Online Appendix
to

The Impact of Immigration on Competing Natives' Wages: Evidence from German Reunification

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A Background

A.1 Immigration to West Germany

In this appendix, we add descriptive evidence on the massive, non-anticipated, and sudden wave of German-German migration after the fall of the Berlin Wall. We also discuss in greater detail how this paper relates to selected papers on immigration to West Germany.

An important feature of the internal migration wave after the fall of the Berlin Wall is the following: the migration of East Germans into West Germany left the relative labor supplies of German individuals in the West quite unchanged at the level of broad educational classes. This distinguishes the wave at hand from waves that change the educational distribution in the destination area by adding relatively more immigrants in the upper or lower tails of the distribution (see also Card, 2009). Moreover, it fits with the view that the East German migrants are in many respects similar to the natives in the West German labor market, extending the discussion in section II.A of the paper.

Using data on the years 1991–92 and 1998–99,[A.1] we observe that 3.92 percent of all medium-educated Germans in the West German labor market are East Germans. Among Germans with a high or low level of education the shares are similar, that is, 3.65 percent and 3.70 percent, respectively. These shares compare well with those reported by D'Amuri et al. (2010) who use data from the IAB Employment Subsample. In addition, we observe a pattern that fits well with the pattern described by Hunt (2006) who uses data from the German Socio-Economic Panel for 1990 to 1999. She finds that 69 percent of the East German migrants to the West German labor market have a medium level of education, 13 percent a high level, and 18 percent a low level. In our data, 73.06 percent of all East German migrants to the West German labor market have a medium level of education, 13.60 percent a high level, and 13.34 percent a low level.

East Germans migrating to West Germany after reunification have already received atten-

[A.1] The descriptive statistics in this paragraph are based on a large sample from the raw survey data described in appendix B. The sample covers all 46,996 Germans in the West German labor market who grew up in East or West Germany, reside in West Germany at the time of the survey in 1991–92 or 1998–99, have German citizenship, and have either a high, medium, or low level of education.

tion in the literature but our research question, our empirical approach, and our data are novel in several ways. D'Amuri et al. (2010), in particular, investigate average effects of immigration in general on labor market outcomes of West Germans in West Germany. In that context, they use the inflow of East Germans in the years after 1991 as an exogenous source of instrumental variation. We, in contrast, present an IV approach to deal with the fact that such inflows of East Germans are potentially endogenous in equations explaining labor market outcomes of West Germans. We propose direct measures of potential migration as excluded instruments in section III.A and use comprehensive data on the region where individuals spent most of their youth in order to distinguish East from West Germans in Germany. Thereby, we are first to identify movers from the massive wave in 1989, 1990, and 1991 – right after the fall of the Berlin Wall (see figure 1). D'Amuri et al. (2010) use data that allows only for identifying the subset of German-German migrants with German nationality who worked in East Germany at least until January 1, 1992, and subsequently started to work in the West.[A.2]

Several studies have considered immigrant groups from other source regions that opened up when the end of the Cold War and the dissolution of the Union of Soviet Socialist Republics (USSR) loomed.

Glitz (2012), as well as Brücker and Jahn (2011), investigate the impact of immigration on labor market outcomes in West Germany with a focus on ethnic German immigrants. To deal with potentially endogenous choices of the immigrants' location, Glitz (2012) exploits the fact that government authorities followed rules as fixed in 1989 when allocating ethnic German immigrants to West German labor market regions between 1996 and 2001. During the 1990s, ethnic Germans constituted the second largest group of immigrants to West Germany.[A.3] In contrast to the East German migrants we focus on, ethnic German immigrants often arrived

[A.2] D'Amuri et al. (2010) use the above-mentioned IAB dataset covering West German employment spells between 1975 and 2001, and East German spells from 1992 onwards. Information on the region of birth is not part of that dataset (see footnote 9 in D'Amuri et al., 2010).

[A.3] Ethnic Germans are German nationals by descent who lived in a country in Central or Eastern Europe or in the Soviet Union before 1989. Similar to East Germans, ethnic Germans were long prevented from migrating to West Germany by travel restrictions of their home countries. These restrictions were relaxed in 1988, or later, and ethnic German migration to West Germany increased subsequently.

with poor language skills, and vocational skills that only poorly matched the needs of West German workplaces. As a result, the unemployment rate of ethnic Germans was very high.[A.4]

Dustmann et al. (2017) investigate the effects on labor market outcomes in West Germany resulting from a commuting policy that allowed Czech workers to work in German regions along the German-Czech border from January 1, 1991, onwards but not to reside there. They find small negative effects on average local wages and sharp declines in local employment. Consistent with the fact that the Czech commuters are, on average, less skilled than German workers in West Germany, larger wage and employment effects surface for unskilled than skilled German workers. In addition, they find the largest negative wage effects for German workers who are aged 18 to 30 years. The authors relate their results to labor supply elasticities, or wage rigidities, that differ across groups and we relate to their work in section IV.C.

[A.4]See, for example, Brück-Klingberg, Burkert, Seibert, and Wapler (2007).

A.2 Product and Labor Market Regulation

A.2.1 The regulation of firms' entry

We refer to the product market regulation which is part of the German Trade and Crafts Code (*Gesetz zur Ordnung des Handwerks (Handwerksordnung)*, HwO). Rules under this law impose substantial fixed entry costs in the form of a mandatory requirement on firms entering certain product markets but not on those entering other markets.

The roots of the law go back to times long before World War II. The first West German version of the law came into force in 1953 and underwent only minor updates through the end of the 1990s. Most importantly, the set of product markets under the regulation remained virtually unchanged (Boyer 1990; Deregulierungskommission 1991; Monopolies Commission of Germany, 1998, 2002; section II.A of the paper).[A.5] In East Germany, the GDR abstained from abolishing core elements of the pre-war Trade and Crafts Code despite the planned economy system. While many elements continued to exist in a pro-forma manner, the system of occupation-specific vocational training and training degrees was kept alive in Code-related occupations, and also in general. The German Reunification Treaty acknowledged these degrees.[A.6]

Under the code's main rules regulating the entry of firms, individuals who want to get registered so that they can start a legally independent business in one of the regulated product markets (*Eintragung in der Handwerksrolle*) must hold a relevant master craftsman certificate (§1(1,1) HwO; §7(1,1) HwO).[A.7]

At all times relevant to this paper, individuals who wanted to acquire a master craftsman certificate had to pass several consecutive stages of training, collecting work experience, and taking examinations. The code prescribes that the individual first needs a vocational training

[A.5] The initial version of the law, with additional legislation (*Ergänzende Vorschriften zur Handwerksordnung*), was amended in 1965 (HwO, 1965), and several changes which are of minor relevance in our context followed in the years up to 1998.

[A.6] See, among others, Einigungsvertragsgesetz (1990), Deregulierungskommission (1991) and section II.A.

[A.7] The German Reunification Treaty entitled East German master craftsmen to start a firm in a regulated product market anywhere in Germany, just like West German master craftsmen.

degree in a relevant occupation. This typically involves two to three years of apprenticeship (*Lehre*) and passing the related journeyman examination. A journeyman degree certifies the mastery of skills required for all relevant occupation-specific tasks (*Gesellenbrief*). The degree is the formal prerequisite for admission to the master exam (*Meisterprüfung*) and several years of work as a journeyman were usually also required (§49 HwO). Most exam candidates participate part-time or full-time in preparatory courses lasting up to three years. The master exam covers general topics, i.e. law, bookkeeping, controlling, marketing, and human resource management, as well as occupation-specific topics. Local five-member committees examine master candidates in closed sessions. During the 1980s, about 25 percent of the candidates failed their exam (Deregulierungskommission, 1991).[A.8] Altogether, earning a master craftsman certificate requires a substantial time investment, in addition to paying, for example, course fees.

Exceptions to the main rules regulating the entry of firms are also part of the Trade and Crafts Code. Individuals with skills considered to be adequate can be exempted. However, exceptions unrelated to continuations or extensions of incumbent firms were not often granted during the 1980s and 1990s (§7 to §9 HwO; Monopolies Commission of Germany, 1998, 2002). In addition, there are educational degrees that were, by law, considered equivalent to the master craftsman certificate at times relevant to this paper, but these degrees were also time-consuming to acquire (§7 (2) HwO). In the case of incorporated firms, a business manager has to fulfill the code's entry rules; non-incorporated firms can be registered if a fully liable owner who fulfills the requirement acts as a business manager (§7 (4) HwO).

Proponents of the code's rules imposing the master craftsman as a mandatory requirement on entering firms point to, in particular, informational asymmetries and external effects that would otherwise work toward inefficient market outcomes or even market failure. They cite as regulatory benefits a high quality of the products supplied to the regulated markets, consumer protection, and training activities providing skilled workers to the own sector and further sectors of the economy. The Monopolies Commission of Germany, alongside other German or EU institutions, have opposed this view (Deregulierungskommission, 1991;

[A.8] Three members per examination committee were from the same occupation as the respective candidate, with two of these representing incumbent firm owners with master craftsmen certificates.

