The Impact of Immigration on Natives' Wages: Heterogeneity resulting from Product and Labor Market Regulation

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Susanne Prantl* and Alexandra Spitz-Oener**

Abstract

Does regulation of product and labor markets alter the impact of immigration on wages of competing native workers? We take German reunification as a natural experiment and compare the wage consequences of East Germans migrating into different segments of the West German labor market: one segment without product and labor market regulation, to which standard immigration models best apply, one segment in which product and labor market regulation interact, and one segment covering intermediate groups of workers. We find a negative effect of the large influx of close substitutes in production on the wage growth of competing native West Germans in the segment with almost free firm entry into product markets and weak worker influence on the decision-making of firms. Competing native workers were shielded from such pressure if firm entry regulation interacted with labor market institutions, implying a strong influence of workers on the decision-making of profit-making firms.

Keywords: Immigration, Labor Market Regulation, Product Market Regulation

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*University of Cologne, Max Planck Institute for Research on Collective Goods, Bonn, and Institute for Fiscal Studies, London. E-mail: prantl@coll.mpg.de; Website: http://www.ieam.uni-koeln.de

**Humboldt-University Berlin, IAB, CASE and IZA. E-mail: alexandra.spitz-oener@wiwi.hu-berlin.de; Website: http://lvb.wiwi.hu-berlin.de/vwl/am.

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1 Introduction

How does immigration influence the wages of competing native workers? Empirical studies addressing this long-standing question have led to diverse results, inspiring the ongoing search for explanations of the mixed evidence. Our contribution to the recent discussion consists of comprehensive micro data evidence establishing the institutional setting in product and labor markets as an important source of systematic heterogeneity in the response of native wages to a large inflow of close substitutes in production. Our findings indicate that ignoring the institutional setting can obscure effects of immigration on natives' wages which could otherwise be observed.

We exploit the German reunification experiment that led to a substantial influx of Germans who had grown up in the former German Democratic Republic (hereafter referred to as East Germans) onto the labor market of the Federal Republic of Germany (West Germany) after the fall of the Berlin Wall in 1989. East Germans are closer substitutes in production for West Germans than immigrants typically are for native workers.[1] Accordingly, this internal migration wave is ideally suited to testing predictions following from standard immigration models in which immigrant and native labor are assumed to represent close substitutes in production.[2] In addition, the influx of East Germans into the West German labor market was substantial, as shown in figure 1. While less than 50,000 people per year came from East to West Germany before 1989, the figures increased to about 400,000 per year in 1989 and 1990. Thereafter, the net inflow to West Germany flattened out and dropped below 50,000 per year after 1993.[3]

Germany after reunification is also well-suited for our purposes due to its regulatory framework. We first isolated the segment of the West German labor market character-

[1] East Germans are, for example, Germans with full political and economic rights, that is, they have free access to the German labor market and there are no specific labor market provisions. They face no language difficulties and are comparably educated. See Section 3.1 for details.

[2] Further assumptions of the standard immigration models include: firms maximize profits and produce goods using immigrant labor, native labor and capital. The production function exhibits constant returns to scale and capital input is fixed. Product as well as labor markets are perfectly competitive (see, for example, Borjas, 1995, 1999).

[3] After 1990, immigration from the East to the West declined sharply and emigration from the West to the East increased. Between 1994 and 1999, the gross flows were relatively stable. Burda and Hunt, 2001, and Hunt, 2006, report on migration between East and West Germany between 1957 and 1999 and Fuchs-Schündeln and Schündeln, 2009, provide migration figures up to 2006.

ized by product markets with almost free firm entry and by weak labor market institutions. This segment fits with the standard immigration model with perfect competition in product and labor markets, leading to the prediction that immigrants who represent close substitutes in production exert a downward pressure on the wages of competing native workers. Next, we isolated the labor market segment in which the consequences of immigration on competing natives' wages are dependent on product market regulation substantially hampering firm entry and on labor market institutions giving workers a strong influence on the decision-making of firms. Product market regulation determines product market competition, and thereby firms' profits, while labor market regulation determines the worker influence, and thereby the distribution of profits between workers and firms. The interaction of these institutions can lead real wages to reflect only weakly the marginal product of labor[4] - a property that should matter for labor market outcomes when the marginal product of labor changes as a result of an economic shock.

