f_{jrt} is then given by

$$-\frac{v\% \frac{\Delta I_t}{P_{t-1}}}{f_{jrt-1}^2(1 + \frac{\Delta I_t}{P_{t-1}})} < 0$$

so the larger the intial skill share, the smaller will be the percentage change in the relative skill supply induced by the skill-homogenous inflow of ethnic German migrants.

Differences in the skill composition before the immigrant inflows occur thus lead to differences in the relative changes of the skill shares and hence to differences in the responses of native labour market outcomes. The variation we exploit in our estimations therefore arises to a large extent from variation in the pre-existing skill compositions across different labour markets regions rather than from a differential composition of the immigrating ethnic German population. For instance, between 1996 and 2001 the average overall ethnic German inflow rate, $\Delta I_t/P_{t-1}$, is 0.88%. Of these migrants v=43.3% did not have vocational training. Now, in our sample of 230 counties, the lowest share of individuals without vocational training in a locality at the end of 1995 is 18.0%

(city of *Münster* in North-Rhine Westphalia) while the highest share is 41.5% (county *Zollernalbkreis* in Baden-Wuerttemberg). Using Equation 7, the corresponding percent change in the population share of individuals without vocational training is then 0.04% for the county with the highest initial share, and 1.2% for the county with the lowest initial share. Similarly, for high skill individuals, the lowest share in our counties is 1.3% (county *LüSchow-Dannenberg* in Lower Saxony) while the highest is 17.7% (city of *Darmstadt* in Hesse). With 10.2% of the ethnic German migrants being college educated, this leads to a percent change in the respective skill share of -0.37% for the initially high skill, and 5.8% for the initially low skilled local labour market. It is this variation in the existing skill compositions across German labour markets that we use to identify the effect of ethnic German inflow rates on native labour market outcomes.[10]

4.2 The instrument

As pointed out earlier, the change in the relative skill shares in Equations 5 and 6 may be endogenous in the presence of skill-specific local productivity and demand shocks. If for instance a favourable local demand shock in a particular skill group increases the respective wage and employment rates and at the same time attracts more workers into that particular skill group, then this will induce a positive correlation between the error terms Δu_{jrt} and Δv_{jrt} in Equations 5 and 6 and the relative skill share $\Delta \log f_{jrt}$. This will lead to an upward bias in the OLS estimates of β_1 and β_2 and therefore underestimate (in absolute terms) the true effect of changes in the relative skill shares on native labour market outcomes.

Because of the exogenous allocation of ethnic German immigrants to Germany's counties between 1996 and 2001, we assume that their inflows are uncorrelated with any skill-specific productivity and demand shocks and can therefore serve as an instrument for the change in the relative factor shares $\Delta \log f_{jrt}$. We construct the skill-specific ethnic German inflow rates by multiplying the overall inflow ΔI_{rt} into a particular locality with the nationwide fraction of ethnic German immigrants in each skill group. We obtain these fractions from the German Microcensuses in 1999, 2001 and 2002. In each Microcensus we are able to identify ethnic German immigrants as individuals with German citizenship that arrived in Germany in any particular year between 1996 and 2001. We then obtain their educational attainment as well as their current or, if not available, last occupation. For any given year of arrival there were between 94 and 274 individuals aged 15 to 64 with valid educational and occupational information. From these observations we then calculate the fraction of ethnic German immigrants in each skill group θ_{jt}, where j is either education or occupation. Since we want to avoid immigrant self-selection into different skill groups, we use the available information closest to the actual year of arrival. The skill shares for 1996, 1997 and 1998 are therefore taken from the 1999 Microcensus, the shares for 1999 and 2000 from the 2001

[10] A policy question that arises in this context is whether the allocation across labour markets based on the existing overall population in a region without consideration of its skill distribution was economically sensible or whether free movement (or a more targeted allocation according to the demands of a region) would have resulted in an overall more efficient allocation of workers.

Microcensus, and the share for 2001 from the 2002 Microcensus.[11] It is possible that these skill shares are already reflecting some degree of self-selection, especially with regard to occupations. However, since we calculate the shares on the national level these selection effects will be absorbed by the year-skill group fixed effects u'_{jt} and v'_{jt} in Equations 5 and 6. Since individual skills did not play a significant role in the allocation of ethnic Germans to local labour markets, we can expect that the skill composition of the arriving ethnic German migrants in each locality is the same. The predicted skill-specific ethnic German immigrant inflow rate into labour market r in year t that we use as an instrument for the change in the relative factor share is then given by

$$SP_{jrt} = \frac{\theta_{jt}\Delta I_{rt}}{P_{jrt_{-2}}},$$

where SP_{jrt} stands for the skill-specific supply-push component of ethnic German immigrant inflow ΔI_{rt}. We use the overall skill-specific labour force lagged by two years in the denominator in order to avoid any correlation with the skill-specific error terms Δu_{jrt} and Δv_{jrt} in Equations 5 and 6.[12]

5 Descriptive evidence

In our analysis we define different skill groups in two ways: First we use the reported educational attainment of an individual. We distinguish three different groups: People without vocational training, with vocational training and with college education. Vocational training is a crucial component of Germany's educational system and more than two thirds of all Germans have received it in 2001. It usually follows directly after an individual has left school and typically consists of two to four years on the job training with complementary class room teaching on one day per week. In terms of future income prospects, the existence of vocational training turns out to be more important than the actual number of years in school which is why we use it as the prime indicator of an individual's educational attainment.[13]

Alternatively, we define skill groups along five different occupation lines (for a similar approach see Card 2001): I. farmers, labourers and transport workers, II. operatives, craft workers, III. service workers, IV. managers, sales workers, and V. professional & technical workers. The moti-

[11] The 1999 Microcensus is the first Microcensus that asks German citizens for their year of arrival in Germany which is why we cannot use earlier Microcensuses for the years 1996 and 1997. Furthermore, the reference week in the German Microcensuses is usually the last week in April so that we cannot use the Microcensus in say 2001 to calculate the skill shares in 2001.

[12] Using the skill-specific labour force of the previous year instead will increase the first stage correlation of the instrument with the endogenous variable $\Delta \log f_{jrt}$ but introduce a positive correlation of the instrument with the first differenced error terms Δu_{jrt} and Δv_{jrt} which would render the instrument invalid.

[13] For instance, the average daily wage of German individuals with neither vocational training nor A-levels in West Germany in 2001 is € 46.5, compared to € 47.1 for those without vocational training but with A-levels. On the other hand, Germans with vocational training but no A-levels earn on average € 76.7 and those who have both vocational training and A-levels € 87.3.

Table 1: Occupational distribution of the German population in West Germany

2001	Occupation Group				
	I	II	III	IV	V
Percentage female	15.3	18.0	71.3	54.3	25.9
Percentage without vocational training	33.0	29.1	19.6	14.2	7.1
Percentage with vocational training	66.1	70.4	73.6	75.1	50.1
Percentage with college education	0.9	0.4	6.8	10.7	42.8
Mean wage (in Euros)	71.7	69.3	71.1	84.9	107.6
Mean wage men (in Euros)	74.0	72.2	87.4	102.0	113.1
Mean wage women (in Euros)	54.3	51.9	62.0	64.4	85.3
Unemployment/labour force rate	10.1	8.3	5.9	5.3	4.3
Percentage of workers	15.4	19.9	37.3	16.1	11.3
Percentage of population	15.9	20.3	36.9	15.9	11.0

Source: IAB sample

Notes: The occupation groups are I: farmers, labourers, transport workers; II: operatives, craft workers; III: service workers; IV: managers, sales workers; V: professional & technical workers. The aggregation has been performed on the basis of the IAB classification of occupations and was crosschecked with the American SF-3 Occupation Table.

vation for this disaggregation by occupations is that the reported level of education an immigrant obtained in his or her country of origin does often not correspond to the respective level of education in the host country. Natives and immigrants in the same occupation group might therefore better reflect comparable skill levels. In the empirical estimations we will use both occupation and education as indicators for the skill level of the population.[14] Occupation groups I - V are ordered according to the percentage of people without vocational training. Table 1 provides some summary statistics for the German population in these occupation groups. It shows that nearly one third of farmers, labourers and transport workers but only 7.1% of professional and technical workers do not have vocational training. Women work predominantly in the service sector (occupation group III) where they make up 71.3% of the workforce. Mean gross daily wages, measured in real 1995 Euros, are lowest among operatives and craft workers and highest for professional and technical workers. Unemployment rates, defined as the number of registered unemployed as a share of the overall number of employees subject to social security contributions plus the registered unemployed, are highest in occupation group I (10.1%) and and lowest in occupation group V (4.3%).

