The Effect of Migration on Aggregate Labor Market Outcomes: Evidence from the Fall of the Berlin Wall

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Abstract

I study the impact of East-West internal migration in Germany on local labor market outcomes for workers in the West. Because migrants' choice of destination is likely to be correlated with local labor market conditions, I instrument migration flows into a West German labor market with distance to each of the East German regions sending migrants and economic conditions in those regions. Consistent with earlier work, I find no negative effect of migration on either wages or unemployment rates for West German residents as a whole. However, I find great variation in the effects when disaggregating the results by characteristics such as age, educational attainment, gender, nationality, and skill group. In absolute terms, migration increased unemployment among the oldest (55 and older) workers and the least educated (those with middle school educations but no vocational training). Migration reduced unemployment among workers with at least a high school education. In relative terms, migration reduced unemployment rates for women, white-collar workers, and industries and occupations serving primarily local demand. This last finding suggests the presence of mitigating effects on employment outcomes due to immigrants' own demand for goods and services. Wage results generally parallel the unemployment results. Overall, these results suggest that, while immigration may be benign with respect to *aggregate* labor market outcomes, it has important distributional effects.

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1 Introduction

Immigration is a hotly debated topic in much of the developed world. It is a central issue in policy discussions over the eastward expansion of the European Union. Arguably, it was concerns over migrating "Polish plumbers" that caused French voters to reject the European Constitution in 2005. In the United States, policy makers have struggled for years with the question of whether to liberalize immigration policy with Mexico.

The intensity of these debates reflects a lack of consensus concerning the economic effects of immigrants on the host country. One widespread view is that immigrants compete with native workers for jobs, driving wages down and unemployment rates up. Countering this is the view that immigrants mainly perform the jobs that natives are unwilling to, and that this, in addition to immigrants' demand for goods and services, leads to net employment gains for natives.

Empirical studies of immigration's effect on the labor market outcomes of natives generally find little or no negative impact.[1] The standard empirical approach is to study *spatial correlation*, i.e., to what extent variations across local labor markets in the magnitude of the migratory shock are correlated with variations in employment outcomes for natives. However, because migrants might go to a particular labor market based on unobservable determinants of local labor demand, estimates based on observed migration flows might suffer from an omitted variables bias. To address the endogenous nature of migrants' locational choices, authors typically use either an instrumental variables – e.g. Altonji and Card (1991) – or a natural experiment – e.g. Card (1990) – approach.

In this paper, I combine elements of both the natural experiment and instrumental variables approaches. I exploit the fall of the Berlin Wall and subsequent mass migration from East Germany as an exogenous event that produced a large labor supply shock in the West. However, since my migration data begin in 1991 – the year after German reunification – I cannot perform the before-and-after comparison typical of the natural

[1] Studies for the U.S. include Altonji and Card (1991), Borjas (2003), Card (1990, 1991), and Lalonde and Topel (1991). Non-U.S. studies include Carrington and de Lima (1996), Dustmann et al. (2005), Friedberg (2001), Pischke and Velling (1997), and Winter-Ebmer and Zweimüller (1996, 1999). Surveys include Borjas (1994, 1999) and Friedberg and Hunt (1995).

experiment literature. Therefore, I use variation in East German migration over time across different West German local labor markets to identify the migration effect. To address possible bias in my estimates due to the endogeneity of migrants' locational choices, I instrument migration flows with distance to, and labor market conditions in, the *sending* regions in East Germany. This is a novel contribution to this literature. Previous work has used lagged information about migrant stocks or economic conditions in the region *receiving* migration to instrument for observed migration to that region. However, the assumption that this information is uncorrelated with later employment outcomes is a strong one, as these authors generally concede. In contrast, my migration instruments are more plausibly exogenous to the employment outcomes I study.

Consistent with earlier work, I find no significant effect of migration on either wages or unemployment rates for West German residents as a whole. However, I find great variation in the effects when disaggregating the results by characteristics such as age, educational attainment, gender, nationality, and skill group. In absolute terms, migration increased unemployment among the oldest (55 and older) workers and the least educated (those with middle school educations but no vocational training). Migration reduced unemployment among German nationals and workers with at least a high school education. In relative terms, migration reduced unemployment rates for women, white-collar workers, and industries and occupations serving primarily local demand. This last finding suggests the presence of mitigating effects on employment outcomes due to immigrants' own demand for goods and services. Wage results generally parallel the unemployment results. In addition, I find that migration decreased the wages of full-time employees relative to those of part-time employees, possibly indicating that employers responded to increased demand by making more intensive use of the latter. Overall, these results suggest that, while immigration may be benign with respect to *aggregate* labor market outcomes, it has important distributional effects.

The plan of the paper is as follows: Section 2 provides background on the East German migration phenomenon and relevant literature. Section 3 describes my empirical approach,

Section 4 my data and how I construct the migration instrument, and Section 5 my results. Section 6 concludes.

2 Background

2.1 East German Migration

With the fall of the Berlin Wall on November 9, 1989, two German systems offering distinctly different degrees of economic opportunity suddenly and unexpectedly came into intimate contact. From 1989-92, 870,000 easterners – 10 percent of the East German labor force – migrated to West Germany. After, that domestic migration stabilized at a rate of about 140,000-180,000 per year (Owen Smith 1994, pp. 266-7). This migration represented a large, exogenous shock to the West German labor supply.

That the fall of the Wall was unexpected in West Germany is clear from contemporary news reports. Less than 18 months beforehand, leaders of Germany's ruling CDU party circulated a document significantly downgrading the aim of reunifying East and West Germany (Marsh 1988a). The opposition SPD was even more committed to a Two Germanies policy. In August, 1988, Egon Bahr, the party's East-West strategist stated, "I must ask whether the whole hypocrisy (about reunification) should not come to an end (Marsh 1988b)." Less than six months before the Wall fell, the *New York Times* reported the results of a poll of West Germans showing that 95 percent of those questioned believed the Wall would be gone in 100 years, but almost 70 percent thought it would still be there in the year 2000 (Schmemann 1989).

Although the fall of the Wall would seem to present a classic natural experiment for studying migration, my analysis is not a natural experiment in the traditional sense. This is because official internal migration statistics did not incorporate the states of the former East Germany until 1991, about 14 months after the Wall fell. I therefore observe East-West migration in midstream. Offsetting this is the fact that I observe information about conditions in East Germany that partially explains regional and intertemporal differences

in migration received in the West. So, in a sense, within the larger experiment of post-Wall migration, I observe hundreds of "miniature" natural experiments. To my knowledge, the use of information about conditions in the source region in the analysis of economic effects of migration on the receiving region is a novel contribution to the literature.

2.2 Related Literature

Previous literature has modeled the effect of migration on labor market outcomes in two main ways. One approach is to start with a production function in which different types of workers, for example immigrants and natives, are substitutes. From this, a system of demand equations can be derived and elasticities of substitution estimated. This is the approach in Lalonde and Topel (1991). One shortcoming of such an approach is that it is based on a partial equilibrium model and therefore disregards the effect on labor demand of immigrants' own incremental demand for goods and services. Altonji and Card (1991) incorporate this effect into a model where the two labor inputs are skilled and unskilled workers, which gives the following comparative statics result for the effect of an increase in the supply of foreign labor:

$$\Delta \log w_u = \frac{B_u \Delta I}{P}, \tag{1}$$

where ΔI is immigration, P is population, w_u is the wage rate for unskilled workers, and B_u is a function of the labor supply and demand elasticities. Substituting this expression into a labor supply curve produces an analogous relation for unemployment. Altonji and Card point out that their model assumes the local labor market clears, and that barriers to wage adjustment would strengthen the employment/unemployment effects of migration and weaken the wage effects. In principle, the choice of skilled versus unskilled workers as the two labor inputs in the Altonji and Card model is arbitrary, and (1) could just as well apply to any category of workers for which immigrants are potentially substitutes. Subject to this caveat, my estimation is based on (1).

Estimation based on (1) is complicated by the fact that migrants' locational choices are endogenous. All else equal, migrants will choose to locate in regions where labor demand

is strong and/or growing due to factors that are unobservable to the econometrician. This will produce an upward bias in estimates of migration's effect on wages and a downward bias in estimates of migration's effect on unemployment rates. Altonji and Card (1991) address this issue by instrumenting the change in the foreigner share with its starting level. This is motivated by Bartel's (1989) suggestion that immigrants tend to go to cities where their kind are already well represented. Variations on this identification strategy are used in Card (2001), Dustmann et al. (2005), Pischke and Velling (1997), and Winter-Ebmer and Zweimüller (1999). However, the identifying assumption that levels of migrants are uncorrelated with changes in labor demand is a fairly strong one. For example, suppose that migration responds only to growth in labor demand. Imagine a region, initially closed to immigration, where labor demand is growing steadily over time. Suppose that, at $t = 0$, the region is opened to immigration. At $t = 1$, there will be a large population of migrants, and between $t = 1$ and $t = 2$ there will be a large influx of migrants. Second-period migration will be correlated with the first-period migrant stock, but only due to the growth in labor demand. Thus, migration instrumented in this way will still be endogenous, and most of the authors just cited acknowledge the limitations of such a strategy.[2] This might explain why these papers generally fail to find strong negative effects of migration on natives' employment outcomes.