In distinguishing the different labor market segments, we relied on two artifacts. One is the German Trade and Crafts Code (GTCC) – a product market regulation that substantially restricts firm entry in a clearly defined set of product markets, and not in others. It has its roots in the nineteenth century and the Middle Ages. The regulated product markets account for about 40 percent of employment in our population of interest. The other is the German Works Constitution Act – a labor market regulation setting the conditions under which work councils have to be established in establishments, these councils being the institutions that determine the influence of incumbent workers on the decision-making of firms. It goes back to the 1950s, and partly to the nineteenth century. Work councils cover more than 90 percent of employees in establishments with 50 or more employees, which represent about 45 percent of the employment in our population of interest.

For the classical labor market segment with almost free firm entry and weak worker influence, we find a negative effect of immigration of close substitutes in production on the wage growth of competing native workers. In contrast, natives turn out to be shielded from such pressure in the labor market segment where product and labor market regulation interact. The source of data variation used for identifying these effects is the differing

[4]See, among others, Blanchard and Giavazzi, 2003, Spector, 2004, and Ebell and Haefke, 2006.

inflow of East Germans across occupation-age cells in the West German labor market and across time after 1989. To account for potential endogeneity of immigration in equations explaining native wages, resulting from migrants' self-selection or endogenous employer decisions, we have made use of the experimental nature of German reunification. Specifically, we constructed instrumental variables from data on all East Germans, on those migrating to West Germany and on those staying in East Germany, in combination with comprehensive information on the occupations in which these East Germans received their vocational training degrees in East Germany before the fall of the Berlin Wall in 1989.[5]

The internal wave of East Germans migrating to West Germany after German reunification has already received attention in the literature. D'Amuri et al. (2010), for example, treat the influx of East Germans to the West German labor market from 1992 onwards as an exogenous source of instrumental variation when analyzing the impact of immigration in general on the labor market outcomes of locales in West Germany.[6] They find no adverse average effects of immigration on wages or employment of locales in West Germany. Frank (2009) investigates the impact of resident flows from East German counties to West German counties and finds neither effects on wages nor on medium-term employment of all residents in West Germany. In contrast to these studies, we can directly identify migrants from East to West Germany after reunification who grew up in East Germany before reunification, including the numerous movers in the early years 1989, 1990 and 1991 (see Figure 1), as well as the relevant West German natives. In addition, we recognize that the relevance of institutions in the West German labor market varies considerably across product markets and establishment groups.

In the immigration literature so far, few empirical studies have explicitly taken the institutional background into account against which immigration occurs.[7] This is surprising

[5]The analysis focuses on employees with a medium level of education for several reasons detailed in Sections 4.1 and 5.1. Employees with a medium level of education represent the large majority of all employees in West Germany as well as among East German migrants, that is about 72 and 73 percent respectively (see also Section 3.1).

[6]Using data from the German Institute for Employment Research (IAB), they identify East Germans as individuals with German nationality who worked in East Germany in 1992 or later and subsequently started to work in the West. West Germans are identified as those who have German nationality and work in West Germany in all considered years (1987 to 2001).

[7]In cross-country studies, labor market institutions are, however, often referred to as a residual culprit

given that there is a body of literature on the consequences of product market regulation for labor market outcomes and on its interactions with labor market regulation that goes back at least to Krueger and Pischke (1997) or Gersbach (2000). These authors stress the relevance of product market regulation for labor market developments. Blanchard and Giavazzi (2003) provide a well-known theoretical analysis in which interacting product market regulation and labor market regulation impact upon wages as well as unemployment.

To the best of our knowledge, the study by Angrist and Kugler (2003) is the only one that considers product market and labor market institutions when analyzing the impact of immigration on natives. Using country-level panel data for European countries during the 1980s and 90s, they implement an instrumental variable strategy to take into account the fact that immigration is endogenous in equations explaining the labor market outcomes of natives. They report a negative effect of the immigrant share in the labor force on native employment that is more pronounced in country-years with higher product and/or labor market regulation. As acknowledged by the authors, their empirical strategy does not allow for identifying whether the findings are a consequence of differential product market regulation, differential labor market regulation or differential interactions of these regulations across countries. Our research design moves ahead in this respect by singling out the labor market segment in which product and labor market regulations interact.