Table 2 provides some descriptive statistics on the overall ethnic German population immigrating in each year between 1996 to 2001. In 1996, 177,751 ethnic German migrants came to Germany. This number gradually declined to 95,615 in 2000 and then increased slightly again to 98,484 in 2001. Overall, over the period 1996 to 2001, 714,265 ethnic German immigrants came to Ger-

[14] Borjas (2003) defines skill groups in terms of education and work experience, arguing that individuals with similar education but different experience in the labour market are not perfect substitutes in the production process.

Table 2: Descriptive statistics of ethnic German immigrants 1996-2001

	Year						Overall
	1996	1997	1998	1999	2000	2001	1996 - 2001
Overall inflow	177,751	134,419	103,080	104,916	95,615	98,484	714,265
Men	85,918	65,010	49,664	50,456	46,145	47,379	344,572
Women	91,833	69,409	53,416	54,460	49,470	51,105	369,693
Mean % inflow rate*	0.20	0.18	0.13	0.13	0.12	0.12	0.88
(standard deviation)	(0.13)	(0.10)	(0.07)	(0.06)	(0.06)	(0.05)	(0.40)
% Labour force	53.6	53.7	55.0	55.6	56.6	57.3	55.0
% Age < 15	27.6	26.2	25.5	24.2	23.3	22.6	25.3
% Age 15-64	65.9	66.5	67.8	69.0	70.1	71.1	68.0
% Age > 64	6.5	7.3	6.7	6.8	6.6	6.3	6.7
% Occupation I	25.8	29.6	23.8	21.5	18.8	17.9	23.5
% Occupation II	28.9	29.6	19.0	39.8	24.5	24.3	28.1
% Occupation III	30.1	19.8	36.9	25.4	37.1	39.1	30.8
% Occupation IV	7.3	13.0	6.4	7.8	10.8	11.6	9.1
% Occupation V	8.0	8.1	13.9	5.6	8.8	7.1	8.5
% Without vocational training	47.2	48.8	36.3	43.6	34.4	45.3	43.3
% With vocational training	43.8	42.9	49.3	46.1	53.1	46.4	46.4
% With college education	9.0	8.3	14.4	10.2	12.5	8.4	10.2

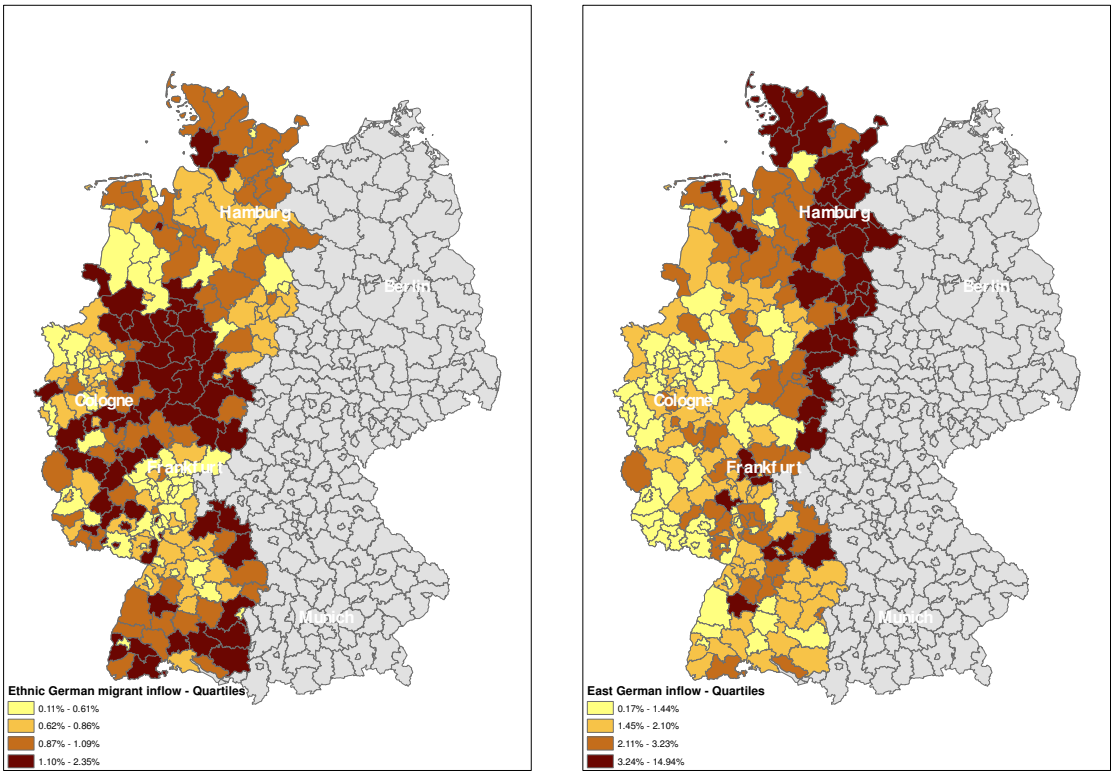
Source: *Bundesverwaltungsamt*
* Mean inflow rate based on 230 West German counties.
Note: Occupational composition and educational attainment are obtained from the German Microcensuses 1999, 2001 and 2002. Labour force participation refers to participation in country of origin before immigration and is reported upon arrival.

many, which corresponds to an average inflow rate of 0.88% using the 230 West German counties for which we were able to obtain the relevant data. Looking at the average inflow rates more closely shows relatively little variation across Germany's counties: For the period 1996 to 2001, the minimum inflow rate was 0.1% (county of *Mainz* in Rhineland-Palatinate) while the maximum inflow rate amounted to 2.4% (county *Waldeck-Frankenberg* in Hesse). This is of course a result of the legal provisions about the allocation of ethnic German immigrants introduced in 1996 (compare Section 2). From the descriptives on the age and occupational composition of the ethnic German immigrants we can see that the immigrant cohorts remained quite homogenous over time. There is a slight increase in the labour force participation in the home country before immigration, which rises from 53.6% in 1996 to 57.3% in 2001. Furthermore, the immigrant cohorts became slightly older over time, with 22.6% being less than 15 years old, 71.1% being of working age 15 to 64, and 6.3% being older than 64 in 2001. The structure of the occupational composition and educational attainment, which we obtain from the German Microcensuses, refer to the first observed job, respectively the reported education level in Germany, did not change very much over time. There is a decrease in the number of migrants working in low skill occupation groups

I and II and a corresponding increase in the share working in the service and commercial sectors. The educational attainment between 1996 and 2001 remains relatively constant with about 45% without vocational training, 45% with vocational training and roughly 10% with college education.

The primary regional unit in our analysis are West German counties. These are relatively small administrative units comprising on average around 225,000 individuals, although this number varies substantially. Table 3 provides some descriptive statistics of the labour market outcomes and socioeconomic characteristics of the German population in the 230 West German counties for which we have data on the ethnic German immigrant inflows and which form the basis of our empirical analysis.[15]. Besides counties we will also use an alternative definition of local labour markets: labour market regions, of which there are 204 in West Germany, although due to the lack of data for Bavaria we can only use 148 of these in our estimations.

Figure 3: Ethnic German and East German inflows by quartiles between 1996-2001



The left map of Figure 3 plots our 230 West German counties according to the quartile of their ethnic German immigrant inflow rate in order to investigate which regions have been the prime destination of the ethnic German immigrants. Due to the exogenous allocation process we would expect relatively little variation in the inflow rates. For comparison we have also plotted the cor-

[15]The figures in Table 3 refer to the overall German population in the counties and hence include both native Germans and ethnic German immigrants.

Table 3: Summary statistics for 230 West German counties. Means and standard deviations.