Another approach to overcoming the endogeneity problem is to find natural experiments in which the migration flow is plausibly exogenous to the labor market outcomes under study. This is the approach initiated by Card (1990) in his study of the effect of the Mariel Boatlift on the Miami labor market and taken in subsequent work by Carrington and de Lima (1996), Friedberg (2001), and Hunt (1992). Still, to the extent that these authors rely on spatial correlations, they must find instruments for migrants' choices of destination labor market.[3] Card (1990) implicitly uses distance as his instrument (Miami

[2] In addition to or in place of immigrant stocks, some of the papers cited above use lagged values of employment outcomes in the receiving region as instruments for migration. The identifying assumptions behind such an approach would seem to be equally problematic.

[3] Friedberg (2001) is unique in focusing on labor market outcomes within occupational groups rather than within regional units. This is motivated by the assumption that limited mobility of workers across occupations prevents the dissipation of the supply shock that might be observed in a spatial analysis due to equilibrating movements of natives in response to migration.

is the closest major U.S. city to Cuba and thus absorbed most of the immigration from the Boatlift). Hunt (1992) uses average temperatures in different regions in France (French nationals repatriating from Algeria tended to settle where the climate was most similar to Algeria's). Carrington and de Lima (1996) rely mainly on cross-country comparisons for their results. In general, this body of work suggests that migration has limited, if any, impact on natives.

Borjas (1994, 2003) has criticized the spatial correlation approach on two main grounds: immigrant flows to specific regions are not exogenous, and their effects on native workers are masked by equilibrating responses of domestic migration and capital flows (factor price equalization). Borjas (2003) studies the variation in supply shifts across education-experience groups in the United States, assuming workers participate in a national labor market. He concludes that a 10 percent increase in supply reduces wages by 3 to 4 percent. To make his point about attenuation due to factor price equalization in estimates based on local labor markets, he performs a parallel, state-level analysis and finds that the estimated elasticities are substantially lower.

3 Empirical Specification and Identification

Following Altonji and Card (1991), I use the following estimating equation:

$$\Delta z_{jkt} = \alpha_1 m_{jt} + \sum_{k=2}^{K} \alpha_k I_k m_{jt} + \beta \Delta x_{jt} + \Delta \varepsilon_{jkt}, \tag{2}$$

where z_{jt} is a measure of labor market performance, m_{jt} is net inmigration from East Germany divided by the total population at time $t-1$, x_{jt} are other determinants of labor market outcomes and k indexes a particular worker category defined by age, skill, etc.

To address the possible correlation between m_{jt} and $\Delta\varepsilon_{jkt}$ in (2), I use a measure of predicted migration as an instrument for m_{jt}. I obtain predicted migration from a regression of migration from East German regions to West German labor markets. The

explanatory variables are labor market indicators for the East German region, distance between the two regions, and interactions. In contrast to previous authors, who instrument for migration with information about the receiving region, my identification rests on using information about conditions *external* to the receiving region, which I believe are more plausibly exogenous to the employment outcomes I wish to study. The identifying assumption is that growth in labor demand in a West German labor market is uncorrelated with distance to, and labor market conditions in, any East German region.[4] I describe the construction of the instrument in more detail below.

My estimation strategy addresses both objections raised by Borjas (1994, 2003) and discussed above. First, by instrumenting the migration variable, I address concerns about the endogeneity of migrants' choice of one labor market over another. Second, my analysis is based on year-on-year differences in the employment measures. There is some evidence in the literature that the equilibrating movements suggested by Borjas take much longer than a year. Using European data, Decressin and Fatás (1994) find that deviations in unemployment and labor force participation due to regional labor market disturbances are not dissipated for four years. In particular, about 98 percent of the adjustment in the unemployment rate occurs in the second and third years after the shock. Blanchard and Katz (1992) find even greater persistence of deviations in unemployment, labor force participation and wages in response to state-level demand shocks in the U.S.

4 Data

4.1 Geography

My analysis focuses on labor market outcomes in the states of the former West Germany. The geographic unit of analysis is the regional labor market (*Arbeitsmarktregion*). This is a well-defined entity in German economic policymaking and analysis whose boundaries are defined according to an algorithm that minimizes commuter flows between labor markets

[4] One might be concerned that this assumption might be violated by correlated labor demand shocks across the former East-West border. I address this concern below.

(Eckey and Klemmer 1991). To make labor market statistics comparable with other official statistics, the boundaries produced by the algorithm are adjusted to correspond to county boundaries. A regional labor market is therefore a county or aggregate of contiguous counties. I use the definitions current in 1991, under which the 327 West German counties were aggregated into 166 regional labor markets. I further aggregate and drop some of these labor markets for reasons discussed below.

4.2 Migration

The county-level migration matrix (*Kreiswanderungsmatrix*) was provided by the German Federal Statistics Office. All residents of Germany, whether citizens or not, are required by law to register their address with the local authorities; these registrations constitute the basis for the migration data. As the name suggests, the matrix provides annual migration flows between all county pairs in Germany. East German states were included in the matrix for the first time in 1991, so my analysis begins with that year.

There are two unusual aspects of German internal migration during this period that I must account for. The first is the ambiguous status of Berlin from the perspective of my experiment. Politically, Berlin was simultaneously part of both West and East Germany, so it is hard to determine to what extent migration between Berlin and West Germany constitutes "East-West migration." For this reason, I exclude Berlin as a source of East German migration. This does not substantially affect my results.

The second aspect is migration from other sources. In the 1990s, significant numbers of "resettlers" (ethnic Germans whose ancestors had emigrated to Eastern Europe centuries earlier) exercised their right of return to Germany. In 1991-92, 453,000 of them arrived from abroad (Owen Smith 1994). Upon arrival in Germany, they were assigned to one of a handful of processing centers distributed throughout Germany and registered as residents of the center's town. Once their status as resettlers was confirmed, they were allocated to other parts of Germany according to a formula designed to equalize the burden on the states. They thus appear as internal migrants leaving the processing center's county. I

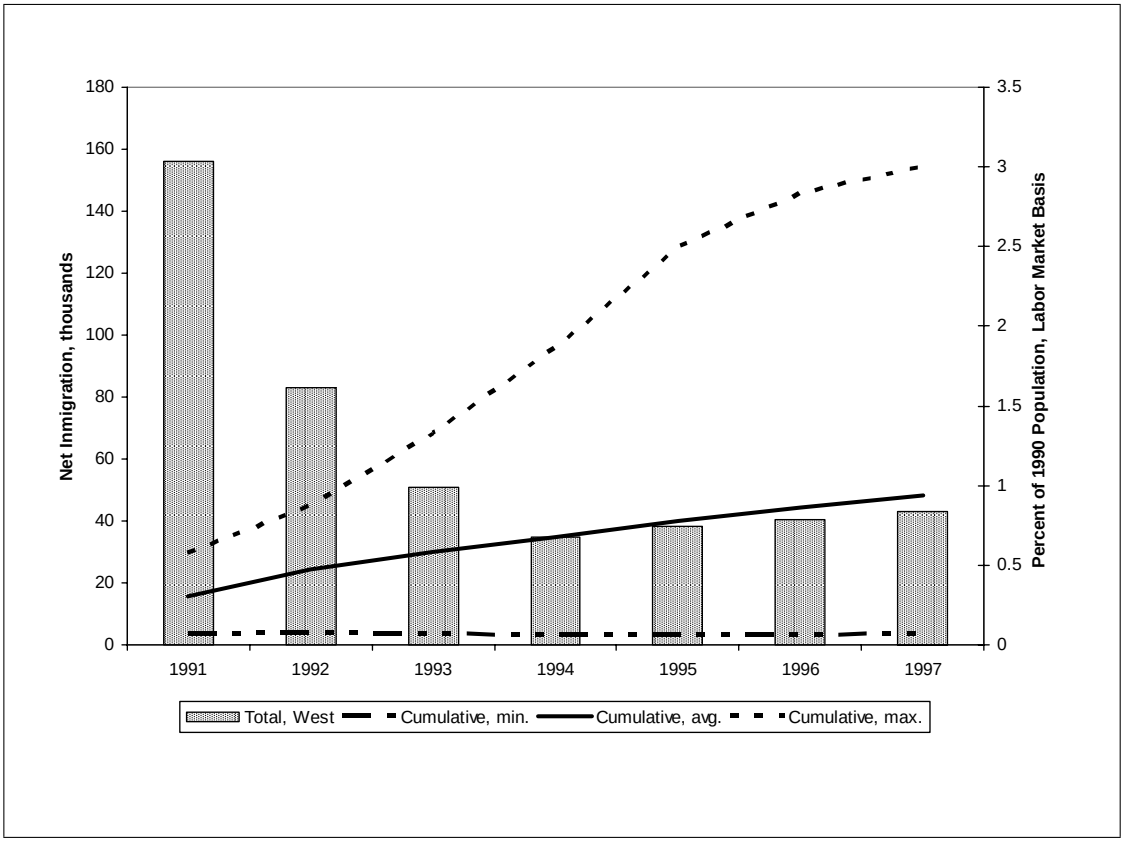

Figure 1: East German Migration to West Germany, 1991-1997
Aggregate figures (columns, left axis) are reported for all labor markets studied. Relative figures (lines, right axis) are based on observations at the level of the local labor market.

have identified five West German towns that had resettler processing centers in the 1990s.[5] Their counties show anomalous migration patterns: an unusually high number of migrants from foreign sources, and often a net outflow of migrants to East Germany, presumably due to the allocation process. These counties and any county aggregates containing them are excluded from the analysis.