Monopolies Commission of Germany, 1998, 2002). They stress that an individual with a journeyman degree and several years of work experience in the occupation can be very similar to someone with a master craftsman certificate with respect to the occupational skills and the qualification as potential entrepreneur. In addition, many of the goods and services in the regulated markets can be classified as standard experience goods, or even search goods, rather than credence goods. In the case of experience goods, for example, signaling activities or investments in reputation can well contribute to high quality in product supply (Tirole, 1988). Private training incentives of firms should foster the efficient provision of training activities. Altogether, the Monopolies Commission of Germany, among others, has classified the code's entry rules as a reason for higher product prices and lower production quantities in the regulated markets. The relevant rules have been argued to restrict the entry of firms, slow down industry dynamics, lower competition, and allow for persistent profits.

The product markets under the code's rules account for about 38 percent of the native West German employees in the main sample. The distribution of these employees across the employment size classes of their employers is remarkably similar to the corresponding distribution in the product markets that are not subject to the code's rules (see table A.1).[A.9] The similarities between both distributions reflect the fact that the rules regulating the entry of firms do not at the same time restrict the size of the firms. This distinguishes the regulatory context at hand from the settings that are studied, for example, by Bertrand and Kramarz (2002) or Chari (2011).

Apart from that, we observe that the share of native West German employees in micro establishments with less than five workers is 8.06 percent in regulated product markets, and thus lower than the share of 10.97 percent in other markets. The share in large establishments with more than 499 workers is greater, with 17.63 percent versus 15.58 percent. Both these observations are in line with expectations on effective restrictions to the entry of firms. Under the code's rules, the average tenure of the employees is 12.08 years, the share of those in long-term employment, defined as in section IV.C, is 52.57 percent and the share of the employees who experienced no occupational change is 84.42 percent. In the product markets where the

[A.9] In both groups, for example, about 74 percent of the employees are in small or medium-sized establishments with between 5 and 499 employees.

code's rules do not apply, the average tenure is 2.02 years lower, the share of employees in long-term employment is 10.63 percentage points lower and the share without occupational change is 17.69 percentage points lower. Taken together, these descriptive statistics are consistent with weaker job dynamics as a consequence of the considered product market regulation effectively restricting the entry of firms, reducing industry dynamics, and leading to a higher concentration of productive resources in incumbent firms.[A.10]

Table A.1: Distribution of native West German employees across employers' size

	(1)	(2)	(3)	(4)
Size of employers in number of employees	Product markets subject to rules of the Trade and Crafts Code regulating the entry of firms		Product markets not under the Code's regulation	
1-4	8.06		10.97	
5-499	74.31		73.45	
5-9		*18.19*		*15.87*
10-49		*31.39*		*28.29*
50-99		*9.54*		*11.80*
100-499		*15.19*		*17.49*
500 or more	17.63		15.58	
500-999		*4.93*		*4.86*
more than 999		*12.70*		*10.72*

Notes: In this table, we show distributions of native West German employees across intervals of their employers' size, measured in the number of employees. We compare the distribution in the product markets subject to the code's rules to the one in the markets that are not under the code's rules which regulate the entry of firms. The calculations are based on the main sample of 18,482 employees (see section II.B and appendix B).

[A.10] Prantl and Spitz-Oener (2009), report, among others, that the code's rules regulating the entry of firms lowered entry into self-employment. Prantl (2012) provides empirical evidence suggesting that the code's rules also reduce sustained entry into self-employment, in other words the probability of long-lasting self-employment. This effect is not accompanied by a counteracting impact on the performance of long-living entrants, as measured by firm size several years after entry. Increased market concentration and increased retailer prices are, for example, reported by Bertrand and Kramarz (2002) in the case of a zoning regulation in the French retail trade industry that involves restrictions to the entry of firms, along with restrictions to firm size.

A.2.2 Works Councils and Wage Bargaining

Establishment-level works councils are a core element of the German system of industrial relations. Other elements are trade unions and employer associations. As explained in section II.A of the paper, works councils are the key component of the German system of establishment-level codetermination (*betriebliche Mitbestimmung*). The main legal rules are part of the German Works Constitution Act (*Betriebsverfassungsgesetz*, BetrVG) and the relevant version of the law for the observation period of this paper, the 1990s, is that of 1972 (BetrVG, 1972).

A firm is obliged to set up a works council in an establishment with at least five adult, full-time employees if demanded by these (§1, §4 and §7 BetrVG).[A.11] All adult employees of the establishment are entitled to elect the members of their works council, and the size of the works council depends on the size of the establishment (§9 BetrVG).[A.12]

The regulation covering works councils determines the strength of worker involvement in hiring, firing, and pay scheme decisions at the establishment level (§99 and §102 BetrVG, among others). The rights and obligations of works councils are such that in an establishment with more than 20 employees, the works council must be involved in every single hiring decision. A works council needs to be informed in advance about application documents, job applicants, the targeted position, the wage classification, and how incumbent employees will be affected by the hiring of the new worker and whether personnel transfers might result. A works council can refuse to give its consent to a hiring when there is a well-grounded concern that the new hiring might result in incumbent workers being fired, or other disadvantages (§99 (2) BetrVG).[A.13] A works council can also object to proper notices of work contract termination if one of the conditions in §102 BetrVG are fulfilled.[A.14] Similar rules regarding

[A.11] An establishment represents a line of business in a legally independent firm.

[A.12] Trade union representatives can be, and often are, among the elected members but this is no legal requirement. In establishments with at least 300 employees, a certain number of members of a works council have to be exempted from work so that they can devote all their work time to their council duties. The number of exempted council members depends on the establishment size (§38 (1) BetrVG).

[A.13] A works council's refusal of consent can complicate a hiring substantially, including by bringing labor court involvement (§99 (4) BetrVG).

[A.14] This can also complicate human resource management, and again through court involvement.

the information rights of works councils, and their involvement and potential mediation procedures become relevant if a firm plans to relocate, restructure or close an establishment (§111 to §113 BetrVG). Taken together, works councils cannot block a hiring or firing without reason, and their refusal of consent-right is not a veto right in the legal sense. They should, however, be expected to only approve hiring and accompanying personnel measures when incumbent workers will not suffer as a result. They are likely to oppose to incumbent workers being fired, and negotiate to maintain or increase the wages of incumbent workers.

Works councils choose the members of the economic committee ("Wirtschaftsausschuss"), which is mandatory in firms with more than 100 full-time employees (§106 (1) and §107 BetrVG). The management of the firm has to inform the committee in a timely manner of the firm's current and expected economic and financial situation. The committee, in turn, has to inform the works council (§106 (2, 3) and §108 (4) BetrVG). Since the representatives of incumbent workers in works councils need to be well informed about the firms' performance and prospective management strategies, they can be expected to be aware of the profit consequences of newly hired East German employees.

While works councils act, to a large extent, independently of trade unions and employer associations in the case of hiring and firing decisions, this is different in the case of wage agreements. Works councils' decisions are, in principle, subordinate to decisions made by unions and employer associations in the context of collective wage bargaining (§2 and §77(3) BetrVG). To account for time-varying effects of collective bargaining on wages at the level of specific industries or occupations, we include industry-time fixed effects, along with occupation-time fixed effects, in all model specifications. Also, note that the industrial relations system in Germany has changed the way it operates and since the late 1980s works councils have become increasingly involved in wage bargaining. Several components of the system have contributed to this, spurred on by a decline in the rate of unionization. First, the recognition of trade unions is at the discretion of firms and union contracts cover only workers in firms that recognize the relevant union(s) or the collective bargaining outcomes (Fitzenberger, Kohn, & Wang, 2011). Second, union contracts only set wage floors. Finally, hardship or opening clauses (*Härte- und Öffnungsklauseln*) have been increasingly added to collective agreements, and the negotiation of establishment-level

agreements has become more common (*betriebliche Bündnisse zur Beschäftigungs- und Wettbewerbssicherung*).[A.15] Overall, wage bargaining has been decentralized in several respects and the importance of works councils has increased relative to unions due to their role in the context of establishment-level codetermination.

[A.15] According to Addison et al. (2009, p. 13), "[...] issues that were formerly dealt with only under collective bargaining are increasingly being addressed within the domain of works councils" (see also Kohaut & Bellmann, 1997; Hassel, 1999; Hassel & Rehder, 2001; Carlin & Soskice, 2009).

A.3 Population Dynamics in East and West Germany

GDR-determined and reunification-induced population dynamics, along with their impact on the size of the labor force of East Germans with occupational training, generate exogenous instrumental variation in measures of potential migration. These sources of variation add to those discussed in the last five paragraphs of section III.A of the paper.