	Year						Change
	1996	1997	1998	1999	2000	2001	1996 - 2001
Overall population	227,728	228,182	228,417	229,017	229,553	230,405	1.6%
	(176,802)	(176,720)	(176,424)	(176,757)	(177,339)	(178,100)	(3.2)
Working-age population (15-64)	154,513	154,568	154,544	154,324	153,998	154,033	-0.1%
	(122,900)	(122,742)	(122,472)	(122,290)	(122,228)	(122,342)	(3.2)
Foreign immigrant share (in %)	10.7	10.6	10.4	10.4	10.3	10.2	−0.3
	(5.0)	(4.8)	(4.8)	(4.8)	(4.7)	(4.7)	(1.4)
Germans							
Labour market outcomes:							
Lf/pop rate	53.9	52.9	54.0	54.2	54.7	54.7	0.9
	(17.3)	(17.2)	(17.5)	(17.8)	(18.0)	(18.3)	(2.7)
Empl/pop rate	48.5	48.0	49.0	50.0	50.6	51.0	1.9
	(16.0)	(16.0)	(16.4)	(16.8)	(17.2)	(17.6)	(3.0)
Unempl/pop rate	5.5	4.9	5.1	4.2	4.0	3.7	−1.0
	(1.9)	(1.8)	(1.8)	(1.5)	(1.5)	(1.4)	(0.9)
Unempl/lf rate	10.1	9.3	9.4	7.8	7.4	6.8	−2.0
	(2.5)	(2.5)	(2.7)	(2.3)	(2.4)	(2.3)	(1.4)
Mean daily wage (in Euros)	76.5	75.9	76.5	77.3	77.1	77.8	1.3%
	(7.5)	(7.6)	(7.7)	(8.0)	(8.0)	(8.2)	(2.2)
Socioeconomic characteristics:							
% Without vocational training	21.8	21.8	21.7	21.7	21.6	21.4	−0.6
	(3.5)	(3.4)	(3.3)	(3.3)	(3.3)	(3.2)	(1.6)
% With vocational training	70.8	70.9	70.0	69.7	69.7	69.6	−1.0
	(2.7)	(2.8)	(2.8)	(3.1)	(3.2)	(3.3)	(2.1)
% With college education	7.5	7.4	8.2	8.5	8.7	9.0	1.6
	(3.8)	(3.8)	(4.0)	(4.2)	(4.2)	(4.3)	(1.0)
% Occupation I	17.5	17.3	17.2	16.9	16.6	16.1	−1.7
	(4.2)	(4.1)	(4.2)	(4.2)	(4.2)	(4.2)	(1.4)
% Occupation II	21.6	21.5	21.3	20.9	20.6	20.2	−1.6
	(5.5)	(5.5)	(5.7)	(5.7)	(5.8)	(5.9)	(1.4)
% Occupation III	34.7	35.2	35.1	35.7	36.3	37.0	2.9
	(4.1)	(4.2)	(4.2)	(4.2)	(4.3)	(4.5)	(1.6)
% Occupation IV	15.6	15.7	15.6	15.6	15.6	15.8	0.2
	(3.6)	(3.7)	(3.7)	(3.8)	(3.8)	(3.8)	(1.1)
% Occupation V	10.6	10.2	10.8	10.9	10.8	10.9	0.2
	(3.3)	(3.2)	(3.3)	(3.3)	(3.4)	(3.4)	(1.0)
% Female	51.9	51.8	51.8	51.7	51.6	51.6	−0.3
	(0.8)	(0.8)	(0.8)	(0.8)	(0.7)	(0.7)	(0.2)
Mean age	38.5	38.6	38.7	38.7	38.8	39.0	0.6
	(1.0)	(0.9)	(0.9)	(0.8)	(0.8)	(0.7)	(0.6)

Source: IAB sample, Statistical Office

Note: For the labour market outcomes and the socioeconomic characteristics we only consider the working-age population aged 15-64. Basis of this table are the 230 counties for which we have data on ethnic German immigrant inflows which include all counties apart from those in Bavaria.

responding map for individuals who moved from East Germany to West Germany in the same period. In contrast to ethnic German immigrants, this group of migrants has been entirely free to choose their place of work and are therefore likely to have self-selected into the most attractive local labour markets. Clearly, both groups of migrants have settled in very different regions. While East Germans have mostly moved to counties that are on the border to East Germany as well as the north of Germany and the bigger cities of Hamburg, Frankfurt and Stuttgart, ethnic German immigrants have primarily settled in - or more precisely been allocated to - counties in Lower Saxony and Hesse as well as the south of Baden-Wuerttemberg.[16] If ethnic Germans had in fact been free to choose their place of residence, we would have expected them to distribute themselves across Germany in a more similar way to those immigrant groups that were not restricted in their destination choice. We take this as further indication that the new legal provisions in 1996 have prevented the ethnic German migrants to endogenously select into booming local labour markets.

5.1 Labour market competition of natives and migrants

Our theoretical model predicts that ethnic German immigrants only affect the native German population if their inflow leads to changes in the relative supply of different labour inputs. This would require the ethnic German immigrant populations to differ from the native German population with respect to their skill distribution.

Comparing the occupational distribution of the native German population and ethnic German immigrants in Tables 2 and 3 shows that more than 50% of ethnic German immigrants work in the low skill occupation groups I and II compared to only about 37% of native Germans. They are also less likely to work in the service ($\sim 30\%$ vs. $\sim 35\%$) and, in particular, the commercial sector ($\sim 9\%$ vs. $\sim 15\%$). A similar fraction of ethnic German immigrants work in high-skill occupation group V ($\sim 9\%$ vs. $\sim 11\%$).

With regard to the educational attainment, the differences between ethnic German migrants and the native German population are even more pronounced. More than 43% of the ethnic German migrants are without vocational training compared to only 21% of the native population. On the other hand, 46% do have vocational training compared to about 70% of native Germans. The shares having college education are similar for both groups at around 10%. Overall, both the occupational and educational composition of the newly arriving ethnic German immigrants differs substantially from the existing skill composition of the German population and will therefore have affected the relative factor supplies in the German economy.

A more systematic way to measure this degree of dissimilarity in the occupational distributions is to compute the following index of congruence for any two skill groups k and l (see Welch 1999):

[16] In the IAB dataset the regional identifier records the county of the work place. Therefore it is likely, that the large inflows of East Germans into West German counties bordering the former GDR do not reflect actual changes of places of residence but rather large commuter flows.

$$C_{kl} = \frac{\sum_c (q_{kc} - \bar{q}_c)(q_{lc} - \bar{q}_c)/\bar{q}_c}{\sqrt{(\sum_c (q_{kc} - \bar{q}_c)^2/\bar{q}_c)(\sum_c (q_{lc} - \bar{q}_c)^2/\bar{q}_c)}}$$

where q_{hc} gives the fraction of group $h(h = k,l)$ in occupation c, and $\bar{q}_c$ gives the fraction of the entire workforce in that occupation. This index C_{kl} equals one if the two skill groups have identical occupational distributions, and minus one if they are clustered in completely different occupations.[17] An index close to one therefore implies a high degree of competition between the two skill groups under consideration, a value close to minus one little competition in the labour market. Table 4 displays the occupational distribution for different subgroups of the native German population in 2001. In the bottom row we report the average occupational distribution of the cohorts of ethnic German immigrants that arrived between 1996 and 2001 as observed in the German Microcensus and reported in the last column of Table 2. The right hand column present the respective estimates of the index of congruence C_{kl} between recent ethnic German immigrants and the various subgroups of the native German population.

Table 4: Occupation distributions and index of congruence

1996-2001	Fraction in occupation group					Index of congruence
	I	II	III	IV	V	Microcensus
Germans						
without vocational training	24.7	27.8	33.3	10.5	3.6	0.87
with vocational training	15.3	20.7	38.8	17.2	8.0	-0.52
with college education	1.5	1.0	26.9	18.8	51.9	-0.50
Ethnic German immigrants	**23.5**	**28.1**	**30.8**	**9.1**	**8.5**	1.00

Source: IAB sample

Notes: The occupation groups are I: farmers, labourers, transport workers; II: operatives, craft workers; III: service workers; IV: managers, sales workers; V: professional & technical workers. The occupational distribution in the last row is obtained from the Microcensuses 1999, 2001 and 2002 and refers to all ethnic German migrants that arrived between 1996 and 2001.

The result show that ethnic German immigrants are most similar in their occupational distribution to native Germans without vocational training with a calculated index of 0.87. This index drops to

[17] Note that the respective fractions are computed using both employed and unemployed individuals, in the latter case using the last occupation they have worked in which are imputed in the IAB dataset. We thus implicitly assume that individuals do not switch between occupations, which is reasonable in the case of very broadly defined occupation groups. By using both employed and unemployed individuals we get a better indication of the actual labour supply in each occupation group.

-0.52 for Germans with vocational training and then increases slightly for college educated Germans to -0.50. Based on these results, the ethnic German immigrant inflows between 1996 and 2001 are likely to have exerted supply pressure on the labour markets of particularly less educated natives.