Figure 1 shows the migration pattern over time in the labor markets I study. In 1991, nearly 160,000 net migrants came from East Germany to the West German labor markets I study. This number decayed rapidly, but began moving upward again toward the end of the sample period. Interestingly, after 1994, the net inflow to West Germany as a whole (including the labor markets omitted from my analysis) was *lower* than that depicted in Figure 1, vividly demonstrating the distortions the resettler processing centers introduce. Relative to 1990, net inmigration from East Germany increased the population of the

[5] They are Friedland, Bramsche, Empfingen, Rastatt and Hamm.

average labor market by nearly 0.5 percent in the first two years, and another 0.5 percent in the next five.

4.3 West German Labor Market Data

The data on West German labor market outcomes comes from the anonymized IAB Regional Sample 1975-2001 (IABS-R01). This data set is a 2 percent sample of all employees registered in the German social security system, augmented with periods of public assistance. The sample is drawn from the Employees and Assistance Recipients History (BLH) of the Institute for Labor Market and Employment Research (IAB) of the German Federal Employment Agency. The IABS-R01 can be acquired from the Central Archive for Empirical Social Research (Cologne). The IAB bears no responsibility for the use of the data in this article.

The regional unit in the IABS-R01 is the census region, of which the county is a constituent component. I map the census regions to the local labor markets defined in Eckey and Klemmer (1991) and discussed above. To make the two classification schemes compatible, I aggregate some of the local labor markets with the result that the count decreases from 166 to 146. I further drop five labor markets because they contain resettler processing centers, so that there are 141 regional units in my analysis.

For each person selected into the sample, the IABS-R01 contains a complete history of that person's interactions with the social security system. This includes the starting and ending dates and average daily wage for each period of employment requiring social security reporting, and starting and ending dates of each period of benefits receipt from the social security system.[6] From this data, I construct labor-market-level measures of employment outcomes as follows:

1. I eliminate records for trainees.

[6] An employment period generally does not exceed a year, since employers typically file year-end reports. Therefore, the average wage reported is closely identified with a calendar year, which is necessary for my analysis.

2. I remove persons whose employment record shows that their first employment experience was in East Germany.

3. I eliminate duplicate records for overlapping employment spells (the data identify the primary employment; I keep that record for each individual).

4. For each month, I identify an individual with an hourly wage if that individual's employment spell overlaps the 15th of the month.[7] I classify individuals receiving assistance payments as unemployed. I compute average hourly wages and unemployment rates by labor market and month. I also compute the employment/population rate as the ratio of employed persons (scaled up by a factor of 50) to the labor market's year-end population.[8]

5. I compute the average annual wage, unemployment rate, and employment/population rate for each labor market as the average of the 12 monthly values.

In addition to information about employment and wages, the IABS-R01 provides a variety of personal characteristics, which I categorize as follows:

- Educational attainment: no vocational training, middle school (*Volks-, Haupt-, Realschule*) with vocational training, high school (*Abitur*), and higher education (*Fachhochschule, Hochschule*)[9];
- Age: under 20, 20-25, 25-35, 35-45, 45-55, and 55-62;
- Gender;
- Nationality: German or foreign;

[7] I set the hourly wage to "missing" if it is top- or bottom-coded. See below for a discussion of these limit values. I also set the wage to missing if it is zero. Zero values can occur when an employee is in an employment relationship but not receiving a salary, for example, due to extended illness, maternity leave, or sabbatical.

[8] I rescale by a factor of 50 because the IABS-R01 is a two percent sample.

[9] The category "no vocational training" includes dropouts but consists almost exclusively of middle school graduates without further vocational training. Dropouts represent 0.03% of the overall sample. In the sample, high school graduates are also differentiated with respect to vocational training. However, in some labor markets there are insufficient observations to compute labor market statistics for both types of high school graduates, so I combine the two into a single category.

- Skill group: unskilled, skilled (including master craftsmen and foremen), and white collar;
- Full- versus part-time;
- Branch of industry: agriculture, industrial goods, consumer durable goods, foodstuffs, heavy construction, light construction, distribution, retailing, transportation/communication, business services, personal services, social services 1 (e.g., education, hospitals), social services 2 (e.g., street cleaning, nonprofit institutions), and local administration/social security.

Table 1 summarizes the variables used in the analysis. The data for the personal characteristics listed above are measured as the fraction of workers in each category at labor market level. Within each group, one category is not reported; it is completely determined by the other categories since the fractions must sum to one. With the exception of full- versus part-time status, which applies only to employed persons, the data on personal characteristics are computed irrespective of employment status.

Table 2 shows how East German migrants compared with other groups on several dimensions of personal characteristics on June 15, 1994 – about the midpoint of my sample period. Migrants were low on the skill distribution relative to East Germans who stayed behind in West Germany. In terms of educational attainment, migrants were very similar to West Germans; the chief difference was a greater tendency for migrant middle school graduates to have vocational training. In terms of skill groups, the distribution of migrants is shifted away from white-collar jobs relative to West Germans. Migrants were younger and more likely to be male than either East Germans who stayed behind or West Germans. On observable characteristics, migrants are much more similar to West Germans than to foreigners in West Germany. However, in terms of wages, migrants appear very similar to foreigners, who were far less educated and skilled than West Germans. This suggests that, while East Germans' skills and education were nominally similar to West Germans', the actual quality of their skills and education was low by West German standards, or

Table 1: Summary Statistics

		Levels				First Differences			
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Log daily wage	987	4.876	0.087	4.625	5.124	0.032	0.019	-0.020	0.081
Employment/population (percent)	987	29.038	4.150	18.561	42.556	-0.415	0.636	-2.543	2.211
Unemployment rate (percent)	987	8.607	2.547	2.780	17.620	0.543	1.093	-2.930	5.080
Migration (percent of population)	987	0.131	0.114	-0.133	0.765				
Predicted migration	987	0.200	0.232	-0.106	1.479				
Share without vocational training	987	0.213	0.043	0.096	0.411	-0.006	0.006	-0.025	0.015
Share with middle school and vocational training	987	0.706	0.045	0.554	0.839	0.003	0.006	-0.022	0.028
Share with high school	987	0.029	0.013	0.006	0.077	0.002	0.002	-0.008	0.013
Share under 20	987	0.016	0.007	0.003	0.051	-0.003	0.005	-0.020	0.012
Share 20-25	987	0.114	0.026	0.061	0.217	-0.009	0.007	-0.039	0.023
Share 25-35	987	0.307	0.021	0.249	0.374	-0.000	0.009	-0.032	0.039
Share 35-45	987	0.274	0.022	0.199	0.351	0.007	0.008	-0.023	0.035
Share 45-55	987	0.219	0.022	0.136	0.280	-0.001	0.008	-0.035	0.028
Share male	987	0.582	0.032	0.479	0.690	-0.001	0.006	-0.021	0.022
Share German nationality	987	0.923	0.037	0.815	0.990	-0.002	0.005	-0.031	0.016
Share unskilled laborers	987	0.281	0.043	0.179	0.445	-0.003	0.007	-0.028	0.024
Share skilled laborers	987	0.299	0.042	0.172	0.430	-0.002	0.006	-0.022	0.021
Full-time share of employed	987	0.866	0.023	0.785	0.924	-0.005	0.005	-0.024	0.015
Share agriculture	987	0.023	0.017	0.005	0.161	-0.000	0.002	-0.017	0.008
Share industrial goods	987	0.253	0.089	0.056	0.539	-0.004	0.007	-0.030	0.019
Share consumer durable goods	987	0.089	0.053	0.020	0.329	-0.002	0.004	-0.028	0.019
Share foodstuffs	987	0.039	0.020	0.010	0.164	-0.000	0.003	-0.022	0.017
Share heavy construction	987	0.058	0.019	0.023	0.169	-0.000	0.003	-0.015	0.011
Share light construction	987	0.030	0.007	0.013	0.064	0.000	0.002	-0.017	0.021
Share distribution	987	0.051	0.020	0.006	0.190	0.000	0.004	-0.018	0.019
Share retailing	987	0.081	0.017	0.038	0.155	0.001	0.004	-0.042	0.041
Share transportation, communication	987	0.039	0.015	0.006	0.100	0.000	0.003	-0.011	0.015
Share business services	987	0.083	0.029	0.037	0.206	0.002	0.004	-0.016	0.023
Share personal services	987	0.044	0.018	0.016	0.121	0.000	0.003	-0.017	0.015
Share social services 1	987	0.098	0.031	0.036	0.248	0.002	0.004	-0.018	0.019
Share social services 2	987	0.043	0.013	0.011	0.101	0.002	0.003	-0.010	0.014

See text for variable definitions. For each set of control variables, e.g. age, one category is omitted. Since values within each group must sum to one, the omitted category is completely determined by the others.