In East Germany up to the unexpected fall of the Berlin Wall in 1989, the standardized mortality rate was higher than in West Germany and the difference remained stable until 1991.[A.16] Importantly, more premature deaths, occurring before the age of 65, were registered in the East than in the West such that the East-West difference in age at which people died was sizable before reunification. This is reflected in figure A.1 on the evolution of the region-specific, annual numbers of years of potential life lost per 100,000 individuals aged one to 64 years in the population standardized to.[A.17] In addition, a striking spike in the East German number of premature deaths is documented for the initial transition period after 1989.[A.18] Standardized mortality rates, averaged across the years 1991 to 1993, are much higher in East than in West Germany in all age groups, in particular in the age group 15–44.[A.19] Comparing the causes of death in the East and West in that period, Riphahn and Zimmermann (2000) conclude from the literature that the strongest differences occur due to cardiovascular diseases, cirrhosis, chronic liver diseases, and accidents, including traffic accidents. Taken together, we observe GDR-related excess mortality in all age groups in East relative to West Germany.

[A.16] A region's standardized mortality rate is the mortality rate of its population which is adjusted to the age distribution of a reference population by applying the regions' age-specific death rates to the reference population. Accordingly, comparisons of region-specific standardized mortality rates do not depend on differences in age distributions across regions. Note also that the East German mortality rate converged to the West German rate from 1991 onwards, in line with East Germans' improving access to adequate health care services, particularly in urban areas. See figure 5 of the "Gesundheitsberichterstattung des Bundes" (Federal Statistical Office of Germany & Robert Koch-Institute, 2011) and Mühlichen (2019).

[A.17] Deaths before the age of 65 are counted when calculating these potential years of life lost, all registered causes of death are considered, the relevant age-specific death rates are standardized, and deaths of younger persons are weighted higher (Federal Statistical Office of Germany & Robert Koch-Institute, 2011, figure 6 and related material).

[A.18] Figure A.1 also indicates convergence from 1991 onwards, in line with the pattern that is reported for age-standardized mortality rates in footnote A.16.

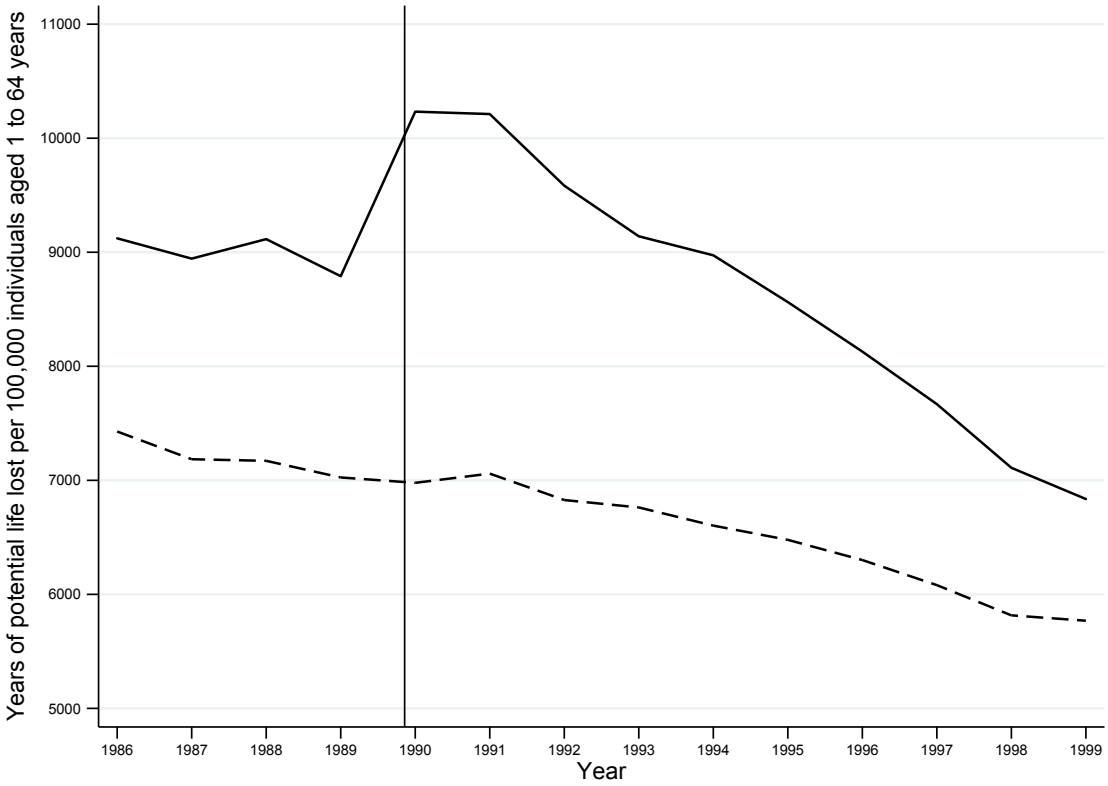
[A.19] See figure 4 in Federal Statistical Office of Germany and Robert Koch-Institute (2011).

Population dynamics depend not only on mortality but also on migration and fertility. In section II.A we discuss the GDR's extensive restrictions to mobility between 1961 and 1989 and their sudden breakdown as GDR-specific sources of exogenous variation in measures of potential migration. GDR-related fertility pattern causing population dynamics that influence the size of the labor force more than two decades later would also provide exogenous variation. The standardized birth rate in East Germany differed, however, not much from the West German rate up to the mid-1970s.[A.20]

In summary, several GDR-related population dynamics generate variation in the labor force of East Germans with occupational training during the 1990s. There is no reason to assume that these factors represent responses to West German labor market outcomes during the 1990s. Accordingly, they trigger exogenous instrumental variation in measures of potential migration from East Germany which differs across West German age-occupation cells and across the time period relevant to the empirical analysis at hand.

[A.20]See, for example, figure 9 in Conrad, Lechner, and Werner (1996). Note that these authors, as well as Chevalier and Marie (2017), focus on East-West differences in fertility rates in later years, after the mid-1970s.

Figure A.1: Years of Potential Life Lost in East and West Germany, 1986–1999



Notes: In this figure, we show the evolution of region-specific, annual numbers of years of potential life lost per 100,000 individuals aged one to 64 years in the population standardized to. The solid line refers to East Germany and the dashed line to West Germany. We use data of the "Gesundheitsberichterstattung des Bundes" for the time period from 1986 to 1999 (Federal Statistical Office of Germany & Robert Koch-Institute, 2011).

B Data, variables, and descriptive statistics

The Qualification and Career Survey was carried out by the German Federal Institute for Vocational Education and Training (*Bundesinstitut für Berufsbildung*, BIBB) and the Research Institute of the Federal Employment Agency, the Institute for Employment Research (*Institut für Arbeitsmarkt- und Berufsforschung*, IAB).[B.1] The data for the three survey waves that we use as pooled cross-sections were collected during the winter months 1985–86, 1991–92 and 1998–99. Each wave covers about 30,000 observations, leading to a total of 94,981 observations in the raw survey dataset.[B.2]

In each survey wave, the sampling frame is a known population of individuals in Germany, covering employees, self-employed individuals and, in the wave of 1991–92, individuals in East Germany who are unemployed or in training programs for the unemployed. The selection of the sample follows a random-route process at the household level. The targeted person per household is personally interviewed using a standardized questionnaire.

Each observation in the survey data is accompanied by a weighting factor. These survey weights account for the fact that the sampling probability in the chosen random-route process depends on household size, and they adjust core sample distributions to the corresponding distributions of the reference population (gender, age, occupational status, federal state, and size of municipality). Typically, the reference statistics are taken from the German Microcensus, a 1-percent random sample of the population in Germany. We take these survey weights into account when we generate variables for which we aggregate individual-level data, like mr^E_{gjt} or p^E_{gjt}. We also use them for weighting observations when generating descriptive statistics or test statistics, and when estimating regressions, except otherwise mentioned.

Data on current and training occupations:

Data on the *current occupation* which an individual is currently working in is available

[B.1] Details on the access to the data and the documentation of the data are provided by BIBB and IAB (1995, 2016) and Jansen and Dostal (2015). See also the supplementary material.

[B.2] Among the studies using the survey are DiNardo and Pischke (1997), Harhoff and Kane (1997), Spitz-Oener (2006), Dustmann, Ludsteck, and Schönberg (2009), and Prantl (2012).

for employees and self-employed individuals in the survey waves of 1985–86, 1991–92, and 1998–99. Data on the *first completed training occupation* is available for employees and self-employed individuals in the survey waves of 1991–92 and 1998–99, and this data is relevant for the IV approach in this paper. If participants in the survey wave of 1991–92 are unemployed or in training programs for the unemployed then a potential current occupation and the first completed training occupation are recorded.

The occupational data follow the 1988 classification of the Federal Statistical Office of Germany (*Statistisches Bundesamt Deutschland*, Destatis) in the version provided by the German Federal Employment Agency (*Bundesagentur für Arbeit*, BA). Data at the level of three-digit occupational titles is available for all survey waves; data at the four-digit level for the survey waves of 1991–92 and 1998–99.