It is worth mentioning though that the preceding comparisons of occupational compositions of ethnic German immigrants and native Germans do not fully cover all aspects of labour market competition. For instance, even if ethnic German immigrants worked in identical occupations, their respective degree of competition with natives could still differ due to other unobserved factors such as language skills and employer attitudes.

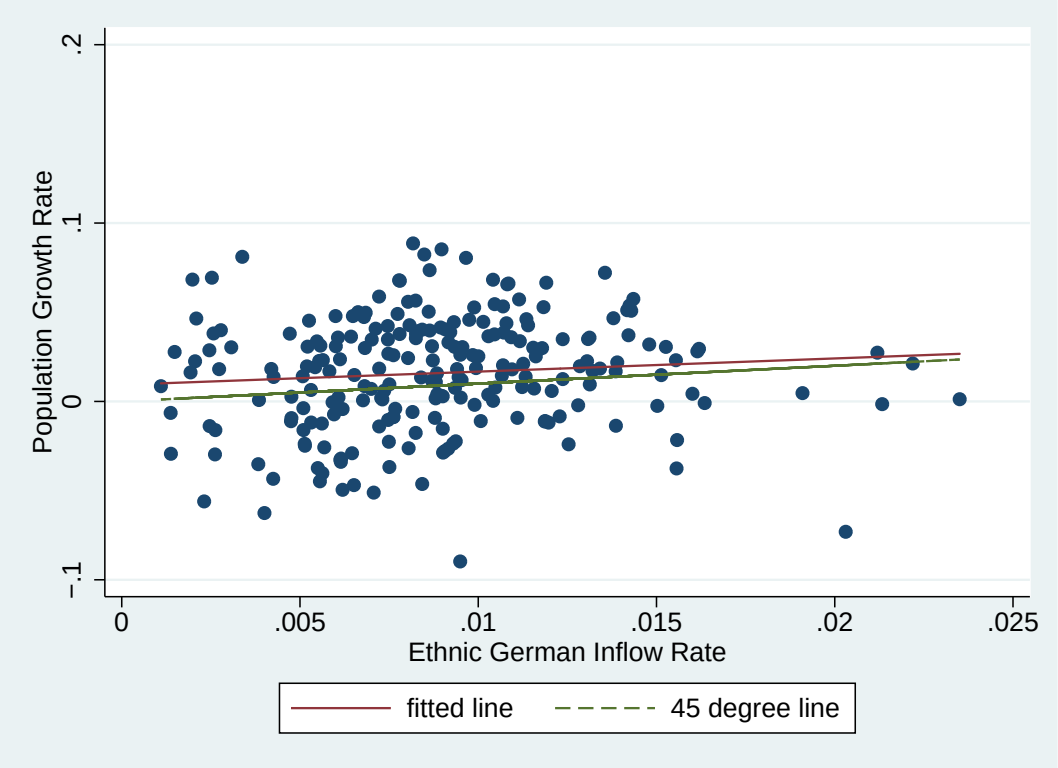
6 Empirical results

6.1 Migratory responses

Before we present the empirical results for the impact of immigration on native labour market outcomes, we first investigate whether there is evidence for native migratory responses to ethnic German immigrant inflows. By dissipating the effect of immigration across Germany, we would in that case underestimate the parameter of interest β. Due to Germany's relatively inflexible labour market, one would a priori not expect large native migration flows as a response to increased immigration. The comparatively generous German social security system, with particularly high and long-lasting unemployment benefits, counteracts to a large extent the incentive to move to a different location in the face of adverse labour market conditions.

This perception is supported by Figure 4 which plots the overall population growth rate in the 230 West German counties between 1996 and 2001 against the respective ethnic German inflow rate. In the absence of out-migration of the resident population in response to the ethnic German immigrant inflows we would expect that for every additional ethnic German immigrant moving into a particular county the overall population of that county should increase by one. Such a situation is reflected by the dashed 45 degree line in Figure 4. A simple OLS regression of the overall population growth rate on the ethnic German immigrant inflow rate yields a coefficient of 0.738 with a robust standard error 0.560, so we cannot reject the hypothesis that this coefficient is equal to one. As apparent in the graph, there is substantial variation in the overall population growth rates across counties, ranging from minus to plus 10% but these changes are not systematically related to the ethnic German immigrant inflows. Regressing annual population growth rates on annual inflow rates for 1996 and 2001 and including both year and county fixed effects, the latter to allow for county-specific population growth trends, gives a coefficient estimate of 1.04 with a robust standard error of 0.15. Hence there is no evidence that ethnic German immigrant inflows lead to an out-migration of the native population that could dissipate any labour market effects across the economy.

Figure 4: Overall Population Growth vs. Ethnic German Immigrant Inflow Rate 1996-2001



Source: Statistical Office and own collection. Sample are 230 West German counties for which ethnic German inflows are observable. Rates are calculated as the overall population change, respectively the overall number of ethnic German immigrants, between 1996 and 2001 divided by the county population on 31 December 1995.

The theoretical framework on which our spatial correlation analysis is based predicts that the extent to which immigrant inflows affect native wages and employment depends on whether these inflows lead to changes in the relative skill supplies in the local economy. If immigrants have the same skill distribution as natives or if native outflows entirely compensate for the immigrant inflows so that the overall skill distribution remains the same, then we would not expect any changes in neither native employment nor wages. Because labour market outcomes depend on the relative skill distribution and not the overall population in a region, we should analyse the effect immigrant inflows had on the relative fraction of individuals in each skill group. Unfortunately we have neither information about the actual skill composition of the ethnic German immigrants nor on their labour force participation rates at the local level. Given the results on the overall population growth as well as the focus on the short term effects using annual inflow rates, we believe, however, that the role of compensatory outmigration of the resident population in response to the ethnic German immigrant inflows is of minor importance in this analysis.

Table 5: Impact of changes in relative factor shares on the employment/labour force rate

1996-2001	Native Germans					
	Men		Women		Men	Women
	OLS	IV	OLS	IV	t-stat first Stage	
Occupation groups						
Without Controlling for Selection	-.081***	-.183	-.095***	.276	2.61	3.16
	(.009)	(.168)	(.012)	(.239)		
Controlling for Selection	-.083***	-.227	-.096***	.250	2.59	3.12
	(.009)	(.174)	(.012)	(.240)		
Education groups						
Without Controlling for Selection	-.033***	-.174	-.086***	-.227	2.28	1.92
	(.011)	(.164)	(.015)	(.258)		
Controlling for Selection	-.034***	-.209	-.088***	-.193	2.16	1.62
	(.011)	(.196)	(.016)	(.339)		

Entries are the estimated coefficients on the change in the factor shares Δf_{jrt}. All estimations include five occupation groups, respectively three education groups, in 230 West German counties (all but Berlin and Bavaria) for the years 1996 to 2001. Overall there are 6900, respectively 4140, observations. Regressions are weighted by the number of observations used to calculate the employment rates in year t. Standard errors are robust and clustered at the skill-specific regional level. Employment rates and average log wages are adjusted for differences in individual specific characteristics across labour markets. The occupation groups used are I: farmers, labourers, transport workers; II: operatives, craft workers; III: service workers; IV: managers, sales workers; V: professional & technical workers as described in Table 1. The education groups are I: without vocational training; II: with vocational training; III: with college education.

6.2 Effects on labour market outcomes

It is useful to think about what effects of immigrant inflows one would a priori expect in the German labour market context. Compared to the U.S., Germany's labour market is relatively inflexible, in particular due to strong unions and strict labour market regulations. Wages in Germany are to a large extent set by sector-level collective wage agreements. Although in decline, the union density and in particular the union coverage are still relatively high in Germany at 25%, respectively 68% in 2000 (OECD 2004). For comparison, the corresponding figures for the U.S. are 13%, respectively 14%. The overall scope for adjustments in the wage structure in Germany in response to immigrant inflows seems therefore limited. But if wages are rigid and there is at least some substitutability between natives and immigrants in the production process, then an increase in labour supply through immigration will lead to an increase in native employment unless it induces a sufficiently large increase in labour demand. In Germany we would therefore expect the immigrant impact on local labour markets to show in the effect on native German employment rather than wage levels.

Table 5 presents weighted least squares estimates of the effect of changes in occupation-specific

local labour force shares on the native German employment/labour force rate using data for 230 West German counties. We estimate our empirical model in Equation 6 first by OLS and then using the predicted ethnic German inflow rate as described in Section 4.2 to instrument the potentially endogenous change of the skill shares in a locality. We report results for skill groups based on occupations in the upper panel and for skill groups based on educational attainment in the lower panel, distinguishing between the effects on men and women. If skill groups are defined by occupation, respectively educational attainment, and men and women are perfect substitutes within these skill groups, then changes in the relative skill supplies in a locality should have the same effect on men and women. The dependent variable in each regression is the regression-adjusted employment/labour force rate of men, respectively women, thus controlling for differences in individual characteristics across labour markets.