Table 2: Distribution of Worker Characteristics by Origin

	E. Germans, E. Germany	**E. Germans, W. Germany**	**W. Germans, W. Germany**	**Foreigners, W. Germany**
No vocational training	6.8	12.9	17.0	54.1
Middle school w/ vocational training	78.8	74.8	71.5	39.0
High school	3.2	3.4	4.0	2.5
Higher education	11.2	8.9	7.6	4.4
Unskilled	15.4	27.6	21.6	59.4
Skilled	38.7	29.7	27.3	22.6
White collar	45.9	42.7	51.1	18.0
Male	51.1	59.5	57.6	67.5
Female	48.9	40.5	42.4	32.5
Average age	39.5	35.1	39.2	37.5
Average daily wage	101.6	126.0	142.2	125.1

Statistics computed for records valid on June 15, 1994.

was discounted by West German employers. If anything, the wage difference probably understates the influence of hours reported, as East Germans worked disproportionately in full-time jobs relative to West Germans.

There are several limitations of the IABS-R01 that should be noted here. First, it does not cover all employees in Germany. Omitted from the employment statistics from which it is drawn are civil servants, those in marginal employment, students enrolled in higher education, the self-employed and family members working in a family business. Nonetheless, the statistics cover about 80 percent of all employed persons in West Germany (Bender et al. 2000). Second, wage data are top- and bottom-coded, corresponding to the upper and lower limits of pay subject to social security assessments.[10] Therefore, my average wage measure is properly interpreted as the average wage, conditional on being between the assessment limits. This affects only 1.3 percent of wage records; 0.85 percent are above the limit and 0.45 percent below.

Finally, my measure of the unemployment rate misstates the true rate for two reasons. First, the IABS-R01 sample is drawn only from individuals who were employed at any time during 1975-2001 in a job requiring reporting to the social security system; it contains no information on individuals who never were employed during this time. However, one

[10]The upper (lower) limit ranged from 213.65 DM (15.50 DM) in 1991 to 269.54 DM (20.10 DM) in 1997 (Alda and Herrlinger 2005).

might rightfully argue that such chronically unemployed persons are not in the workforce anyway, making them of questionable relevance for a study of labor market effects of migration. Second, the IABS-R01 provides no information on the employment status of a person who is neither employed nor receiving benefit payments; these situations appear as gaps in the individual's employment history. These gaps can arise when an unemployed individual chooses not to apply for benefits or fails to qualify, but they can also arise if the person is not seeking work or has employment not subject to social security reporting.[11] Therefore, I cannot necessarily infer that they indicate a period of unemployment. Rather than make subjective judgments about the nature of these gaps in order to construct a more traditional unemployment measure, I have opted for the less traditional, but unambiguous, measure based on benefits receipt. In Appendix B, I discuss the impact on my coefficient estimates of systematic error in my measure of the unemployment rate. Taking the relevant population as occupations covered by the IABS-R01, I conclude that my estimates are inflated by no more than 7 percent.

4.4 Instruments

Because the locational choices of migrants are endogenous, I use a measure of predicted migration as an instrument for the raw migration data. The instrument comes from a regression in which the unit of analysis is a pairing of a West German labor market and an East German employment office district. The latter is a territorial unit of the German Federal Employment Agency (*Bundesagentur für Arbeit*), which administers the unemployment insurance system through a network of offices spread throughout Germany. Employment office districts are not equivalent to regional labor markets, nor do their boundaries always coincide with county boundaries. However, for compatibility with county-level migration data, I remap the 35 East German employment office districts to coincide with county boundaries. This procedure is discussed in Appendix A and results in 26 districts. I drop Berlin for reasons discussed above, resulting in 25 districts from

[11] These gaps comprise about 6.5 percent of the days that could possibly be observed.

Table 3: Data for Migration Instrument

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Relative outmigration	24675	0.003	0.009	-0.129	0.297
Distance (km)	24675	471.2	162.8	29.5	1048
Unemployment index	24675	1.120	0.303	0.426	2.066
Make-work index	24675	1.565	1.069	0.155	5.503

The unit of analysis is the pairing of an East German employment office district with a West German labor market (25 x 141 x 7 years). Relative outmigration is the percentage of the East German region's population migrating to the West German region in a given year. Distance is the driving distance between the county seats of the largest counties in each region in the pairing. The unemployment index is the squared ratio of the East German region's unemployment rate to the aggregate value for East Germany. The make-work index is the analogous statistic for the share of the employed workforce in government-subsidized jobs.

which I observe outmigration.

In the regression, the dependent variable is the net percentage of the East German region's population migrating to the West German region. (The German Federal Statistics Office provided annual, county-level population data, which I used to normalize migration flows and elsewhere in the analysis.) Explanatory variables are distance, labor market indicators for the East German region, and interactions.

Distance is the driving distance between the county seats (*Kreishauptstädte*) of the largest constituent counties. I obtained the driving distances from *www.mapquest.de* in April and May, 2005. Labor market indicators are the squared ratios of the unemployment rate and share of the employed work force in government-sponsored make-work schemes to the corresponding aggregate values for East Germany. These are based on information provided by the German Federal Employment Agency. Data cover the years 1991-97 and are reported by the Agency for each of the 35 employment office districts. I recalculate the statistics for the 25 reconstituted districts discussed above. Table 3 reports summary statistics for the variables used to construct the instruments. Table 4 contains the regression results.

For each year the regression produces 25 predicted population fractions migrating to each West German labor market. I convert these fractions to predicted flows by multiplying by the respective populations of the 25 East German source regions, then I sum these to get a single measure of predicted, net East German migration to the West German labor market. Finally, I normalize this value by the labor market's population in the previous year. This statistic is the instrument for observed net inmigration to that labor

Table 4: Migration Instrument: Predicted Migration Regression

Distance	-0.002***
	(0.000)
Distance squared	0.000***
	(0.000)
Unemployment index	1.265***
	(0.192)
Unemployment index x 50-100 km	-0.398**
	(0.200)
Unemployment index x 100-250 km	-1.064***
	(.186)
Unemployment index x 250-500 km	-1.357***
	(0.189)
Unemployment index x over 500 km	-1.370***
	(0.191)
Make-work index	-0.016
	(0.011)
Number of observations	24675
R-squared	0.142

Coefficients from OLS regressions; coefficients and standard errors multiplied by 100. The dependent variable is relative outmigration. See the notes to Table 3 for further description of the variables and unit of analysis.

market. Summary statistics for it appear in Table 1.

5 Results

The unit of analysis is a West German labor market. The dependent variable is the first difference of one of the following: log average wage, unemployment rate (in percent), or employment/population (in percent). The explanatory variable is net inmigration from East Germany per hundred labor market population. I include year dummies to capture general time trends for West Germany. To control for changes in workforce composition, I include measures of the distribution of the workforce by each the characteristics discussed above.

5.1 Aggregate Labor Market Outcomes

Table 5 contains the results for aggregate wages, unemployment rates and employment/population rates. Both the OLS (Column 1) and instrumental variables (Columns 2 and 3) estimates of the effect of migration on wages are positive, although they are not statistically significant. In Column 3, I control for distance from the labor market to the East German

Table 5: Labor Market Effects of Migration, Pooled Data

	Dependent Variable: Log Wage		
	OLS	**IV**	**IV**
	(1)	**(2)**	**(3)**
Migration	0.002	0.006	0.014
	(0.002)	(0.005)	(0.015)
Migration x 10th Distance Percentile			-0.009
			(0.009)
Migration x 10th-25th Distance Percentile			-0.006
			(0.008)
Migration x 25th-50th Distance Percentile			0.002
			(0.007)
	Unemployment Rate		
	OLS	**IV**	**IV**
	(4)	**(5)**	**(6)**
Migration	-0.262	0.034	0.216
	(0.210)	(0.441)	(1.123)
Migration x 10th Distance Percentile			0.422
			(0.684)
Migration x 10th-25th Distance Percentile			-0.559
			(0.654)
Migration x 25th-50th Distance Percentile			-0.620
			(0.531)
	Employment/Population		
	OLS	**IV**	**IV**
	(7)	**(8)**	**(9)**
Migration	0.452**	1.080**	2.379**
	(0.203)	(0.432)	(1.167)
Migration x 10th Distance Percentile			-1.165*
			(0.701)
Migration x 10th-25th Distance Percentile			-0.871
			(0.652)
Migration x 25th-50th Distance Percentile			-0.261
			(0.544)

Instrumental variables estimates computed by two-stage least squares. The unit of analysis is a West German local labor market (N=141). The total number of observations in each regression is 987. The dependent variable is in first differences. Unemployment and employment/population rates are measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted distance category is the 50th to 100th distance percentile. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

border. This is motivated by the observation above that correlated local labor demand shocks across the border would violate the identifying assumption of exogeneity of my instruments to West German local labor market outcomes.