Demographic variables and data on education:

For each survey participant, we define the *age* in years at the time of the survey, namely at the end of the data collection periods in 1986, 1992, or 1999. The variable *gender* is encoded with 1 for men and 0 for women.

We distinguish individuals according to the *level of education*. Individuals with a medium level of education hold a vocational training degree either from a vocational school (*Berufsfachschule, Fachschule*) or from the dual system of apprenticeship (*Lehre*) which combines on-the-job training and training in schools. Individuals without a completed occupational training have low education and those with a degree from a university, a university of applied sciences, or a university of cooperative education are highly educated.

Natives and migrants:

Separating East from West Germans requires more than data on citizenship since both have German citizenship (Grundgesetz, 1949, article 116). Therefore, we use unique data on youth residence that is based on the responses to the following survey question in 1991–92 and 1998–99: Where did you grow up, that is, where did you spend most of your youth? Possible answer categories are: 1) in the current area of Germany or in pre-WWII territories of Germany, that is, 1.a) in West Germany, 1.b) in East Germany (former GDR), 1.c) in pre-WWII German territories in Eastern Europe (labeled as *damalige Ostgebiete*); 2) outside

the area of Germany, that is, 2.a) in a country in the European Union (EU) at the date of the survey, 2.b) in a non-EU country in Eastern Europe at the date of the survey, 2.c) in another country.

The survey respondents with German citizenship who grew up in the region of East Germany (former GDR) are those who we identify as East Germans in East or West Germany after reunification. Native West Germans in West Germany have German citizenship, grew up in the region of West Germany, and reside in West Germany. Those East Germans who reside in West Germany represent the East German migrants to West Germany.

Main measures of migration and potential migration:

Share and number of East German migrants per West German labor market cell

The main measure of the migration rate, mr^E_{gjt}, is defined as the share of East German migrants per age-occupation cell gj in the West German labor market at time t. The number of East Germans who migrated to the West German age-occupation-time cell gjt is denoted by m^E_{gjt}. The relevant details are provided in paragraphs five to seven of section II.B in the paper.

Pool of East Germans who potentially migrate to a West German labor market cell

The main measure of potential migration, p^E_{gjt}, is defined as a weighted count of all those East Germans in East and West Germany who qualify for potentially migrating to a specific West German age-occupation-time cell gjt (see section III.A, paragraphs six to eight).

Samples and descriptive statistics

The main set of migration measures, mr^E_{gjt}, p^E_{gjt}, and m^E_{gjt}, is relevant to the sections III.B, IV.B, and IV.C, as well as to most parts of appendix C.

In the case of the migration rate mr^E_{gjt}, we use information on 20,266 respondents to the survey in 1991–92 or 1998–99 to calculate the values of the denominator, $m^E_{gjt} + n^W_{gjt}$ for the respective points in times. These respondents are Germans in the West (youth in East or West Germany, residency in West Germany, German citizenship), are aged 25 to 54 years, have medium education, and work as employees or are self-employed in one of the 46 occupational groups of the main estimation sample. The 715 respondents among them who

indicate that they grew up in East Germany (former GDR) are relevant for the numerator, m^E_{gjt}. Descriptive statistics on mr^E_{gjt} are provided in appendix table B.1 (see section II.B for discussion).

When determining the potential migrants who qualify for the pool p^E_{gjt} that is relevant to a specific West German age-occupation-time cell gjt, we consider the data on the 9,808 respondents to the survey in 1991–92 or 1998–99 who are East Germans in Germany (youth in East Germany, residency in East or West Germany, German citizenship). They are aged 25 to 54 years, have medium education, and work as employees or are self-employed. Since we use data variation beyond the variation within the West German age-occupation-time cell gjt for measuring the pool of potential migrants p^E_{gjt}, we only eliminate the observations with missing training occupations.

Considering East Germans in self-employment, in addition to employees, we acknowledge that these members of the labor force may try to get hired as employees. In the sample of the 20,266 Germans in West Germany, the self-employment share is 9.85 percent among the native West Germans and 7.76 percent among the 715 East Germans. Using the sample of 9,808 East Germans in Germany, the share is 7.37 percent among the 8,864 individuals in the East and 7.04 percent among the 944 individuals in the West.

Note that the main findings remain robust if we abstain from counting self-employed individuals as migrants, or as potential migrants (see appendix C.2 and panel B in appendix table C.2).

Extended measures of migration and potential migration:

1) Extending by individuals with high, medium, or low education:

In section IV.C of the paper, we explore whether the main finding of heterogeneity in native West Germans' wage responses to the influx of East German migrants holds up if we deviate from the concept of the main migration measures by taking into account that individuals with high, medium, or low education may play a role as migrants, or potential migrants, and not only those with a medium level of education.

For that purpose, we generate a first set of extended measures of migration and potential migration, $mr^{E,\,HML}_{gjt}$ and $p^{E,\,HML}_{gjt}$. To calculate the denominator of $mr^{E,\,HML}_{gjt}$, we use data

on the 25,347 survey respondents who are Germans in the West (youth in East or West Germany, residency in West Germany, German citizenship), have high, medium, or low education, and fulfill all the other exclusion restrictions that are relevant to the respective main measure. Among these Germans in the West, 875 individuals grew up in East Germany (former GDR) and are relevant for the numerator, $m_{gjt}^{E,\,HML}$.

The relevant data for the expanded pool of potential migrants, $p_{gjt}^{E,\,HML}$, consists of all 11,934 respondents to the survey in 1991–92 or 1998–99 who are East Germans in Germany (youth in East Germany, residency in East or West Germany, German citizenship), have high or medium education, and fulfill all the other exclusion restrictions that are relevant to the respective main measure. Note that individuals with low education are not considered here because the measures of potential migration require data on training occupations. Information on training is by definition missing in the case of individuals with low education. Our reasoning regarding the validity of the instrumental variable remains, however, unaffected (see section III.A).

2) Extending by individuals who are unemployed or in training programs for the unemployed:

In appendix C.2, we acknowledge that East Germans who are unemployed or in training programs for the unemployed may also try to get hired in the West German labor market, not only employees or those in self-employment.

For the relevant measures of migration and potential migration, $mr_{gjt}^{E,\,UT}$ and $p_{gjt}^{E,\,UT}$, we expand the data relevant to the main measures by adding data on Germans who are unemployed or participate in training programs for the unemployed.[B.3] Individuals who are unemployed or in training programs for the unemployed are only surveyed in 1991–92 and only if they indicate residency in East Germany.[B.4] Among the 11,275 survey respondents that we consider when calculating the pool of potential migrants $p_{gjt}^{E,\,UT}$, 6,414 respond to

[B.3] A potential current occupation and the first completed training occupation are recorded for these individuals (see the fourth paragraph in Appendix B).

[B.4] This restriction is unlikely to have a strong impact on the extended pool of potential migrants $p_{gjt}^{E,\,UT}$ in 1991–92 as 91.61 percent of the East Germans that are relevant for calculating that measure reside in East Germany. The share of East German migrants $mr_{gjt}^{E,\,UT}$ differs slightly from mr_{gjt}^{E} because there is no reason to exclude individuals who do not specify the type of their labor when adding data on individuals who are unemployed or in training programs for the unemployed.

survey wave 1991–92 and reside in East Germany.

The share of unemployed individuals is 12.51 percent among these 6,414 employees, self-employed individuals, unemployed individuals, and individuals who take part in training programs for the unemployed. Participants in training programs for the unemployed represent an additional 3.78 percent. Data on this type of "hidden unemployment" is highly relevant in the case of East Germany and often not well measured.

Note as well that the stated share of unemployed individuals, 12.51 percent, gets close to the unemployment rates reported for East Germans with medium education in figure 2 of Reinberg and Hummel (2002). Using data on September 1991 and September 1992, they report unemployment rates of about 11.5 and 13.1 percent, respectively. Our figure is also in the range of the 10.3 and 14.8 percent that Burda and Hunt (2001) report in their table 1 for the unemployment rate in the years of 1991 and 1992.

Industry and size of employers:

In the survey data, the following seven classes of an *employers' industry affiliation* can be distinguished: agriculture, including hunting, forestry, and fishing; mining and quarrying; manufacturing; energy, including electricity, gas, and water supply; construction; retail, wholesale, import, export and other trade; services.[B.5] The underlying wave-specific survey data provides more details, in some parts relating to the 2-digit level of the NACE classification of economic activities in the European Union (version 1993, revision 1), and in other parts to the 1-digit level.

The survey data on the *employers' size* provides seven establishment size intervals, measured in the number of employees: 1–4, 5–9, 10–49, 50–99, 100–499, 500–999, and more than 999.