Looking at the OLS results in the first row of the upper panel we see a significantly negative effect of an increase in the relative occupation share in a locality on the employment/labour force rate of both men and women. The estimated coefficients are -0.081 and -0.095, respectively. These estimates imply that an inflow of immigrants that raises the relative skill share by 10% reduces the employment/labour force rate of native German men and women by 0.81 and 0.95 percentage points, respectively.[18]

In the presence of unobserved transitory local demand shocks, the OLS estimates of Equation 6 will be biased. As expected if unobserved skill-specific local demand shocks attract workers into the labour force as well as lead to favourable changes in native labour market outcomes, we find larger detrimental effects of changes in relative skill shares on the native German employment/labour force rate of men if we instrument these changes with the occupation-specific ethnic German inflow rate. The coefficient estimate increases from -0.081 to -0.183, implying that a 10% increase in the relative occupation share of, for instance, the lowest occupation group in a labour market reduces the employment/labour force rate of native German men by 1.83 percentage points. For women, on the other hand, we find some indication of a positive effect on the employment/labour force rate. Both IV estimates, however, are statistically not significant. We report the respective t-statistics of the instrument in the first stage regressions in the last two columns of Table 5.

There are two important issues that arise when using the simple change in the German labour market outcomes from one year to the next as the dependent variable in the estimations. First, native Germans may drop out of the labour force and thus disappear from our dataset in response to changes in the relative skill shares induced by the ethnic German immigration. This could lead to a selectivity bias problem when calculating the regional skill specific employment/labour

[18]Note that in order to facilitate the calculation of regression-adjusted employment/labour force rates we use the employment/labour force rate in levels in our estimations rather than in logs as suggested by the theoretical model in Section 4. One can translate the coefficients in Table 5 into estimates of β_2 by dividing them by the average employment/labour force rates of men (0.91), respectively women (0.92).

force rates, particularly for women. If we had survey data we could circumvent this problem by using the employment/population rather than the employment/labour force rate. For the wage regression, however, the problem is more general. If increases in the relative skill shares lead to reductions in the employment/labour force rate, that is, pushes individuals into unemployment, then the observed average wage will suffer from selectivity bias and typically be an overestimate of the unconditional average wage.

The second issue stems from the fact that we are not able to distinguish ethnic German immigrants from native Germans in the IAB data so that part of the change in the employment/labour force rate, respectively the log wages in the later regressions, could be simply due to composition effects through newly entering ethnic German migrants. Appendix A shows that in this case our estimates of β_1 and β_2 will be biased and that this bias depends on the differential in employment and wages between the ethnic German immigrants and the native German population. In general, the lower the employment/labour force rate (average wage rate) of the incoming German migrants relative to the existing native German population, the more is our empirical estimate of β_2 (β_1) an underestimate of the true effect on the employment/labour force rate (average wage rate) of the native German population. In order to assess the wage and employment differentials between ethnic German immigrants and native Germans we run a probit estimation for unemployment and a linear regression for log income using data from the cumulative German General Social Survey (Allbus) for the period 1988 to 2001. The respective results reported in Appendix B show that ethnic German immigrants have on average a 4 percentage points higher probability of being unemployed and earn around 14% less than comparable native Germans. Due to a limited sample size, these estimations, however, do not restrict the sample of ethnic Germans to those who recently immigrated for which the labour market differentials are likely to be substantially larger. Their inclusion in the calculation of average labour market outcomes will therefore lead to a downward bias of the true change in labour market outcomes for native Germans. In the case of the employment/labour force rate, however, this downward bias is counteracted by the particular character of our data: Since the IAB data only covers individuals that are either employed (and subject to social security contributions) or receive unemployment compensation, which you are only entitled to if you have paid into the social security system for at least 12 months during the three years prior to the unemployment, ethnic German immigrants can enter the dataset exclusively by becoming employed. This will lead to a mechanical upward bias of the change in the overall German employment/labour force rate.

To prevent these potential composition and selection effects from biasing our results we make use of the longitudinal dimension of the data and restrict the sample of natives in our second set of estimations to those Germans that we already observe in the data in the previous year. This effectively excludes all newly immigrating ethnic Germans from the calculation of the average German labour market outcomes.

The respective results are shown in the second row of the upper panel of Table 5. Though of sim-

ilar magnitude, both estimates are smaller than previously estimated, with the estimate for men decreasing to -0.227 and the one for women to 0.250 which is what we expect due to the particular population captured by our data.

The lower panel of Table 5 presents the corresponding estimates of β_2 in Equation 6 when we define skill groups by educational attainment. As for the occupation groups, the OLS results are highly significant with a coefficient estimate of -0.033 for men and -0.086 for women. Instrumenting the potentially endogenous changes in relative education shares decreases these estimates to -0.174 and -0.227, respectively, indicating again the presence of unobserved education group specific local demand shocks. When we control for composition and selection effects, the estimates are -0.209 for men and -0.193 for women. Although none of the IV results is statistically significant at conventional levels of significance, the similar magnitude of the point estimates implies that local labour markets are indeed defined by education and that men and women are substitutes within different education groups. According to these results an ethnic German immigrant inflow that raises the relative education share in a locality by 10% will reduce the native German employment/labour force rate by 2.09 percentage points for men and 1.93 percentage points for women.

Turning towards the impact of changes in relative skill shares on native German wages, the upper panel in Table 6 reports the results for the coefficient β_1 in Equation 5, defining skill groups, as before, by occupation first. While the OLS estimates in the basic specification are -0.043 for men and -0.077 for women, the IV results are substantially lower for native German men with a significant estimate of -0.544. A 10% change in the relative occupation share would accordingly reduce average daily wages of native German men by 5.44%. The estimate for women is close to zero and very imprecisely estimated. Once we control for possible composition and selection effects, the negative wage effect turns into a positive effect of 0.500 for men and 0.945 for women. From a theoretical point of view, the result of positive wage effects is difficult to explain. One should remember though that in this specification we are looking at wage changes of those individuals that were already in employment in the previous year. Given Germany's widespread collective wage agreements and union coverage, the scope for short term wage adjustments for current workers is relatively limited. When skill groups are defined by educational attainment we find no effect on the wages of native German men when we do not control for selection and composition effects, and some indication of positive wage effects when we do. For women the results are less precisely estimated and inconclusive which is due to a weak first stage with t-statistics of 1.43 and 0.69 as reported in the last two columns of Table 6.

Summarising the results of Tables 5 and 6 we conclude that, first, there is some indication that unobserved skill specific demand shocks lead to biased OLS estimates of the effect of changes in relative skill shares on local labour market outcomes. Instrumenting these changes with the ethnic German inflow rate generally leads to substantially lower estimates, in particular for the employment/labour force rates of men. Second, the estimated effect on the native German em-

Table 6: Impact of changes in relative factor shares on the log daily wage

2001	Native Germans					
	Men		Women		Men	Women
	OLS	IV	OLS	IV	t-stat first Stage	
Occupation groups						
Without Controlling for Selection	-.043***	-.544*	-.077***	-.022	2.55	2.76
	(.010)	(.309)	(.020)	(.444)		
Controlling for Selection	-.020**	.500	-.032*	.945	2.39	2.58
	(.009)	(.314)	(.017)	(.615)		
Education groups						
Without Controlling for Selection	-.057***	.008	-.094***	1.210	2.28	1.43
	(.208)	(.225)	(.032)	(1.013)		
Controlling for Selection	-.023*	.742	-.036	-.758	1.63	0.69
	(.014)	(.455)	(.026)	(1.952)		

Entries are the estimated coefficients on the change in the factor shares Δf_{jrt}. All estimations include five occupation groups, respectively three education groups, in 230 West German counties (all but Berlin and Bavaria) for the years 1996 to 2001. Overall there are 6900, respectively 4140, observations. Regressions are weighted by the number of observations used to calculate the employment rates in year t. Standard errors are robust and clustered at the skill-specific regional level. Employment rates and average log wages are adjusted for differences in individual specific characteristics across labour markets. The occupation groups used are I: farmers, labourers, transport workers; II: operatives, craft workers; III: service workers; IV: managers, sales workers; V: professional & technical workers as described in Table 1. The education groups are I: without vocational training; II: with vocational training; III: with college education.

ployment/labour force rate is relatively stable for both skill definitions, occupations and educational attainment, at around -0.2. The magnitude of this estimate is at the upper limit of those Card (2001) finds for the US. This would imply that an inflow of ethnic Germans that increased the relative skill share in a local labour market by 10% would lower the employment/labour force rate of native German men and women by 2 percentage points. The effect on native wages is less stable across specifications. What the results do show is that wages of native Germans already in employment are not affected by changes in the relative skill shares in a locality.