To understand how correlated demand shocks might influence the results, consider two regions – E(ast) and W(est) – that experience a common negative shock to labor demand. The negative shock in Region E will be measured as an increase in unemployment, which will produce an increase in predicted migration to Region W. Thus, an increase in predicted migration to Region W will be associated with a decrease in wages there (from the negative demand shock), biasing estimates of the wage effect of migration downward. Note that one should expect this effect to attenuate with distance. In Column 3, there is some slight indication of an upward trend in the estimated migration effect with distance to the border. However, although these distance interactions are jointly significant ($p = 0.08$), I cannot reject the hypothesis of equality of any two of them. There does not appear to be compelling evidence of correlated demand shocks in the wage regression. Nonetheless, I include specifications with distance interactions in all subsequent results. Where the distance interactions are significant, I focus my discussion on the omitted distance category – labor markets above the median distance from the border – since these labor markets are least likely to be affected by correlated demand shocks.

Results for the unemployment rate in Columns 4-6 show positive effects of migration, although the estimates are not significant. Column 4 also shows the bias produced by using uninstrumented measures of migration. Endogeneity of migration would cause the estimate of the marginal effect on unemployment to be biased downward, as it appears to be in comparison with the estimate in Column 5 (although both estimates are so imprecise that the comparison is perhaps uninformative). In Column 6, the distance interactions are jointly significant, but show no pattern consistent with correlated labor demand shocks.

Finally, Columns 7-9 of Table 5 show patterns similar to the unemployment results, but here the effects are statistically significant. However, there are a few reasons for caution in approaching these results. First, one would expect endogenous migration to bias the

uninstrumented coefficients upward, but the instrumental variables coefficient estimate is *higher* than the uninstrumented estimate. Second, the marginal effect in Column 8 (the distance interactions in Column 9 are not jointly significant, so I focus on Column 8 here) seems rather large – a 1.1 percentage point increase in the employment/population ratio per percent increase in population due to East German migration.

The way the IABS-R01 sample is drawn may make measures of the employment/population ratio at labor market level inaccurate. Because the sample is drawn at a national level (and only once at that), it will not necessarily represent two percent of the workforce at the labor market level at any given time. For statistics other than the employment/population ratio, this is not a problem; the IABS-R01 still constitutes a random sample from the labor market.[12] However, computing the correct employment/population ratio depends crucially on the assumption that the IABS-R01 represents the same fraction of the workforce across all labor markets and time periods. If the differences across labor markets are random noise, then my coefficient estimates should suffer from an attenuation bias. However, I cannot rule out some systematic pattern in the distribution of workers by labor market that is producing the unusually large estimate I obtain.

In summary, consistent with most earlier work, I find little evidence of a negative aggregate impact of migration. Rather, the employment results suggest that migrants on the whole benefited West German workers, but these results should be viewed cautiously.

5.2 Disaggregated Labor Market Outcomes

In this section, I study variations in outcomes across different categories of employees. I use two measures of labor market outcomes: average wages and unemployment rates by category. I omit employment/population as an outcome variable. Apart from the limitations of this statistic discussed above, the total population would seem not to be the appropriate denominator for disaggregated measures of employment/population. For

[12] Observe that in computations of the unemployment rate, both the numerator and denominator come from the IABS-R01, so this statistic is automatically adjusted for differences in the size of the subsample at the labor market level.

example, if the population of a labor market stays constant, but the share of unskilled workers in the population increases, it is possible for the unemployment rate in this group to increase but the employment/labor-market-population ratio to increase also. The best measure I have of a category-specific population is the denominator in my measure of the unemployment rate, so I use only this statistic for disaggregated employment outcomes.

In the analysis below, I apply the same migratory shock to all worker categories within a labor market, without regard to the distribution of workers by category in either the native population or the migrant population. It would clearly be preferable to take the approach used in Card (2001) and measure category-specific shocks. However, this requires information about the characteristics of the migrants. Although Table 2 would seem to suggest that this information is available, the data there come from the IABS-R01, not the migration matrix. The former is a small sample and picks up East Germans only in 1992, while the latter is effectively a census and begins in 1991. Therefore, I settle for the more precise but undifferentiated measure of the migratory shock.

In the results below, I report only instrumental variables estimates. Since the emphasis is on relative outcomes across different worker categories, comparisons to OLS estimates would seem to be of little value. To address concerns that correlated labor demand shocks might influence the coefficient estimates for labor markets closer to the East German border, I continue to include specifications with distance interactions. Whenever the distance interactions are jointly significant, I discuss results from these specifications, focusing on results for the labor markets above the median distance from the border (the omitted distance category). Unless otherwise specified, the reader should assume that I am referring to this distance category. Note that because distance is the same for all categories of workers in a labor market, the distance interactions will affect estimates of the average marginal effect of migration on the dependent variable, but not estimates of differences across worker categories. When the distance interactions are not jointly significant, I discuss results for the simpler specification.

Marginal effects on wages are percent change in wages; marginal effects on the unem-

Table 6: Labor Market Effects of Migration, by Age

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	0.053**	0.102***	1.593	2.891
	(0.022)	(0.034)	(1.078)	(1.959)
Migration x Age 20-25	-0.045**	-0.045**	-0.785	-0.788
	(0.018)	(0.018)	(0.786)	(0.786)
Migration x Age 30-35	-0.062***	-0.062***	-2.700***	-2.703***
	(0.018)	(0.018)	(0.626)	(0.627)
Migration x Age 35-45	-0.075***	-0.075***	-1.517**	-1.520**
	(0.020)	(0.020)	(0.710)	(0.711)
Migration x Age 45-55	-0.060***	-0.060***	-1.315*	-1.318*
	(0.019)	(0.019)	(0.731)	(0.732)
Migration x Age 55-62	-0.055**	-0.055**	2.374**	2.370**
	(0.023)	(0.023)	(1.096)	(1.098)
Migration x 10th Distance Percentile		-0.038**		0.004
		(0.016)		(1.115)
Migration x 10th-25th Distance Percentile		-0.037**		-1.786
		(0.016)		(1.090)
Migration x 25th-50th Distance Percentile		-0.016		-1.221
		(0.013)		(0.841)
Number of observations	5913	5913	5918	5918

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted age category is under 20. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

ployment rate are percentage point changes in the unemployment rate. Both are relative to a one percent increase in population due to East German migration, but in the discussion below I will omit repeated reference to the units of the explanatory variable. So "a one percent increase in wages" below should be interpreted as "a one percent increase in wages per percent increase in population due to East German migration." I will refer to the "absolute effect" when discussing the marginal effect of migration on a particular category; this is the sum of the coefficient on the uninteracted migration variable with the coefficient on that category's interaction term. I will refer to each category's interaction coefficient as the "relative effect" with respect to the omitted category.

5.2.1 Effects of Migration by Age

Table 6 contains the results for the effect of migration on wages and unemployment rates by age category. The omitted category is Under 20. Column 2 shows that migration increased wages for this category by 10.2 percent. Only for the 20-25 and 55-62 age

groups did the absolute effect differ significantly from zero, but the relative effect for the latter category is not always distinguishable from that for the other categories. The relative effect for the 20-25 age group is distinguishable from that for all other age groups except 55-62. Only in the case of the 35-45 age group is the relative effect consistently distinguishable from that for the other categories. Relative to all other groups, this age group's wages declined by at least 1.3 percent due to migration.

Column 4 shows that the absolute effect on the unemployment rate was statistically different from zero for only one age category – 55-62 – increasing it by 5.3 percentage points. For people in the age range 30-55, migration decreased the unemployment rate by at least 1.3 percentage points relative to the youngest and oldest workers. For the 30-35 age group, the relative increase was over twice this amount.

Overall, these results are a bit mixed. The wage results suggest the youngest workers benefited from migration in both relative and absolute terms, while the unemployment results suggest that they and the oldest workers were made relatively worse off (with the latter group absolutely worse off).

5.2.2 Effects of Migration by Educational Attainment

Table 7 contains the results for the effect of migration on wages and unemployment rates by educational attainment. The omitted category is no vocational training. Column 2 shows generally no impact of migration on wages by education. Only for the middle school with vocational training group is the relative effect significant. This effect is indistinguishable from the effect on the high school group, but it is significantly different from the effect on the higher education group.

Results for the unemployment rate show a much greater impact of migration. Because the distance interactions in Column 4 are not significant ($p = 0.7149$), I discuss the results for Column 3. Migration increased unemployment for the least educated workers by 1.5 percentage points. The absolute effect on the next education category was negative but not significant. For the two highest education categories, migration reduced the unem-

Table 7: Labor Market Effects of Migration, by Education

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	-0.010	0.002	1.468**	0.151
	(0.017)	(0.038)	(0.732)	(2.078)
Migration x Middle School w/ Training	0.014***	0.014***	-2.198***	-2.198***
	(0.004)	(0.004)	(0.335)	(0.335)
Migration x High School	0.018	0.018	-6.227***	-6.227***
	(0.021)	(0.021)	(0.996)	(0.997)
Migration x Higher Education	-0.001	-0.001	-3.514***	-3.514***
	(0.007)	(0.007)	(0.615)	(0.615)
Migration x 10th Distance Percentile		-0.025		0.963
		(0.024)		(1.294)
Migration x 10th-25th Distance Percentile		0.003		0.858
		(0.021)		(1.283)
Migration x 25th-50th Distance Percentile		0.012		1.193
		(0.020)		(1.072)
Number of observations	3948	3948	3948	3948

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted education category is no vocational training. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

ployment rate – by 4.7 percentage points for high school graduates and by 2.0 percentage points for workers with higher education degrees. The differences among all categories are statistically significant.