Identifying labor market segments:

We introduced three labor market segments reflecting different product and labor market conditions (see, in particular, section IV.A). The relevant product and labor market regulations coexist in segment B, and employees in this segment are indicated by B_{igjqt}. Employees in the competitive segment C where neither type of regulation matters are indicated by C_{igjqt}, and those in the intermediate segment I with either of the regulations

[B.5] All these industry sectors are part of the main sample, apart from the energy sector.

but not both are indicated by I_{igjqt}. The variable S represents the segment indicators, $S \in \Omega_3 = \{C_{igjqt}, I_{igjqt}, B_{igjqt}\}$, and T represents the indicators for the worker groups, $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$.

To separate these segments, we identify the *product markets in which the entry of firms is subject to the rules of the German Trade and Crafts Code*. We build directly on the Code enumerating the regulated occupations and consider all the occupational titles to which at least one state-accredited training degree (*Staatlich anerkannter Ausbildungsberuf nach §25 (1) BBiG bzw. §25 (1) HwO*) is assigned (BIBB, 1991, 1998). The Trade and Crafts Code regulates the entry of firms into certain product markets that relate to some of these occupations with state-accredited training degrees but not to others.

Most titles of the Code-regulated occupations can be identified based on the available survey data at the level of 334 three-digit occupational titles (BA, 2009). The three-digit occupational titles that may aggregate employees in both product markets subject to the code's rules and in product markets not subject to the rules can usually be classified after an inspection of the distribution of employees across the 1,991 four-digit occupational titles available for the survey waves of 1991–92 and 1998–99. A few remaining titles, like technician n.e.c., assisting workers n.e.c., or mathematicians, are too unspecific to indicate a product market; these are classified as miscellaneous and are excluded from the main sample.

Finally, we define 21 regulated product markets, aggregating related occupational titles under the code's rules, and set the occupation-based indicator of the product market regulation equal to 1. In the case of titles not subject to the code's rules, we aggregate into 25 product markets and set the indicator equal to 0. In appendix C.3, we add an industry-level measure which takes into account the industry affiliations of employers, entrepreneurs' occupations, and the industry affiliations of their ventures.

We also single out the part of the labor market where works councils provide incumbent workers with a strong influence on the decision making of firms. To do so, we encode a dummy variable indicating a *strong influence on firms' decision making through works councils* with a value of 1 for employees in establishments with 50 or more workers, and 0 otherwise. Using this variable, we build on an empirical regularity that has repeatedly been reported for different time periods and data sources. Addison et al. (1997), for example, use

data on 1,025 West German establishments in the year 1994 and the descriptive statistics in their table 1 imply that about 93 percent of the employees in establishments with 50 or more employees were represented by works councils, while the figure was only 18 percent of the employees in those with less than 50 employees.[B.6] In appendix C.3, we provide estimation results for a size-related variant of the main model specification.

Further work-related variables:

In section IV.C of the paper, we distinguish between employees in and out of long-term employment, using data on *job tenure* and *occupational change*. Employees in long-term employment have kept their jobs and occupations for at least 10 years and, thereby, did not change these in response to German reunification.

The variable *job tenure* indicates job tenure in years at the end of the survey's data collection periods in 1986, 1992, or 1999. In the case of employees, the underlying survey responses are those to the following survey questions: In which year did you start working for your current employer?; How many years have you been working for your current employer?

Occupational change can be measured using the following survey questions: Since you finished school or your vocational training, have the tasks that you perform on the job changed to an extent that would lead you to speak of an occupational change?; If you experienced such an occupational change, in what year did this happen for the last time?

Wage data:

The dependent variable in all model specifications is the logarithm of the real hourly wage for native West German employees in the West German labor market, measured in euros (€) at prices in the year 1992. To calculate the hourly wage, we first classify the survey data on the monthly gross earnings of employees into 14 rank-ordered intervals. These intervals are harmonized across the three survey waves because we pool the cross-sectional survey data for estimation purposes. Then, we divide the midpoint of each employee's monthly earnings interval by the employee's usual hours of work per month. In assigning interval midpoints

[B.6] In establishments with 250 to 499 employees, for example, about 98 percent of the employees were represented by works councils; in establishments with 20 to 29 employees, about 23 percent.

to approximate a continuous wage variable, we follow, among others, DiNardo and Pischke (1997). Hourly wages are deflated to year 1992 prices using a consumer price index.

The wage distributions that we refer to in section II.B of the paper are illustrated in appendix table B.2. The additional descriptive statistics in appendix table B.4 indicate how the means, and the standard deviations, of the real hourly wages of West and East Germans vary across the survey waves and across the four different employee groups in the West German labor market C, $I.1$, $I.2$, and B.

Main estimation sample:

The main estimation sample of native workers in the West German labor market consists of 18,482 employees who grew up in West Germany, reside there at the time of the survey in 1985–86, 1991–92, or 1998–99, and have German citizenship. We consider those employees who are aged 25 to 54 years, have a medium level of education, work between 10 and 75 hours per week, and report all the relevant information. Of these employees, about 78 percent work in 179 three-digit occupational titles to which at least one state-accredited training degree (*Staatlich anerkannter Ausbildungsberuf nach §25 Abs. 1 BBiG bzw. §25 Abs, 1 HwO*) is assigned (BIBB, 1991, 1998). We restrict the main sample accordingly because the German Trade and Crafts Code regulates the entry of firms in certain product markets that relate to some of these occupations with state-accredited training degrees but not in others.

Industries and occupations in the public sector are excluded, as well as those that are dominated by non-profit organizations like, for examples, churches. We classify occupational titles which are too unspecific to indicate a product market as miscellaneous and eliminate them from the sample. Finally, we drop tiny age-occupation-time cells with fewer than three observations, and we drop singletons at the level of age-occupation cells, age-time cells, or occupation-time cells.

The definitions of the main variables and basic descriptive statistics for the main sample with 18,482 observations are provided in table B.5.

Table B.1: Distribution of the share of East German migrants in West Germany

	(1)	(2)	(3)
	Survey waves		
	1985–86	1991–92	1998–99
	mr^E_{gjt} (share of East German migrants)		
	mean [median] (10^{th} percentile; 90^{th} percentile)		
West German labor market	0 [0] (0; 0)	0.0283 [0.0155] (0; 0.0740)	0.0428 [0.0350] (0; 0.0849)
Segments of the West German labor market:			
C_{igjqt} (competitive segment)	0 [0] (0; 0)	0.0256 [0.0149] (0; 0.0555)	0.0446 [0.0393] (0; 0.0810)
I_{igjqt} (intermediate segment)	0 [0] (0; 0)	0.0270 [0.0149] (0; 0.0730)	0.0417 [0.0310] (0; 0.0914)
B_{igjqt} (segment with both regulations)	0 [0] (0; 0)	0.0370 [0.0238] (0; 0.0908)	0.0420 [0.0468] (0; 0.0779)

Notes: In this table, we describe the distribution of the share of East German migrants per age-occupation-time cell gjt in the West German labor market, mr^E_{gjt}, using the main sample of 18,482 employees (see section II.B and appendix B). We display means, medians [in brackets], 10^{th} and 90^{th} percentiles (in parentheses) per survey wave in the entire West German labor market, and in each of the three labor market segments in $\Omega_3 = \{C_{igjqt}, I_{igjqt}, B_{igjqt}\}$.

Table B.2: Distribution of native West Germans' real hourly wage in West Germany

	(1)	(2)	(3)
	Survey waves		
	1985–86	1991–92	1998–99
	w^W_{igjqt} (real hourly wage of native West Germans, in €)		
	mean [median] (10^{th} percentile; 90^{th} percentile)		
West German labor market	8.9664 [8.4839] (5.6560; 12.7293)	9.8730 [9.5846] (5.8794; 13.9620)	10.6885 [9.9779] (6.2270; 14.9176)
Segments of the West German labor market:			
C_{igjqt} (competitive segment)	8.2136 [7.6369] (4.5238; 11.5721)	8.8924 [8.2287] (5.2228; 13.2256)	9.6970 [8.8206] (5.6208; 13.9696)
I_{igjqt} (intermediate segment)	9.2745 [9.1067] (5.9394; 12.8238)	10.1877 [9.9246] (6.6128; 14.3200)	10.9774 [10.3770] (6.9146; 15.3669)
B_{igjqt} (segment with both regulations)	9.5865 [9.3344] (6.1095; 12.8238)	10.7148 [10.3270] (7.0537; 14.5060)	12.2761 [11.9197] (8.6475; 15.9121)

Notes: In this table, we describe the distribution of the real hourly wage of native West Germans in the West German labor market, measured in euros at year 1992 prices, w^W_{igjqt}. The calculations are based on the main sample of 18,482 employees (see section II.B and appendix B). We display means, medians [in brackets], 10^{th} and 90^{th} percentiles (in parentheses) per survey wave in the entire West German labor market, and in each of the three labor market segments in $\Omega_3 = \{C_{igjqt}, I_{igjqt}, B_{igjqt}\}$.