As a robustness check we re-estimate our empirical models in Equation 5 and Equation 6 using an alternative definition for local labour markets: labour market regions. These are on average around 60% larger than the counties used in this analysis so far.[19] As Borjas et al. (1997) point out, if internal flows of native workers or capital diffuse the immigration impact across the economy, then the larger the regional unit of analysis, the larger will be the estimated impact of immigration on native labour market outcomes. Table 7 presents the corresponding results for the employment/labour

[19]Overall there are 204 labour market regions in West Germany (excluding Berlin) with an average population of 320,210 in 2001. For our estimations we can only use 148 of these because of a lack of data on ethnic German immigrant inflows for Bavaria.

Table 7: Impact of changes in relative factor shares on the employment/labour force rate - labour market regions

2001	**Native Germans**					
	Men		Women		Men	Women
	OLS	IV	OLS	IV	t-stat first Stage	
Occupation groups						
Without Controlling for Selection	-.106***	-.684	-.105***	.640	1.02	1.03
	(.011)	(.685)	(.937)	(.316)		
Controlling for Selection	-.109***	-.771	-.106***	.579	1.01	1.00
	(.011)	(.756)	(.015)	(.942)		
Education groups						
Without Controlling for Selection	-.037***	-.163	-.113***	-.208	2.55	2.35
	(.013)	(.156)	(.020)	(.225)		
Controlling for Selection	-.037***	-.216	-.116***	-.306	2.48	2.11
	(.014)	(.190)	(.021)	(.292)		

Entries are the estimated coefficients on the change in the factor shares Δf_{jrt}. All estimations include five occupation groups, respectively three education groups, in 148 West German labour market regions (all but Berlin and Bavaria) for the years 1996 to 2001. Overall there are 4440, respectively 2664, observations. Regressions are weighted by the number of observations used to calculate the employment rates in year t. Standard errors are robust and clustered at the skill-specific regional level. Employment rates and average log wages are adjusted for differences in individual specific characteristics across labour markets. The occupation groups used are I: farmers, labourers, transport workers; II: operatives, craft workers; III: service workers; IV: managers, sales workers; V: professional & technical workers as described in Table 1. The education groups are I: without vocational training; II: with vocational training; III: with college education.

force rates. While the IV results for the occupational skill groups show somewhat larger although not significant results, the estimates for education groups are very similar in magnitude to the ones obtained when using counties as the regional unit of analysis. In the estimations for the occupation groups our instrument loses a lot of its strength as indicated by the low t-statistics of only around 1. This weak instrument problem for occupation groups persists in the wage regressions based on labour market regions and leads to very imprecise and potentially biased IV estimates which are reported in Table 8. The instrument is somewhat stronger in the wage regression for education groups and produces a similar positive point estimate as in the county regression for men (0.643 vs. 0.742). The latter results are reported in Table 8.

Table 8: Impact of changes in relative factor shares on the log daily wage - labour market regions

2001	**Native Germans**					
	Men		Women		Men	Women
	OLS	IV	OLS	IV	t-stat first Stage	
Occupation groups						
Without Controlling for Selection	-.033**	-.543	-.086***	.095	0.99	0.97
	(.013)	(.702)	(.025)	(1.267)		
Controlling for Selection	-.010	1.562	-.030	1.788	0.85	0.87
	(.012)	(1.877)	(.021)	(2.619)		
Education groups						
Without Controlling for Selection	-.045**	.067	-.121***	.864	2.61	2.15
	(.019)	(.167)	(.037)	(.619)		
Controlling for Selection	-.017	.643*	-.066**	.241	2.20	1.67
	(.017)	(.351)	(.031)	(.692)		

Entries are the estimated coefficients on the change in the factor shares Δf_{jrt}. All estimations include five occupation groups, respectively three education groups, in 148 West German labour market regions (all but Berlin and Bavaria) for the years 1996 to 2001. Overall there are 4440, respectively 2664, observations. Regressions are weighted by the number of observations used to calculate the employment rates in year t. Standard errors are robust and clustered at the skill-specific regional level. Employment rates and average log wages are adjusted for differences in individual specific characteristics across labour markets. The occupation groups used are I: farmers, labourers, transport workers; II: operatives, craft workers; III: service workers; IV: managers, sales workers; V: professional & technical workers as described in Table 1. The education groups are I: without vocational training; II: with vocational training; III: with college education.

7 Summary and conclusion

In this paper we analyse the effect of changes in local skill shares on the employment/labour force rates and average wages of native Germans between 1996 and 2001. We distinguish between the effects on native men and women using two alternative skill definitions based on either occupations or educational attainment. In our instrumental variable estimations we use the skill specific ethnic German immigrant inflows as an instrumental variable for the potentially endogenous changes of relative skill shares due to unobserved local demand shocks. Ethnic German immigrants are exogenously distributed across German labour markets upon arrival, offering a unique natural experiment to investigate the impact of immigration on labour market outcomes.

Our empirical results show that shifts in the relative supply of different skill groups in a locality systematically affect native employment and wage rates. Our estimates imply that an inflow of immigrants that increases the relative share of a particular skill group by 10% reduces the native German employment/labour force rate by around 2 percentage points and the average daily wage of men by about 5%. The results for the employment/labour force rate are very similar for both skill definitions and, in the case of education, for men and women, pointing towards education based labour markets. Once we control for potential selectivity bias by restricting the sample to those native Germans who had already been in employment, the negative wage effect is reversed and there is some indication for a positive wage effect for men. While the numerically small and in some cases positive results for the wage effects of immigration are consistent with most of the existing evidence for Germany, the conclusion that immigrant inflows into a local labour market have a detrimental effect on native employment/labour force rates stands in contrast to a number of other studies for Germany, for instance Bonin (2005). Overall, however, the estimated magnitude of these employment effects is relatively small.

We do not find evidence of systematic outmigration of native Germans in response to ethnic German immigration. Since ethnic German migrants differ substantially in their skill distribution from the native population, their inflows are likely to have altered the relative skill compositions in the local workforces across Germany. Our estimates of the labour market impacts of immigration are therefore unlikely to be underestimated as a result of unaccounted compensating native migration flows.

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A Appendix A

A-1 The unemployment rate

The fact that we do not observe the employment/labour force rate of native Germans alone but only a composite employment rate of native and ethnic Germans, poses the question, to what extent this affects our estimate β_2 on the skill specific ethnic German inflow rate in Equation 6. In the following derivation we will look at the effect of this composition problem on the unemployment/labour force rate rather than the employment/labour force rate that we use in our regression. For the latter, however, a very similar derivation holds. Suppose our dependent variable were the first difference of the overall German unemployment rate. Suppose further that in the initial period $t-1$, the overall population in a local labour market P_{t-1} consists exclusively of native Germans, of which U_{t-1} are unemployed. Suppose further that the native German population remains constant over the years. Then the change in the unemployment rate of all Germans after an inflow of ethnic Germans of ΔG in period t can be written as

$$\Delta ue_t = \frac{U_{t-1} + \Delta U_t^N + s_G \Delta G}{P_{t-1} + \Delta G} - \frac{U_{t-1}}{P_{t-1}} \tag{A-1}$$

where ΔU_t^N is the change in the number of unemployed native Germans, and s_G is the fraction of the new ethnic German immigrants that is unemployed. Let $a = \frac{\Delta G}{P_{t-1}}$ be the ethnic German immigrant inflow rate, then equation A-1 can be expressed as

$$\Delta ue_t = \frac{a(s_G P_{t-1} - U_{t-1})}{(1+a)P_{t-1}} + \frac{1}{(1+a)} \frac{\Delta U_t^N}{P_{t-1}}. \tag{A-2}$$

Equation A-2 shows how the observed change in the overall German unemployment rate Δue_t is related to the change in the native German unemployment rate $\Delta U_t^N / P_{t-1}$, which is the true parameter of interest. It can be shown, that if

$$s_G > \frac{U_{t-1} + \Delta U_t^N}{P_{t-1}} = \frac{U_t^N}{P_{t-1}},$$

i.e. if the unemployment rate of the ethnic German immigrants is higher than the new unemployment rate of native Germans in period t, then we have the intuitive result that the observed change in the overall German unemployment rate will always be larger than the change in the native German unemployment rate:

$$\Delta ue_t > \frac{\Delta U_t^N}{P_{t-1}}.$$

Furthermore, under the same condition,

$$\frac{\partial \Delta ue_t}{\partial a} > 0,$$

which for our estimations means that even if there is no increase in the native German unemployment rate ($\Delta U_t^N / P_{t-1} = 0$), we will observe a positive change in the overall unemployment rate which is increasing in the ethnic German immigrant inflow rate $\Delta G / P_{t-1}$. Our estimate of δ_s will therefore be upward-biased. There is a composition effect in the overall German population for which we have to adjust in order to identify the effect on the native German population alone.