Overall, the unemployment results broadly support the conclusion that migration made the more educated workers better off and the least educated workers worse off, in both absolute and relative terms.

5.2.3 Effects of Migration by Nationality

Table 8 contains the results for the effect of migration on wages and unemployment rates by nationality. The omitted category is German nationals. Column 1 (distance interactions in Column 2 are not significant) shows that migration decreased wages of foreigners by 6.3 percent and increased wages of natives by 3.4 percent. Column 3 (distance interactions in Column 4 are not significant) shows that migration decreased the unemployment rate of German nationals by 2.5 percentage points. Relative to Germans, foreigners saw their unemployment rate increase by 1.4 percent, although this effect is not significant at conventional levels. Overall, these results suggest that migration harmed foreigners but

Table 8: Labor Market Effects of Migration, by Nationality

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	0.034**	0.012	-2.534**	0.208
	(0.017)	(0.036)	(1.214)	(2.587)
Migration x Foreigners	-0.097***	-0.097***	1.402	1.402
	(0.012)	(0.012)	(1.132)	(1.133)
Migration x 10th Distance Percentile		0.007		-2.401
		(0.020)		(1.798)
Migration x 10th-25th Distance Percentile		0.027		-1.355
		(0.022)		(1.536)
Migration x 25th-50th Distance Percentile		0.003		-2.601
		(0.019)		(1.610)
Number of observations	1974	1974	1974	1974

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted nationality is Germans. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

benefited Germans. Recall from Table 2 that the average wages of foreigners and East Germans working in West Germany in 1994 were almost identical. This might indicate that East Germans were mainly in competition with foreigners for jobs. If foreigners and natives are complements in production, then these results might indicate that East Germans, by increasing the supply of low-skilled labor, increased demand for occupations populated mainly by natives, improving their employment outcomes.

5.2.4 Effects of Migration by Gender

Table 9 contains the results for the effect of migration on wages and unemployment rates by gender. The omitted category is males. Column 2 shows that migration increased wages for women by 3.7 percent, while leaving those for males essentially unchanged. Relative to male wages, female wages increased by 2.7 percent. The unemployment results in Column 4 mirror this result. The unemployment rate for women decreased by 2.2 percentage points relative to that for men, although the absolute effect is not significantly different from zero. These results suggest that women were relatively better off as a result of migration. Recall from Table 2 that East German migrants working in West Germany in 1994 were disproportionately male. If men and women work in jobs that are complementary inputs, then a relative increase in the supply of male workers might be

Table 9: Labor Market Effects of Migration, by Gender

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	-0.005	0.010	1.225***	1.424
	(0.005)	(0.015)	(0.445)	(1.159)
Migration x Female	0.027***	0.027***	-2.157***	-2.157***
	(0.003)	(0.003)	(0.266)	(0.266)
Migration x 10th Distance Percentile		-0.016		0.410
		(0.010)		(0.723)
Migration x 10th-25th Distance Percentile		-0.008		-0.572
		(0.009)		(0.697)
Migration x 25th-50th Distance Percentile		-0.000		-0.626
		(0.008)		(0.555)
Number of observations	1974	1974	1974	1974

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted gender is males. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

expected to improve employment outcomes for women.

5.2.5 Effects of Migration by Skill Group

Table 10 contains the results for the effect of migration on wages and unemployment rates by skill group. The omitted category is unskilled workers. Column 2 shows that migration increased wages by 0.9 percent for skilled and 2.2 percent for white-collar employees relative to unskilled employees. Only for the white collar workers was the absolute effect – a 3.5 percent increase – significant. Results for unemployment in Column 4 mirror the wage results, although in no case are the absolute effects significant. Relative to both categories of blue-collar workers, however, white-collar workers saw their unemployment rate decline by at least 2.5 percentage points. Overall, the results indicate that migration benefited higher-skill employees, especially white-collar workers. Recall from Table 2 that East German migrants working in West Germany in 1994 were disproportionately in blue-collar occupations. If blue- and white-collar workers are complementary inputs, then a relative increase in the supply the former might be expected to improve employment outcomes for the latter.

Table 10: Labor Market Effects of Migration, by Skill Group

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	-0.001	0.013	1.314**	1.015
	(0.005)	(0.014)	(0.575)	(1.227)
Migration x Skilled	0.009***	0.009***	-0.415	-0.415
	(0.003)	(0.003)	(0.327)	(0.327)
Migration x Salaried	0.022***	0.022***	-2.874***	-2.874***
	(0.003)	(0.003)	(0.328)	(0.328)
Migration x 10th Distance Percentile		-0.014		0.881
		(0.009)		(0.701)
Migration x 10th-25th Distance Percentile		-0.009		-0.260
		(0.008)		(0.676)
Migration x 25th-50th Distance Percentile		0.001		-0.535
		(0.007)		(0.547)
Number of observations	2961	2961	2961	2961

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted skill group is unskilled workers. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

5.2.6 Effects of Migration by Branch of Industry

Table 11 contains the results for the effect of migration on wages and unemployment rates by branch of industry. The omitted category is agriculture. Distance interactions are not significant in the wage regression, so I discuss results for Column 1. Migration produced absolute wage gains of 1.6 percent in consumer durable goods production and 2.4 percent in heavy construction, and absolute wage decreases of 2.7 percent in agriculture, 2.0 percent in transportation/communication and 2.2 percent in business services. The other categories are generally not distinguishable from one another.

The results for the effect on unemployment parallel to a degree the wage results. Migration produced absolute increases in the unemployment rate of 2.5 percentage points in agriculture, 2.0 percentage points in industrial goods, 3.7 percentage points in heavy construction, 2.2 percentage points in light construction and 2.5 percentage points in transportation/communication. The result for heavy construction is at odds with the increase in wages observed in Column 1. It is interesting to observe where the largest and most significant relative decreases in the unemployment rate occurred: social services, retailing and local administration. These are all services that are likely to be provided

Table 11: Labor Market Effects of Migration, by Branch of Industry

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	-0.027**	-0.021	1.896**	2.534**
	(0.012)	(0.016)	(0.757)	(1.227)
Migration x Industrial Goods	0.028***	0.028***	-0.553	-0.553
	(0.011)	(0.011)	(0.777)	(0.777)
Migration x Consumer Durable Goods	0.043***	0.043***	-0.871	-0.871
	(0.011)	(0.011)	(0.939)	(0.939)
Migration x Foodstuffs	0.030**	0.030**	-1.501	-1.501
	(0.014)	(0.014)	(1.144)	(1.144)
Migration x Heavy Construction	0.051***	0.051***	1.118	1.118
	(0.011)	(0.011)	(0.873)	(0.874)
Migration x Light Construction	0.033***	0.033***	-0.327	-0.327
	(0.012)	(0.012)	(0.950)	(0.950)
Migration x Distribution	0.014	0.014	-2.068**	-2.068**
	(0.017)	(0.017)	(1.043)	(1.043)
Migration x Retailing	0.029**	0.029**	-2.651***	-2.651***
	(0.012)	(0.012)	(0.953)	(0.953)
Migration x Transportation, Communication	0.006	0.006	-0.061	-0.061
	(0.013)	(0.013)	(0.993)	(0.993)
Migration x Business Services	0.004	0.004	-1.865**	-1.865**
	(0.012)	(0.012)	(0.758)	(0.758)
Migration x Personal Services	0.015	0.015	-1.521*	-1.521*
	(0.019)	(0.019)	(0.879)	(0.879)
Migration x Social Services 1	0.031***	0.031***	-3.243***	-3.243***
	(0.011)	(0.011)	(0.803)	(0.803)
Migration x Social Services 2	0.020	0.020	-3.295***	-3.295***
	(0.017)	(0.017)	(0.836)	(0.836)
Migration x Local Administration	0.038***	0.038***	-2.437***	-2.437***
	(0.011)	(0.011)	(0.850)	(0.850)
Migration x 10th Distance Percentile		-0.011		0.114
		(0.008)		(0.629)
Migration x 10th-25th Distance Percentile		0.001		-0.945
		(0.007)		(0.603)
Migration x 25th-50th Distance Percentile		0.001		-0.791
		(0.006)		(0.491)
Number of observations	13818	13818	13818	13818

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted industry is agriculture. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

Table 12: Labor Market Effects of Migration, by Locus of Demand

	Dependent Variable			
	Log Wage		Unemployment Rate	
	(1)	(2)	(3)	(4)
Migration	0.006	0.010	0.466	1.352
	(0.005)	(0.014)	(0.426)	(1.157)
Migration x Local Job	0.003	0.003	-0.471**	-0.471**
	(0.004)	(0.004)	(0.226)	(0.227)
Migration x 10th Distance Percentile		-0.007		-0.277
		(0.009)		(0.749)
Migration x 10th-25th Distance Percentile		-0.001		-0.918
		(0.008)		(0.672)
Migration x 25th-50th Distance Percentile		0.004		-0.927*
		(0.006)		(0.553)
Number of observations	1974	1974	1974	1974

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted locus of demand category is "non-local" jobs. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

locally. This is consistent with a positive general equilibrium effect from migrants' own demand for goods and services. Although migrants might also stimulate demand for products and services that are provided in broader markets, these effects would not necessarily show any correlation with regional variation in migration. I investigate possible general equilibrium effects further below.