Table B.3: Distribution of native West Germans' age in West Germany

	(1)	(2)	(3)
	Survey waves		
	1985–86	1991–92	1998–99
	age_{igjqt} (age of native West Germans, in years)		
	mean [median] (10^{th} percentile; 90^{th} percentile)		
West German labor market	38 [37] (26; 50)	37 [36] (26; 51)	38 [37] (28; 50)
Segments of the West German labor market:			
C_{igjqt} (competitive segment)	37 [36] (26; 49)	37 [36] (26; 50)	38 [38] (28; 50)
I_{igjqt} (intermediate segment)	38 [38] (26; 50)	37 [36] (26; 51)	37 [36] (27; 49)
B_{igjqt} (segment with both regulations)	39 [39] (27; 51)	38 [37] (26; 51)	38 [38] (28; 50)

Notes: In this table, we describe the distribution of the age of native West Germans in the West German labor market, measured in years, age_{igjqt}. The calculations are based on the main sample of 18,482 employees (see section II.B and appendix B). We display means, medians [in brackets], 10^{th} and 90^{th} percentiles (in parentheses) per survey wave in the entire West German labor market, and in each of the three labor market segments in $\Omega_3 = \{C_{igjqt}, I_{igjqt}, B_{igjqt}\}$.

Table B.4: Real hourly wages of Germans in the West German labor market

		(1)	(2)	(3)	(4)	(5)
		Survey waves				
		1985–86	1991–92	1998–99	1991–92	1998–99
		native West Germans			East Germans	
		w_{igjqt} (real hourly wage in €)				
	Employees in product markets... ...*not* under code's rules regulating the entry of firms and in establishments...					
C_{igjqt}	...with weak worker influence (< 50 employees)	8.21 (3.73)	8.89 (4.19)	9.70 (5.52)	8.48 (3.72)	7.95 (2.77)
$I.1_{igjqt}$	...with strong worker influence (≥ 50 employees)	9.71 (4.07)	10.84 (3.71)	11.88 (5.23)	10.27 (3.63)	11.09 (4.54)
	Employees in product markets... ...under code's rules regulating the entry of firms and in establishments...					
$I.2_{igjqt}$	...with weak worker influence (< 50 employees)	8.65 (2.87)	9.38 (2.72)	9.93 (3.52)	9.41 (2.97)	9.46 (3.39)
B_{igjqt}	...with strong worker influence (≥ 50 employees)	9.59 (2.87)	10.71 (2.84)	12.28 (3.56)	9.71 (2.65)	10.73 (3.50)

Notes: In this table, we report means of the real hourly wages of the West and East Germans in the West German labor market, measured in euros at year 1992 prices, w_{igjqt}. The calculations are based on the sample of 18,939 employees that results when applying all the exclusion restrictions that are relevant to the main sample, except for the one that. eliminates East Germans residing in West Germany (see section II.B and appendix B). We provide means per survey wave, along with standard deviations in parentheses, for the four labor market groups in $\Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$.

Table B.5: Definitions of main variables and descriptive statistics

Variable	Definition	Mean/ share	Standard deviation
w^W_{igjqt}	real hourly wage of employee i in age-occupation-time cell gjt and industry q in the West German labor market, measured in € at prices in the year 1992	9.90	4.14
mr^E_{gjt}	share of migrants, i.e., East Germans in age-occupation-time cell gjt in the West	0.02	0.03
m^E_{gjt}	number of migrants, i.e., East Germans in age-occupation-time cell gjt in the West	1.89	3.11
p^E_{gjt}	pool of potential migrants, i.e., East Germans in the East or West who hold a training degree relevant to occupation j and may enter age-occupation-time cell gjt in the West	23.60	26.27
regulation of the entry of firms_j	1: entry of firms regulated by German Trade and Crafts Code in occupation j, 0: otherwise	0.39	
worker influence_{igjqt}	1: strong worker influence on firms' decisions, i.e., worker in establishment with ≥ 50 employees, 0: weak worker influence (< 50 employees)	0.44	
establishment size_{igjqt}	size of the employing establishment in intervals (1:1–4 employees, 2:5–9, 3:10–49, 4:50–99, 5:100–499, 6:500–999, 7:more than 999)	3.70	1.78
age_{igjqt}	age of employee i in years at the end of the survey's data collection periods	37.37	8.34
gender_{igjqt}	1: male, 0: female	0.63	

Notes: This table provides non-weighted descriptive statistics for the main sample of 18,482 observations on employees in the West German labor market who grew up in the region of West Germany, reside there at the time of the survey in 1985–86, 1991–92 or 1998–99, and have German citizenship. The selected employees are aged 25 to 54 years, have medium education, work between 10 and 75 hours per week in occupations with state-accredited training degrees, and report all the relevant information. We exclude industries and occupations in the public sector, miscellaneous occupational classes, age-occupation-time cells with less than three observations, and singletons at the level of age-occupation cells, age-time cells or occupation-time cells (see also appendix B).

C Additional analyses

C.1 Relating potential migration to migration

Extending section III.B of the paper, we here provide additional evidence on the relation between the pool of East Germans who qualify as potential migrants and the influx of East Germans into the West German labor market.[C.1]

We first reestimate the first-stage equation of column 3 in panel B of table 1, sticking to the same migration measures but estimating on data at the aggregate age-occupation-time level. We restrict the data to the 769 West German age-occupation-time cells in the main sample and specify: $mr^E_{gjt} = \delta p^E_{gjt} + \phi_{gj} + \varphi_{gt} + \chi_{jt} + \upsilon_{gjt}$. The estimate of the coefficient δ that we report in column 1 of appendix table C.1 is positive. Its size of 0.0012 in table C.1 implies that an increase by one standard deviation of the number of potential migrants from East Germany, p^E_{gjt}, increases the share of East Germans per West German age-occupation-time cell, mr^E_{gjt}, by 0.0323 in absolute terms and by 0.9258 relative to the share's standard deviation.[C.2] These results compare very well to the absolute and relative effect sizes based on the estimate in panel B of table 1, that is, 0.0311 and 0.9054.[C.3] Accordingly, estimating on individual data, and imposing additional employee- and employer-specific exclusion restrictions on the main sample, have a negligible influence on the first-stage estimation results.

The fixed effects estimation (FE) in column 1 of table C.1 can be compared to the estimation of the corresponding model in first differences (FD) for which we specify: $mr^E_{gjt} - mr^E_{gj,t-1} = \delta(p^E_{gjt} - p^E_{gj,t-1}) + \varphi'_{gt} + \chi'_{jt} + \upsilon'_{gjt}$. The FD estimate of the coefficient δ is 0.0011 in column 2. This FD estimate is very similar to the FE estimate of 0.0012, also in the absolute and relative terms considered so far (0.0296, 0.8486). Given the similarity, this comparison does not speak against treating the main measure of potential migration as a strictly exogenous explanatory variable in first-stage equations and this is in line with our argumentation (Wooldridge, 2010).

[C.1] We would like to thank our anonymous referees for related suggestions.

[C.2] The relevant standard deviation of p^E_{gjt} is 26.9252 and the one of mr^E_{gjt} is 0.0349. When calculating these descriptive statistics, the observations at the aggregate level are weighted by the total number of Germans per West German age-occupation-time cell.

[C.3] The standard deviation of p^E_{gjt} is 25.8790 in the main sample and the standard deviation of mr^E_{gjt} is 0.0343, considering the relevant survey weights. The non-weighted descriptive statistics in table B.5 are not relevant here.

In column 3 we vary the dependent variable, now using the measure of the absolute number of East German migrants per West German age-occupation-time cell, m^E_{gjt}, instead of the share measure, mr^E_{gjt}. The coefficient estimate is positive and its size of 0.1524 in column 3 implies that an increase by one standard deviation of p^E_{gjt} increases m^E_{gjt} by 4.1007 in absolute terms and by 1.3063 relative to m^E_{gjt}'s standard deviation which takes a value of 3.1391. While the effect size is, as expected, higher in absolute terms than in the case of the model specification in column 1, it is in relative terms in a similar range.[C.4]

In column 4, we search for possible indirect effects by considering an occupation-level measure of the pool of potential migrants, p^E_{jt}, in addition to the age-occupation-level measure, p^E_{gjt}. We use the same data as for the estimation results in columns 1 or 3 and specify: $m^E_{gjt} = \zeta p^E_{gjt} + \xi p^E_{jt} + \pi_g + \lambda_j + \mu_t + \iota_{gjt}$. The estimate of the main coefficient, the one on p^E_{gjt}, turns out to be similar to the one in column 3. This finding is in line with the main empirical approach where we treat individuals in different age groups within an occupation as imperfect substitutes.

[C.4] When we reestimate the first-stage equation in panel B of table 1 on the main sample with m^E_{gjt} as the migration measure, the first-stage effect sizes are in absolute and relative terms similar to those based on the estimates in column 3 of table C.1. The relative effect size is also in a similar range as the one based on the estimates in panel B of table 1 or column 1 of table C.1.