To see how this bias depends on the various parameters, suppose we estimate a model similar to the one we estimate in this paper

$$\Delta ue_t = \delta(\frac{\Delta G_t}{P_{t-1}}) + \varepsilon_t,$$

where for the sake of simplicity we have not included any additional regressors other than the ethnic German immigrant inflow rate. Suppose further from this estimation we obtain a coefficient estimate of $\widehat{\delta}$. Now using equation A-2 and $a = \Delta G / P_{t-1}$, we can rewrite this result as

$$\begin{aligned} \frac{\Delta U_t^N}{P_{t-1}} &= [\widehat{\delta} a - \frac{(s_G a P_{t-1} - U_{t-1} a)}{(1+a) P_{t-1}} + \varepsilon_t](1+a) \\ &= \widehat{\delta} a + \widehat{\delta} a^2 - s_G a + \frac{U_{t-1}}{P_{t-1}} a + \varepsilon_t (1+a) \\ &= a((1+a)\widehat{\delta} - s_G + \frac{U_{t-1}}{P_{t-1}}) + \varepsilon_t (1+a). \end{aligned} \tag{A-3}$$

Note that the effect of the ethnic German immigrant inflow on the native German unemployment rate is non-linear in the ethnic German immigrant inflow rate a. In order to look at the marginal effect of an increase in this rate on the native German unemployment rate we take the partial derivative of this expression with respect to a, which yields:

$$\frac{\partial (\Delta U_t^N / P_{t-1})}{\partial a} = \widehat{\delta}(1+2a) - (s_G - \frac{U_{t-1}}{P_{t-1}}) + \varepsilon_t.$$

Evaluating this expression at the mean allows us to assess the bias of our initially estimated parameter δ. Let us look at two extreme cases first.

Case 1: $s_G = 0$. In this case none of the incoming ethnic German immigrants is unemployed. The average effect of these inflows on the native German unemployment rate will then be given by

$$E(\frac{\partial(\Delta U_t^N/P_{t-1})}{\partial a}) = \widehat{\delta}(1+2\bar{a}) + \overline{(\frac{U_{t-1}}{P_{t-1}})},$$

where $\bar{a}$ and $\overline{(\frac{U_{t-1}}{P_{t-1}})}$ are the means of the ethnic German immigrant inflow rate and the unemployment rate in period $t-1$ in our local labour markets.

As we can see, our estimate of $\widehat{\delta}$ will underestimate the true effect of ethnic German immigrant inflows on the native German unemployment rate. Intuitively, by adding only to the denominator, the ethnic German inflow will mechanically decrease the overall unemployment rate thus causing a downward bias in the estimated effect on the native German unemployment rate.

Case 2: $s_G = 1$. Here, all of the ethnic German immigrants become unemployed upon arrival. The expression for the effect on the native unemployment rate is then given by

$$E(\frac{\partial(\Delta U_t^N/P_{t-1})}{\partial a}) = \widehat{\delta}(1+2\bar{a}) - (1 - \overline{(\frac{U_{t-1}}{P_{t-1}})}),$$

which for all reasonable values of U_{t-1}/P_{t-1} and a is smaller than $\widehat{\delta}$. Hence, if all ethnic German immigrants were unemployed, we would overestimate their effect on the native German unemployment rate. Intuitively this results from the fact that in this case both the numerator and the denominator of the overall German unemployment rate increase by the same absolute number (ΔG), which mechanically leads to an increase in that rate even in the absence of any effect on native German employment.

Finally, note that even if the unemployment rate of the incoming ethnic German immigrants in Germany is the same as the existing unemployment rate of the native German population, $s_G = \frac{U_{t-1}}{P_{t-1}}$, we will still underestimate the true effect on the native unemployment rate (as long as it is different from zero) by a factor of $(1+2\bar{a})$. With average annual ethnic German inflow rates of around 0.23%, however, this bias will be very small.

ALTERNATIVE PROCEEDING

... where for the sake of simplicity we have not included any additional regressors other than the ethnic German immigrant inflow rate. Suppose further from this estimation we obtain a coefficient estimate of $\widehat{\delta}$. Now using equation A-2 and $a = \Delta G/P_{t-1}$, we can rewrite this result as

$$\begin{aligned} \frac{\Delta U_t^N}{P_{t-1}} &= [\widehat{\delta}a - \frac{(s_G a P_{t-1} - U_{t-1}a)}{(1+a)P_{t-1}} + \varepsilon_t](1+a) \\ &= \widehat{\delta}a + \widehat{\delta}a^2 - s_G a + \frac{U_{t-1}}{P_{t-1}}a + \varepsilon_t(1+a) \end{aligned} \tag{A-4}$$

Ignoring the quadratic term of the ethnic German immigrant inflow rate a^2, a regression of the change in the true native German unemployment rate on the ethnic German immigrant inflow rate would now yield an estimate $\widehat{\delta}^*$ given by

$$\widehat{\delta}^* = \widehat{\delta} - (s_G - \frac{U_{t-1}}{P_{t-1}})$$

Dependent on the term in brackets we will thus under- or overestimate the effect of the ethnic German immigrant inflows on the native German unemployment rate if we use the overall German unemployment rate as the dependent variable instead. However, if we can get a measure for the difference in the unemployment rates between ethnic German immigrants and native Germans, $(s_G - \frac{U_{t-1}}{P_{t-1}})$, and if we assume that this difference is constant over time and across labour markets, then it will be possible to adjust our estimated coefficient $\widehat{\delta}$ accordingly. Let us look at two extreme cases.

Case 1: $s_G = 0$. In this case none of the incoming ethnic German immigrants is unemployed. The average effect of these inflows on the native German unemployment rate will then be given by

$$\widehat{\delta}^* = \widehat{\delta} + \overline{(\frac{U_{t-1}}{P_{t-1}})}$$

where $\overline{(\frac{U_{t-1}}{P_{t-1}})}$ is the mean of the unemployment rate in period $t-1$ in our local labour markets.

As we can see, our estimate of $\widehat{\delta}$ will underestimate the true effect of ethnic German immigrant inflows on the native German unemployment rate. Intuitively, by adding only to the denominator, the ethnic German inflow will mechanically decrease the overall unemployment rate thus causing a downward bias in the estimated effect on the native German unemployment rate.

Case 2: $s_G = 1$. Here, all of the ethnic German immigrants become unemployed upon arrival. The expression for the effect on the native unemployment rate is then given by

$$\widehat{\delta}^* = \widehat{\delta} - (1 - \overline{(\frac{U_{t-1}}{P_{t-1}})})$$

which is smaller than $\widehat{\delta}$. Hence, if all ethnic German immigrants were unemployed, we would overestimate their effect on the native German unemployment rate. Intuitively this results from the fact that in this case both the numerator and the denominator of the overall German unemployment rate increase by the same absolute number (ΔG), which mechanically leads to an increase in that rate even in the absence of any effect on native German employment.