5.2.7 Effects of Migration by Locus of Demand

Table 12 contains the results for the effect of migration on wages and unemployment rates by locus of demand, which I define as whether an occupation has primarily local or extra-regional demand. The IABS-R01 contains 130 different occupations, and I categorize employees as having a "local job" if the source of demand for that occupation is primarily local. This is based on entirely on my subjective judgment; the list of "local jobs" appears in Table 13.

Column 2 of Table 12 shows that migration's effect on wages did not vary by locus of demand, although the sign of the relative effect on wages in local jobs is positive. Column 4 shows that migration produced a relative decrease of 0.5 percentage points in the unemployment rate for workers in local jobs, although the absolute effect was positive and insignificant. Overall, these results – like those above – suggest that migrants' own

Table 13: Occupations With Mainly Local Demand

Baker
Butcher
Cook
Mason
Concrete Worker
Carpenter
Roofer
Construction Assistant
Earthmoving Worker
Plasterer, Tile Layer, Glazier, etc.
Painter
Wholesale and Retail Clerk
Bookseller, Pharmacy Assistant, Filling Station Attendant
Bank Clerk
Insurance Clerk
Tourism Worker, Advertising Worker, Real Estate Agent
Doctor, Dentist, Veterinarian, Pharmacist
Physical Therapist, Nonmedical Practitioner
Nurse, Orderly, Midwife
Medical Assistant
Dietician, Pharmacy Technician
Medical Office Worker
Social Worker (Sozialarbeiter), Career Counselor
Social Worker (Sozialpädagoge/-in), Institution Manager
Kindergarten Teacher, Childcare Worker
Teacher/Professor (high school and above)
Teacher (middle school)
Hairstylist
Innkeeper, Restaurateur
Waiter
Other Hospitality Worker
Housekeeper, Housekeeping Management
Launderer
Fabric Cleaner, Dyer, Dry Cleaner
Room Cleaner
Window, Building Cleaner
Street Cleaner, Garbage Collector

Source: Institut für Arbeitsmarkt und Berufsforschung. Author's own translations.

Table 14: Labor Market Effects of Migration, by Full- vs. Part-Time

	Dependent Variable:	
	Log Wage	
	(1)	**(2)**
Migration	0.014	0.024
	(0.013)	(0.028)
Migration x Full-Time	-0.026***	-0.026***
	(0.007)	(0.007)
Migration x 10th Distance Percentile		-0.007
		(0.017)
Migration x 10th-25th Distance Percentile		-0.007
		(0.015)
Migration x 25th-50th Distance Percentile		-0.013
		(0.013)
Number of observations	1974	1974

Coefficients from instrumental variables (two-stage least squares) regressions. The unit of analysis is a West German local labor market (N=141). The dependent variable is in first differences. The unemployment rate is measured in percentage points. Migration is net inmigration from East Germany, expressed as a percentage of the labor market's population at the beginning of the year and instrumented as described in the text. The omitted job category is part time. The omitted distance category is the 50th to 100th percentile of distance to the East German border. All regressions include controls (first differences) for the distribution of age, education, gender, nationality, skill group, full- vs. part-time employees, and branch of industry. See text for details. Robust standard errors (clustering on labor markets) in parentheses. Significance levels are * 0.10, ** 0.05, *** 0.01.

demand ameliorates any negative impact on employment outcomes for natives.

5.2.8 Effects of Migration by Full- versus Part-Time Employees

Table 14 contains the results for the effect of migration on wages by full- versus part-time employees. Column 1 (the distance interactions in Column 2 are not significant) shows that migration decreased the wages of full-time employees by 2.6 percent relative to those of part-time employees, although the absolute effect is not significantly different from zero. This may reflect changes in hours for the two groups, as the wage data in the IABS-R01 are daily, not hourly. This result is consistent with the following general equilibrium effect: If migrants generated increased demand for goods and services, employers who were uncertain about the permanence of this demand shift (i.e., whether the migrants would ultimately return to East Germany) would have wanted to respond in the way that insured them against a future reversal. One way to do this would have been to increase the hours of part-time employees already on the payroll rather than hire new employees. The latter decision would be difficult to reverse due to laws governing worker dismissal in Germany. Also, part-time employees are frequently excluded from collective bargaining agreements in Germany or covered on disadvantageous terms (Houseman 1995), possibly

making the marginal cost of increasing their hours relatively low.

6 Conclusion

Consistent with earlier work, I find no significant effect of migration on either wages or unemployment rates for West German residents as a whole. However, I find great variation in the effects when disaggregating the results by characteristics such as age, educational attainment, gender, nationality, and skill group. In absolute terms, migration increased unemployment among the oldest (55 and older) workers and the least educated (those with middle school educations but no vocational training). Migration reduced unemployment among workers with at least a high school education. In relative terms, migration reduced unemployment rates for women, white-collar workers, and industries and occupations serving primarily local demand. This last finding suggests the presence of mitigating effects on employment outcomes due to immigrants' own demand for goods and services. Wage results generally parallel the unemployment results. In addition, I find that migration decreased the wages of full-time employees relative to those of part-time employees, possibly indicating that employers responded to increased demand by making more intensive use of the latter. Overall, these results suggest that, while immigration may be benign with respect to *aggregate* labor market outcomes, it has important distributional effects.

Because this is a reduced-form analysis, my results capture both partial and general equilibrium employment effects. It is therefore difficult to infer much about the exact mechanisms producing the observed effects. However, the evidence suggests that both sides of the immigration debate have valid arguments. On the one hand, migration seems to produce the worst employment outcomes, in either absolute or relative terms, among groups that are generally regarded to be the most vulnerable: older workers, the least skilled and the least educated. Generally, relative employment outcomes are worst for the groups in which East Germans are disproportionately represented, suggesting the migrants are substitutes for these categories of workers. On the other hand, in most

cases, these effects are relative, suggesting that the "harm" done by immigration is greater dispersion in employment outcomes rather than absolute harm to any particular group. Furthermore, there is also some evidence that immigrants do stimulate labor demand due to their demand for goods and services.

Both the wage and unemployment results have their limitations. Although I use a full battery of variables to control for changes in the composition of the workforce that might affect wages, I cannot rule out the possibility that compositional changes are driving my wage results. Another possible approach to the wage analysis is that followed in Altonji and Card (1991), where adjusted wages are the dependent variable.[13] Another limitation is that the IABS-R01 provides no information about the long-term unemployed or workers who are neither employed nor receiving benefits payments. Therefore, my measure of unemployment differs from traditional measures and probably leads to slightly inflated estimates of the effect of migration on unemployment.

More globally, in comparing employment outcomes for different categories of workers, it would be preferable to measure category-specific shocks as in Card (2001). However, my data do not permit this. On the other hand, I believe this shortcoming is balanced by a novel instrument for migration that is more plausibly exogenous than those used in the existing literature. Finally, one might be concerned that migrants from East Germany displaced migrants from other sources. In this case, my analysis would understate the true effect of migration on employment outcomes.

References

Alda, H. and D. Herrlinger (2005). LIAB-Datenhandbuch Version 1.0. Bundesagentur für Arbeit, FDZ Datenreport 7/2005.

Altonji, J. G. and D. Card (1991). The effects of immigration on the labor market outcomes of less-skilled natives. In J. M. Abowd and R. B. Freeman (Eds.), *Immigration, Trade, and the Labor Market*, pp. 201–234. Chicago: The University of Chicago Press.

Arntz, M. and R. A. Wilke (2005, March). Map intersection based merging schemes for administrative data sources and an application to Germany. Cen-

[13] In this approach, the "adjusted wage" is the coefficient on a regional dummy in an individual-level regression of wages on personal characteristics.

tre for European Economic Research Discussion Paper 05-20. Retrieved from ftp://ftp.zew.de/pub/zew-docs/dp/dp0521.pdf.

Bartel, A. (1989). Where do the new U.S. immigrants live? *Journal of Labor Economics 7*, 379–391.

Bender, S., A. Haas, and C. Klose (2000). IAB employment subsample 1975-1995: Opportunities for analysis provided by the anonymised subsample. *IZA Discussion Paper 117*.

Blanchard, O. and L. F. Katz (1992). Regional evolutions. *Brookings Papers on Economic Activity 1*, 1–75.

Borjas, G. J. (1994, December). The economics of immigration. *Journal of Economic Literature 32*(4), 1667–1717.

Borjas, G. J. (1999). The economic analysis of immigration. In O. Ashenfelter and D. Card (Eds.), *Handbook of Labor Economics Vol. 3*, pp. 1697–1760. Amsterdam: Elsevier Science B.V.

Borjas, G. J. (2003, November). The labor demand curve is downward sloping: Reexamining the impact of immigration on the labor market. *The Quarterly Journal of Economics 118*, 1335–1374.