C.2 Measuring migration and potential migration

Expanding the sections IV.B and IV.C, we investigate here whether the main finding of heterogeneity in the impact of changes in the share of immigrants per age-occupation cell across time on the respective native wage changes is sensitive to modifying the main measures of migration and potential migration in five respects.

First, we simplify the procedure for constructing the pool of potential migrants from East Germany to a West German age-occupation-time cell gjt while considering again the data on the 9,808 East Germans that we used already for calculating the main measure of potential migration, p^E_{gjt} (see appendix B). Specifically, we abstain from distinguishing between different levels of the relevance of individuals' human capital for working in occupation j:

$$p^{E,\ basic}_{gjt} = \begin{cases} 0 & \text{if } t = 1985\text{–}86 \\ \sum_{z=1}^{Z} I_{\omega_{zj}>0}(z) D_{zgt} & \text{if } t = 1991\text{–}92 \text{ or } 1998\text{–}99 \end{cases},$$

where the indicator $I_{\omega_{zj}>0}(z)$ is equal to 1 for all observations z where the human capital–related weight ω_{zj} takes a positive value and 0 otherwise and where D_{zgt} is defined as in section III.A.

The four related interactions, $p^{E,\ basic}_{gjt} T$ with $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$, serve as excluded instruments. We report the second-stage IV estimates of the coefficients on the interactions between the migration share and the indicators of the three labor market segments, $C_{igjqt} mr^E_{jgt}$, $I_{igjqt} mr^E_{jgt}$, and $B_{igjqt} mr^E_{jgt}$, in panel I.A of appendix table C.2. These IV estimates turn out to be in line with those in column 3 of table 2.

Second, we neglect self-employed individuals but proceed, apart from that, as in the case of the main measures of migration and potential migration.[C.5] Relying on the measures resulting from the narrower bases, $mr^{E,\ no\ S}_{gjt}$ and $p^{E,\ no\ S}_{gjt}$, we find OLS and IV results that indicate a similar effect heterogeneity as in columns 1 and 3 of table 2 (see panel I.B of table C.2).

[C.5] Neglecting self-employed individuals, reduces the number of Germans in West Germany who are relevant to calculating a migration measure from 20,266 to 18,521 and the number of East Germans in Germany relevant to a measure of potential migration from 9,808 to 9,082.

Third, we expand the data that we use for calculating the pool of potential migrants by adding data on East Germans who are unemployed or in training programs for the unemployed. Since such data is not available for the survey wave of 1998–99 (see appendix B), we reestimate the main model specification on the smaller subsample of 12,510 employees from the main sample who responded to the survey in 1985–86 or 1991–92. The OLS and IV estimation results reported in panel I.C of table C.2 show a similar pattern as the main results in table 2.

Fourth, we modify the main empirical model by replacing the main explanatory variable, mr^E_{gjt}, by the number of migrants m^E_{gjt}. The OLS and IV results in panel II.A of table C.3 indicate that the main heterogeneity in natives' wage responses to the influx of migrants in table 2 is robust with respect to this change.

Finally, we change the empirical model by using the logarithm of the main measure of potential migration to construct the four excluded instruments: $ln(p^E_{jgt} + 1)T$ with $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$. The resulting IV estimates in panel II.B of table C.3 correspond very closely to those reported in columns 2 and 3 of table 2.

C.3 Segmenting the West German labor market

Identifying the labor market institution

When studying effect heterogeneity across labor market segments, we single out the part of the labor market where works councils provide incumbent workers with a strong influence on the decision making of firms, exploiting how the share of employees represented through works councils varies across employer size classes.[C.6] This approach may raise the concern that the main findings on effect heterogeneity, reported in section IV.B, could reflect a general employer size-depending response of native West Germans' wages to the influx of East Germans rather than a mechanism related to product and labor market conditions.[C.7]

In this respect it is useful to consider statistical tests related to column 5 of table 2. Only the IV estimate on $C_{igjqt}mr^{E}_{gjt}$, indicating the impact of the East German influx on the wages of native West Germans employed by small employers in product markets not subject to the German Trade and Crafts Code, differs significantly from the estimates specific to the other labor market groups.[C.8] The estimate on $I.2_{igjqt}mr^{E}_{gjt}$ does not differ at standard significance levels from the ones on $I.1_{igjqt}mr^{E}_{gjt}$ or $B_{igjqt}mr^{E}_{gjt}$ despite the fact that the labor market group $I.2$ covers only workers of small employers. These are, however, the small employers in the other product markets where the code's rules restrict the entry of firms. The observed pattern is not in line with an employer size-depending response of natives' wages to immigration which could be classified as general in nature or independent of product and labor market conditions.

Next, we substantially narrow down the employer size variation in the data to find out whether the main effect heterogeneity that we report in section IV.B depends on considering workers in very small or in large establishments. We keep only workers in medium-sized establishments with 10 to 499 employees, and thereby establishments around the cut-off point of 50 employees. Re-estimating on this much smaller subsample of 10,526 employees,

[C.6] See section II.B, appendix A.2.2, and appendix B.

[C.7] Recall that we use a large set of employer size fixed effects that captures nonlinear employer size–related wage differences across segments and further wage changes within segments in all main models (see section IV.A).

[C.8] The relevant F-statistics are: 5.02 ($H_0 : \beta^C = \beta^B$); 2.93 ($H_0 : \beta^C = \beta^{I.2}$); 3.64 ($H_0 : \beta^C = \beta^{I.1}$)).

the results in panel A of table C.4 confirm the previously reported heterogeneity in the response of native West Germans' wages to the influx of East Germans.

These results reduce, in addition, the concern that the reported heterogeneity could be driven by employment protection legislation because workers in establishments with less than 10 employees are excluded from the subsample. German employment protection rules make it costlier for firms to dismiss workers by requiring severance payments and advanced notice periods. These rules apply to all firms, except for small firms with less than five employees, or less than 10 in other years of the observation period (see, for example, Bauer, Bender, & Bonin, 2007). Eliminating the workers in large establishments addresses, in addition, the issue that some of these are likely to be active in many product markets, and that these markets may partly be subject to the code's rules and partly not.

Taken together, the extensions reported here do not contradict the view that the reported variation in the wage responses of native West Germans to the influx of East Germans depends on product and labor market regulations.

Identifying product market types

To identify the product markets in which the entry of firms is subject to the rules of the German Trade and Crafts Code, we rely, so far, on a measure which is directly based on the relevant law and comprehensive occupational information (see appendix B). An employee's occupation, however, does not necessarily indicate the product market focus of the establishment in which he or she works.[C.9] To address this concern, we impose a stricter separation between product market types, adding an industry-level measure of the product market regulation.

For constructing the industry-level measure, we exploit the fact that the survey data covers self-employed individuals and provides information on the industries in which they are active with their ventures, as well as on the entrepreneurs' occupational activities. Using the survey data on all 8,540 Germans in self-employment with non-missing industry data on their ventures,[C.10] we first calculate the share of entrepreneurs who indicated that their

[C.9] Employees in an occupation not subject to the code's rules may work for a firm that is primarily active in a regulated product market (i.e., a beautician may work at a hairdresser's), and vice versa.

[C.10] We distinguish between 38 industries, harmonizing the data across the survey waves.

entrepreneurial activity was in an occupation subject to the code's rules. Then, we set the industry-level measure of the product market regulation equal to 1 in the industries at or above the median of the distribution of that industry-specific share, and 0 otherwise. We merge the industry-level measure to the main sample of employees using the information that these employees provide on their employers' industry codes.

Finally, we combine the industry- and the occupation-level measures of the product market regulation to restrict the main sample to the subsample of 14,017 employees who are in one of the following groups: 1) employees working in a regulated industry and a regulated occupation; 2) employees in an unregulated industry and an unregulated occupation. Applying the stricter separation between the two product market types of interest, the coefficient estimates in panel B of table C.4 show that the main effect heterogeneity in table 2 remains robust.