...END OF ALTERNATIVE PROCEEDING

More generally, we can conclude, that the higher the unemployment rate of the incoming ethnic German immigrants is relative to the existing native German population, the more is our empirical estimate of δ an upward biased estimate of the true effect on the unemployment rate of the native German population.[20]

A-2 The average wage rate

A similar adjustment is required to translate the estimated effect of the ethnic German immigrant inflow rate on the overall average German wage rate into the effect on the native German wages. Keeping the notation of the previous section, the change in the overall German wage rate can be written as

$$\Delta w_t = \frac{w_t^N N_t + w^G \Delta G^e}{N_t + \Delta G^e} - \frac{w_{t-1}^N N_{t-1}}{N_{t-1}},$$

where w_t^N and w^G are the average wage rates of natives and ethnic German immigrants in period t, respectively, N_t represents the native German population in employment in period t and ΔG^e the number of new ethnic German immigrants in employment (that is, with positive recorded wages). Remember that in $t-1$, before the inflow occurred, the population consisted exclusively of native Germans, so that the second term also coincides with the overall German wage rate in period $t-1$. Now let $\alpha = \frac{\Delta G^e}{N_{t-1}}$ and suppose that the percentage change in the native population in employment is given by $v = \frac{N_t}{N_{t-1}} - 1$, then the previous equation can be rewritten as

$$\Delta w_t = \frac{\alpha(w^G - w_{t-1}^N)}{(1+v+\alpha)} + \frac{(1+v)}{(1+v+\alpha)} \Delta w_t^N. \tag{A-5}$$

This equation shows how the observed change in the overall German wage rate Δw_t is related to changes in the native German wage rate Δw_t^N, which, again, is the true parameter of interest in our empirical analysis. It can be shown, that if

$$w^G > w_t^N, \tag{A-6}$$

then

$$\Delta w_t > \Delta w_t^N. \tag{A-7}$$

[20] It should be pointed out that the bias will also depend on the additional covariates X in the original estimation model. Their inclusion would lead to an interaction term of $a * X$ in equation A-3, which we did not account for in the preceding derivation.

Equations A-6 and A-7 only reflect the intuitive result that if the wage rate of the incoming ethnic German immigrants is higher than the native German wage rate in period t, then the observed change in the overall German wage rate will always be larger than the change in the native German wage rate.

Suppose we estimate a model such as

$$\Delta \ln w_t \approx \frac{\Delta w_t}{w_{t-1}} = \delta \frac{\Delta G^e}{N_{t-1}} + \varepsilon_t,$$

and obtain a coefficient estimate of $\widehat{\delta}$. Now using equation A-5 and $\alpha = \Delta G^e / N_{t-1}$ and after some transformations, we can rewrite this result as

$$\Delta \ln w_t^N \approx \frac{\Delta w_t^N}{w_{t-1}^N} = \frac{\alpha}{(1+v)}((1+v+\alpha)\widehat{\delta} - \frac{w^G - w_{t-1}}{w_{t-1}}) + \frac{(1+v+\alpha)}{(1+v)}\varepsilon_t, \tag{A-8}$$

where we have made use of the fact that $w_{t-1} = w_{t-1}^N$. Taking the partial derivative of this expression with respect to α yields:

$$\frac{\partial(\Delta w_t^N / w_{t-1}^N)}{\partial \alpha} = \widehat{\delta}\frac{(1+v+2\alpha)}{(1+v)} - \frac{1}{(1+v)}(\frac{w^G - w_{t-1}}{w_{t-1}}) + \frac{1}{(1+v)}\varepsilon_t,$$

which, evaluated at the mean, allows us a comparison with our estimated parameter $\widehat{\delta}$.

We can see that if the ethnic German immigrants earn on average less than the native German population earned in period $t-1$, then $w^G - w_{t-1} < 0$ and our estimate of δ will underestimate the true effect of ethnic German immigrant inflows on the native German wage rate. This bias will be exacerbated if they also cause a decrease in the number of natives in employment, $v < 0$. Intuitively, part of the estimated negative effect on the wage rate stems from the addition of ethnic German immigrants who earn below the native average German wage. On the other hand, if ethnic German immigrants earn sufficiently more than the native German population so that the condition

$$\frac{w^G - w_{t-1}}{w_{t-1}} > 2\alpha\widehat{\delta},$$

is satisfied, then our estimate of δ will be an upward-biased estimate of the true effect of the ethnic German immigrant inflow on the native German wage rate. Intuitively, part of the positive effect on the wage rate is a result of the addition of ethnic German immigrants who earn above the average native wage rate.

ALTERNATIVE PROCEEDING

...which then again implies that our estimate of δ_s in the wage regressions would be upward-biased. Suppose we estimate a model such as

$$\Delta \ln w_t \approx \frac{\Delta w_t}{w_{t-1}} = \delta \frac{\Delta G^e}{N_{t-1}} + \varepsilon_t,$$

where we again abstract from any additional regressors, and obtain a coefficient estimate of $\widehat{\delta}$. Now using equation A-5 and $\alpha = \Delta G^e / N_{t-1}$ and after some transformations, we can rewrite this result as

$$\begin{aligned} \Delta \ln w_t^N \approx \frac{\Delta w_t^N}{w_{t-1}^N} &= \frac{\alpha}{(1+v)}((1+v+\alpha)\widehat{\delta} - \frac{w^G - w_{t-1}}{w_{t-1}}) + \frac{(1+v+\alpha)}{(1+v)}\varepsilon_t, \\ &= \alpha\widehat{\delta} + \frac{\alpha^2}{(1+v)}\widehat{\delta} - \frac{\alpha}{(1+v)}\frac{w^G - w_{t-1}}{w_{t-1}} + \frac{(1+v+\alpha)}{(1+v)}\varepsilon_t, \end{aligned} \tag{A-9}$$

where we have made use of the fact that $w_{t-1} = w_{t-1}^N$. Again ignoring the quadratic term in the ethnic German immigrant inflow rate α, a regression of the change in the native German wage rate on the ethnic German immigrant inflow rate would now yield an estimate of $\widehat{\delta}^*$ given by

$$\widehat{\delta}^* = \widehat{\delta} - \frac{1}{(1+v)}(\frac{w^G - w_{t-1}}{w_{t-1}}).$$

If the native German population in employment remains constant ($v = 0$), then the bias of our initial estimate $\widehat{\delta}$ using the overall German wage rate instead of the native German wage rate as the dependent variable is given by the term in brackets.

We can see that if the ethnic German immigrants earn on average less than the native German population earned in period $t-1$, then $w^G - w_{t-1} < 0$ and our estimate of δ will underestimate the true effect of ethnic German immigrant inflows on the native German wage rate. This bias will be exacerbated if they also cause a decrease in the number of natives in employment, $v < 0$. Intuitively, part of the estimated negative effect on the wage rate stems from the addition of ethnic German immigrants who earn below the native average German wage. On the other hand, if ethnic German immigrants earn more than the native German population so that

$$\frac{w^G - w_{t-1}}{w_{t-1}} > 0,$$

is satisfied, then our estimate of δ will be an upward-biased estimate of the true effect of the ethnic German immigrant inflow on the native German wage rate. Intuitively, part of the positive

effect on the wage rate is a result of the addition of ethnic German immigrants who earn above the average native wage rate. If we can find a measure of the relative wage differential between natives and ethnic German immigrants, $(\frac{w^G - w_{t-1}}{w_{t-1}})$, and if we assume that this wage differential is constant over time and local labour markets, then we will be able to adjust the obtained regression coefficient $\widehat{\delta}$ of our estimations accordingly.

...END OF ALTERNATIVE PROCEEDING

B Appendix B

Table 9: Labour market outcome differentials between ethnic German immigrants and native Germans

	Outcome variable	
	log income	unemployment
Ethnic German Immigrant	**-0.139*** **	**0.040*** **
	(0.025)	**(0.014)**
with vocational training	0.315***	-0.028***
	(0.019)	(0.005)
with college education	0.551***	-0.023***
	(0.027)	(0.004)
unknown education	0.332***	-0.018***
	(0.027)	(0.004)
occupation group II	-0.008	-0.014***
	(0.014)	(0.003)
occupation group III	0.123***	-0.023***
	(0.016)	(0.004)
occupation group IV	0.273***	-0.014***
	(0.022)	(0.004)
occupation group V	0.204***	-0.027***
	(0.019)	(0.004)
age	0.078***	-0.000
	(0.003)	(0.001)
age squared	-0.001***	-0.000
	(0.000)	(0.000)
female	-0.316***	-0.007**
	(0.020)	(0.003)
year dummies	yes	yes
sample size	6065	12472
Adjusted R^2	0.48	0.05

Note: Estimations are based on the cumulative Allbus 1980-2002. The sample for the log income estimation comprises all ethnic German immigrants (162) and native Germans (5903) in full-time employment in West Germany between 1988 and 2002. The dependent variable in the probit estimation for unemployment is an indicator variable for the unemployment status. The reported coefficients in this column show the marginal effects on the probability of being unemployed (dprobit). The sample here comprises the entire population aged 15-64 of both ethnic German immigrants (309) and native Germans (12163) in West Germany between 1988 and 2002.

Standard errors in parentheses: * significant at 10%, ** significant at 5%, *** significant at 1%.