Card, D. E. (1990, January). The impact of the Mariel Boatlift on the Miami labor market. *Industrial and Labor Relations Review 43*(2), 245–257.

Card, D. E. (2001). Immigrant inflows, native outflows, and the local market impacts of higher immigration. *Journal of Labor Economics 19*(1), 22–64.

Carrington, W. J. and P. J. de Lima (1996). The impact of 1976 repatriates from Africa on the Portuguese labor market. *Industrial and Labor Relations Review 49*(2), 330–347.

Decressin, J. and A. Fatás (1994). Regional labor market dynamics in Europe. *European Economic Review 39*, 1627–1655.

Dustmann, C., F. Fabbri, and I. Preston (2005). The impact of immigration on the British labour market. *The Economic Journal 115*, F324–F341.

Eckey, H.-F. and P. Klemmer (1991). Neuabgrenzung von Arbeitsmarktregionen für die Zwecke der regionalen Wirtschaftspolitik. *Informationen zur Raumentwicklung 10*, 569–577.

Frankfurter Allgemeine Zeitung (1999). Respekt vor einem historischen Standort. September 29, Section Politik.

Friedberg, R. M. (2001). The impact of mass migration on the Israeli labor market. *The Quarterly Journal of Economics 116*(4), 1373–1408.

Friedberg, R. M. and J. Hunt (1995). The impact of immigration on host country wages, employment and growth. *The Journal of Economic Perspectives 9*(2), 23–44.

Houseman, S. N. (1995). Part-time employment in Europe and Japan. *Journal of Labor Research 16*(3), 249–262.

Hunt, J. (1992). The impact of the 1962 repatriates from Algeria on the French labor market. *Industrial and Labor Relations Review 45*(3), 556–572.

Lalonde, R. J. and R. H. Topel (1991). Labor market adjustments to increased immigration. In J. M. Abowd and R. B. Freeman (Eds.), *Immigration, Trade, and the Labor Market*, pp. 167–199. Chicago: The University of Chicago Press.

Marsh, D. (1988a). CDU boost for two Germanies. *Financial Times*. February 17, Section I.

Marsh, D. (1988b). German reunification fades into the future. *Financial Times*. August 5, Section I.

Pischke, J. and J. Velling (1997). Employment effects of immigration to Germany: An analysis based on local labor markets. *The Review of Economics and Statistics 79*(4), 594–604.

Schmemann, S. (1989). Despite new stirrings, dream of 'one Germany' fades. *New York Times*. May 19, Section 4.

Smith, E. O. (1994). *The German Economy*. London: Routledge.

Winter-Ebmer, R. and J. Zweimüller (1996). Immigration and the earnings of young native workers. *Oxford Economic Papers 48*, 473–491.

Winter-Ebmer, R. and J. Zweimüller (1999). Do immigrants displace young native workers: The Austrian experience. *Journal of Population Economics 12*, 327–340.

A Treatment of East German Regions

Mapping the counties in my data to employment office districts is complicated by two factors. First, East German counties were redefined several times throughout my sample period. By the end of the period, the number of counties had been reduced to its current value of 113. To obtain geographic entities that are consistent throughout my sample period and compatible with other data sources, I map counties to the post-redistricting definitions. Although redistricting was mainly a fusion of small counties into larger ones, there were ample exceptions, so the mapping process is imprecise.

For some states (Brandenburg, Mecklenburg-Vorpommern, Thüringen), I was able to obtain detailed cross-reference tables showing the composition of counties by town code before and after redistricting. For these states the mapping rule was as follows: for each old county-new county pair, I calculated the percentage of the old county's towns redistricted into the new county. If that percentage weakly exceeded 20 percent, I mapped

the old county to the new. If an old county was assigned in this way to multiple new counties, I combined the new counties to remove the split.

For the remaining states (Sachsen, Sachsen-Anhalt), I used information from their entries in the online encyclopedia Wikipedia (http://de.wikipedia.org/wiki/Sachsen, http://-de.wikipedia.org/wiki/Sachsen-Anhalt). These entries describe the current county structure and each county's redistricting history. If the history indicated that an old county was redistricted into multiple new counties, I combined the new counties to remove the split. Since Wikipedia is based on voluntary entries provided by the general public, I did the following informal accuracy check. I compared the Wikipedia entries for Brandenburg, Mecklenburg-Vorpommern, and Thüringen with my own data. I found that Wikipedia did not always exhaustively list the old counties represented in the new counties. However, in these cases, the omitted counties were generally the same ones that fell below the 20 percent threshold discussed above. I have no strong reason to believe that the mapping based on Wikipedia is significantly less precise than the one based on the detailed cross-reference tables.

The second complication is that the employment office district structure and county structure do not perfectly coincide, so again there is a loss of precision in assigning counties to employment office districts. I use a variation of the "naive" mapping scheme described by Arntz and Wilke (2005). They propose various assignment rules based on the intersection areas formed by overlaying digitized maps of Germany subdivided by county and employment office, and they provide a link to their file of map intersections. Using their data, I mapped the counties (post-redistricting definitions) to the employment office district with which they had the largest intersection. Of 113 counties, only 7 had less than 90 percent overlap with their assigned district. In each of these cases, the county seat (*Kreishauptstadt*) was correctly assigned. Assuming the county seat is the economic center of the county, these counties' population and migration statistics should thus be matched with the relevant labor market data. Arntz and Wilke test the robustness of their various mapping rules by performing an unemployment duration analysis for West

Germany in the years 1975-1997. They find that the results are highly robust with respect to the merging scheme applied. It should be noted here that their unit of analysis – the employment office – is more detailed than mine – the employment office district. Also, their analysis does not include East Germany. I will leave it to the reader to evaluate the relevance of their results as indicators of the robustness of my mapping scheme.

After mapping each of the 113 Eastern counties to an employment office district, I aggregated employment office districts so that none of the county clusters resulting from my redistricting-related mapping was split. This aggregation reduced the 35 employment office districts to 26 clusters. As discussed above, eliminating Berlin produces the 25 regions I use.

B Estimated Bias in Coefficient Estimates

Because the IABS-R01 does not include all employed persons in Germany, and because it does not contain information about the status of persons who are neither working in a job requiring social security reporting nor receiving benefits payments, my measure of the unemployment rate is not precise. This potentially biases my estimates of the effect of migration on unemployment, and in this section I derive a rough estimate of the magnitude and direction of this bias.

Let e be the number of employed persons observed in the IABS-R01 on a given date and r be the number of benefits recipients observed. Then my measure of the unemployment rate is

$$u^* = \frac{r}{e+r}.$$

Let $p_o = e + r$ be the observed "workforce" and p_u be the unobserved workforce. We can think of p_u as either the number of people regularly appearing in the IABS-R01 but with gaps in their records on the date of observation or as the total workforce not covered by the IABS-R01. Let μ be the unemployment rate in p_u. Then the true unemployment rate

is

$$u = \alpha u^* + (1 - \alpha)\mu,$$

where

$$\alpha = \frac{p_o}{p_o + p_u}.$$

Assume that u^* and μ are related as follows:

$$\mu = k + \gamma u^* + \varepsilon.$$

Then

$$\Delta u = [\alpha + \gamma(1 - \alpha)]\, \Delta u^* + \eta,$$

where $\eta = (1 - \alpha)\Delta\varepsilon$. If I observed u perfectly, in a one-variable least squares estimation I would estimate the marginal effect of migration on unemployment as

$$\beta = \frac{\text{cov}(\Delta u, m)}{\text{var } m}.$$

Since I don't observe u perfectly, what I actually estimate is

$$\beta^* = \frac{\text{cov}(\Delta u^*, m)}{\text{var } m}.$$

Because $\text{cov}(ax, y) = a\ \text{cov}(x, y)$, $\beta = [\alpha + \gamma(1 - \alpha)]\, \beta^*$. We can now consider several different possibilities for γ:

1. $\gamma > 1$: β^* gives an attenuated estimate of β.

2. $\gamma = 1$ (u^* and μ are perfectly correlated): β^* is unbiased. In other words, if the observed data in the IABS-R01 are representative of the broader labor market, the missing data poses no problem for the analysis.

3. $\gamma \in [0, 1)$: β^* is inflated by at most $\frac{1}{\alpha}$. Note that $\gamma = 0$ describes the case when the measured unemployment rate is uncorrelated with the unemployment rate in the

unobserved population.

4. $\gamma < 0$ (u^* and μ are negatively correlated): β^* is severely inflated and may even have the wrong sign.

The last case seems highly unlikely, so the worst-case scenario for β^* is that it is inflated by $\frac{1}{\alpha}$. If we take the relevant population to be persons regularly appearing in the IABS-R01, then $\alpha = 0.935$ and my estimates are inflated by at most approximately 7 percent. If we take the relevant population to be the West German workforce, then $\alpha \approx 0.748$ (80 percent occupational coverage of the IABS-R01 deflated for gaps within the IABS-R01[14]) and my estimates are inflated by at most approximately 34 percent.

[14]Note that this involves some double counting, as some of the gaps in the IABS-R01 may be due to crossovers into occupations it does not cover.