Table C.1: German-German migration and potential migration

	(1)	(2)	(3)	(4)
	Dependent variables:			
	mr^E_{gjt}	$mr^E_{gjt} - mr^E_{gj,t-1}$	m^E_{gjt}	m^E_{gjt}
Explanatory variables:				
p^E_{gjt} (main measure of the pool of potential East German migrants)	**0.0012** (0.0003)		**0.1524** (0.0402)	**0.1399** (0.0278)
$p^E_{gjt} - p^E_{gj,t-1}$ (1^{st} difference in the main pool of potential migrants)		**0.0011** (0.0003)		
p^E_{jt} (pool of potential migrants at the occupation-time level)				**–0.0089** (0.0057)

Notes: In column 1 of this table, we show OLS estimates of a model explaining the share of East German migrants in the West German labor market, mr^E_{jgt}. We estimate on data at the aggregate level, considering the 769 West German age-occupation-time cells in the main sample. In column 2, we report the corresponding model in first differences, estimating on first differences for 498 age-occupation-time cells. In columns 3 and 4, the dependent variable is the number of East German migrants, m^E_{jgt}, and we use again the data at the level of the 769 age-occupation-time cells.
The explanatory variable p^E_{jgt} is the main measure of the pool of East Germans who may potentially migrate to cell gjt. In columns 1 and 3, we control for fixed effects at the age-occupation, age-time and occupation-time level, in column 2, for fixed effects at the age-time and occupation-time level, and in column 4 for fixed effects at the age, occupation and time level.
As in table 1, bold numbers are coefficients. Standard errors in parentheses are clustered at the level of 268 age-occupation cells in columns 1 and 3, at the level of 265 age-occupation cells in column 2, and at the level of 46 occupation cells in column 4. Observations are weighted by the total number of Germans in the respective West German age-occupation-time cell, summing up the East German migrants, m^E_{gjt}, and the West German natives, n^W_{gjt}.

Table C.2: Extensions with alternative measures of (potential) migration: Part I

Dependent variable: log w^W_{igjqt} (log real hourly wage of West Germans)					
		Main explanatory variables:			F-statistics
		$M \times C_{igjqt}$	$M \times I_{igjqt}$	$M \times B_{igjqt}$	$(H_0 : \beta^C = \beta^B)$
Panel I.A: Pool measure with restricted human capital–related weights ($P = p^{E,\ basic}_{gjt}$)					
(1)	IV	**–1.9611**	**–0.5740**	**–0.0434**	5.45
		(1.1006)	(1.1070)	(1.0037)	
Panel I.B: Migration rate excluding self-employed individuals ($M = mr^{E,\ no\ S}_{gjt}$)					
(2)	OLS	**–0.6383**	**–0.0002**	**0.4244**	15.69
		(0.2038)	(0.1260)	(0.1802)	
(3)	IV	**–1.4885**	**0.0727**	**0.6217**	7.29
		(0.6339)	(0.5782)	(0.5895)	
Panel I.C: Migration rate incl. East Germans who are unemployed, in training programs, self-employed or employees ($M = mr^{E,\ UT}_{gjt}$)					
(4)	OLS	**–0.6628**	**–0.0311**	**0.2685**	4.13
		(0.4164)	(0.2397)	(0.2832)	
(5)	IV	**–2.4132**	**–0.2488**	**0.4253**	9.29
		(1.1318)	(1.0680)	(0.9828)	

Notes: In this table, we show additional OLS and second-stage IV estimates using equation (3). As in columns 1 and 3 of table 2, the explanatory variables cover a migration measure, the employee characteristics (gender, age, age^2), and seven employer size intervals. Each of these enters interacted with each of the three indicators for the competitive segment of the West German labor market, C_{igjqt}, the intermediate one, I_{igjqt}, and the one with both regulations, B_{igjqt}. We also include the full sets of fixed effects (ϱ_{gj}, ς_{gt}, τ_{jt}, κ_{qt}).

In rows 1, 3, and 5, we use four excluded instruments PT where $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$ and where P represents a measure of the pool of East Germans who may potentially migrate to the West German age-occupation-time cell gjt. In panel I.A, we stick to the main share of East German migrants in West Germany, $M = mr^E_{gjt}$, but simplify the calculation of the pool of potential migrants: we abstain from distinguishing between different levels of the relevance of individuals' human capital by restricting the human capital–related weights, $P = p^{E,\ basic}_{gjt}$. In panel I.B, we use $M = mr^{E,\ no\ S}_{gjt}$ and $P = p^{E,\ no\ S}_{gjt}$ for which we do not consider self-employed individuals. The measures relevant to panel I.C are extended by considering East Germans who are unemployed or in training programs for the unemployed ($M = mr^{E,\ UT}_{gjt}$, $P = p^{E,\ UT}_{gjt}$). See also appendix C.2.

While we use the main sample of 18,482 employees in panels I.A and I.B, we estimate on the subsample of the 12,510 employees in the survey waves 1985–86 and 1991–92 in panel I.C. As in table 1, bold numbers are coefficients, standard errors in parentheses are clustered at the level of 268 age-occupation cells, and observations are weighted.

Table C.3: Extensions with alternative measures of (potential) migration: Part II

Dependent variable: log w^W_{igjqt} (log real hourly wage of native West Germans)		Main explanatory variables: $M \times C_{igjqt}$	$M \times I_{igjqt}$	$M \times B_{igjqt}$	F-statistics ($H_0 : \beta^C = \beta^B$)
Panel II.A: Numbers of migrants as endogenous explanatory variable ($M = m^E_{gjt}$)					
(1)	OLS	**–0.0092**	**–0.0036**	**0.0075**	14.92
		(0.0020)	(0.0025)	(0.0039)	
(2)	IV	**–0.0104**	**–0.0028**	**0.0059**	6.52
		(0.0039)	(0.0050)	(0.0064)	
Panel II.B: Excluded instruments with logarithm of the main potential migration measure ($ln(p^E_{jgt} + 1)T$ where $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$)					
(3)	OLS	**–0.7550**	**–0.0382**	**0.4662**	19.00
		(0.2008)	(0.1298)	(0.1963)	
(4)	IV	**–1.7506**	**–0.4856**	**0.3288**	7.57
		(0.6638)	(0.6049)	(0.7057)	

Notes: In this table, we show additional OLS and second-stage IV estimates of equation (3) for the main sample of 18,482 employees. As in columns 1 and 3 of table 2, the explanatory variables cover a migration measure, the employee characteristics (gender, age, age^2), and seven employer size intervals. Each of these enters interacted with each of the three indicators for the competitive segment of the West German labor market, C_{igjqt}, the intermediate one, I_{igjqt}, and the one with both regulations, B_{igjqt}. We also include the full sets of fixed effects (ϱ_{gj}, ς_{gt}, τ_{jt}, κ_{qt}).
In rows 2 and 4, we consider four excluded instruments PT where $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$ and where P represents a measure of the pool of East Germans who may potentially migrate to the West German age-occupation-time cell gjt. In panel II.A, we use the main measures of the number of East German migrants and the pool of potential migrants ($M = m^E_{gjt}$, $P = p^E_{gjt}$). In panel II.B, we consider the main migration measure and the logarithm of the main potential migration measure ($M = mr^E_{gjt}$, $P = ln(p^E_{jgt} + 1)$). See also appendix C.2.
As in table 1, bold numbers are coefficients, standard errors in parentheses are clustered at the age-occupation level, and observations are weighted.

Table C.4: Segmenting the West German labor market

Dependent variable: log w^W_{igjqt} (log real hourly wage of native West Germans)		Main explanatory variables: $m^E_{gjt} \times C_{igjqt}$	$m^E_{gjt} \times I_{igjqt}$	$m^E_{gjt} \times B_{igjqt}$	F-statistics ($H_0 : \beta^C = \beta^B$)
Panel A: Employees of employers with 10–499 employees					
(1)	OLS	**–0.6437**	**–0.0153**	**0.6086**	14.92
		(0.2449)	(0.1691)	(0.2264)	
(2)	IV	**–1.0683**	**–0.1451**	**0.5488**	3.32
		(0.6127)	(0.6466)	(0.8066)	
Panel B: Refined set of product market types					
(3)	OLS	**–0.8609**	**–0.0704**	**0.3736**	13.50
		(0.2700)	(0.1657)	(0.2010)	
(4)	IV	**–1.6349**	**–0.2677**	**0.3695**	6.41
		(0.7394)	(0.6942)	(0.7075)	

Notes: In this table, we show additional OLS and second-stage IV estimates of equation (3). As in columns 1 and 3 of table 2, the explanatory variables cover the main measure of the share of East German migrants in the West German labor market (mr^E_{gjt}), the employee characteristics (gender, age, age^2), and seven employer size intervals. Each of these enters interacted with each of the three indicators for the competitive segment of the West German labor market, C_{igjqt}, the intermediate one, I_{igjqt} and the one with both regulations, B_{igjqt}. We also include the full sets of fixed effects (ϱ_{gj}, ς_{gt}, τ_{jt}, κ_{qt}). In panel A, we use the subsample of the 10,526 employees in the main sample who work in medium-sized establishments with 10 to 499 employees. In panel B, we estimate on the 14,017 employees in the refined set of product market types. For rows 2 and 4, we consider four excluded instruments, $p^E_{gjt}T$ where $T \in \Gamma_4 = \{C_{igjqt}, I.1_{igjqt}, I.2_{igjqt}, B_{igjqt}\}$ and where p^E_{gjt} is the main measure of the pool of East Germans who may potentially migrate to the West German age-occupation-time cell gjt. See also appendix C.3.
As in table 1, bold numbers are coefficients, standard errors in parentheses are clustered at the age-occupation level, and observations are weighted.

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