Our analysis can be integrated well into several strands of the recent immigration literature which are in search of explanations for why the observed consequences of immigration on natives' wages and employment can be heterogeneous. A series of papers emphasizes that a low degree of substitutability between immigrants and natives can be an important reason for weak or even no effects of immigration on the wages of native workers (see, for example, Borjas, 2003 or Ottaviano and Peri, 2010). Focusing on the large inflow of East Germans onto the West German labor market after reunification, with East Germans being far closer substitutes for West Germans than traditional immigrants, separates

if labor market outcomes react differently to immigration across countries. See, for example, Kahn, 2004, or Antecol et al., 2006. Empirical studies that investigate the dependence of labor market outcomes on interactions between product market regulation and labor market institutions, but that do not consider immigration or other labor supply shocks, are numerous. Examples include Nicoletti and Scarpetta, 2005, and Griffith et al., 2007.

our work from empirical investigations of immigration waves that bring in numerous immigrants who represent weak substitutes in production to native workers, such as the recent U.S. immigration experience.

Other studies suggest that producers adapt their production technologies in response to an influx of immigrants, which is in line with theories of endogenous technological change. Lewis (2004), for example, examines industries in Miami after the Mariel Boatlift experiment, first analyzed by Card (1990), who finds no detrimental effects of the large, sudden influx of Cuban immigrants to the Miami labor market. Lewis reports that the industries adjusted to the influx of the mainly unskilled Marielitos by using more unskilled-intensive production technologies.[8] In a similar vein, Lewis (2011a) documents how the elastic supply of automation machinery moderates the effects immigration has on the wages of natives. Peri and Sparber (2009) and D'Amuri and Peri (2010) analyze adjustments along the occupational margin and show that immigration can cause natives to specialize in different production tasks, thereby reducing downward wage pressure. We show below that one such adjustment process also took place after the influx of East Germans to the West German labor market, but we have not observed this varying across different regulatory labor market segments and, thus, we do not find any indication of an alternative explanation for the effect variation that we observe.

The paper is structured as follows: in the next section, we will discuss the wage adjustments that we expect after the influx of East Germans to the West German labor market in different regulatory settings. In Section 3, we characterize the wave of East Germans migrating to the West German labor market after the fall of the Berlin Wall and the collapse of the GDR. We also discuss the relevant product and labor market regulations. In Section 4 we introduce our empirical model, and in Section 5 we sketch the data. Section 6 provides the empirical results and we conclude in Section 7.

[8]Bodvarsson et al., 2008, also revisit the Mariel Boatlift experiment and investigate another specific adjustment process after the immigration wave. Their findings suggest that the potential negative effect of immigrants was dampened by the fact that immigrants consumed local goods and thereby increased labor demand in the sectors in which they predominantly found work.

2 Conceptual Framework

Germany after reunification provides a unique setting for investigating how immigration of close substitutes in production impacts the wages of competing native workers, depending on product and labor market regulation. In our analysis, we therefore distinguish between different labor market segments, with the following two being of primary interest:

- Employees in product markets with almost free firm entry and in establishments with weak worker influence on the decision-making of firms (classical labor market segment);
- Employees in product markets with strong regulatory restrictions to firm entry and in establishments with strong worker influence on firm decision-making (labor market segment with both regulations).

The first regulatory segment is the one to which standard models of the immigration literature assuming competitive product and labor markets best apply (see, for example, Borjas 1995, 1999). The set-up of these models for the classical case is such that real wages are determined by the marginal product of labor.[9] As a result, a labor supply shock resulting from immigration of individuals who represent close substitutes in production exerts downward pressure on native wages.

The second segment of the labor market under consideration is the one in which product market regulation and labor market regulation interact. Such interactions and their consequences for labor market outcomes are at the core of various theoretical models, including Blanchard and Giavazzi (2003), Gersbach (2003), Spector (2004), Ebell and Haefke (2006), Koeniger and Prat (2007), or Seldeslachts (2008). Product market regulation can restrict product market competition by many means; these include state involvement in production, tariffs or other trade barriers, and firm entry regulation. In this study, we focus on the firm entry regulation in the German Trade and Crafts Code restricting firm entry

[9]Firms are assumed to maximize profits and produce goods using immigrant labor, native labor and capital. The production function exhibits constant returns to scale, capital input is fixed, and immigrant and native labor are close substitutes in production. A firm that responds to immigration by paying lower wages and keeping production constant might earn higher profits in the short term. Such profits, as well as profits coming from other sources, will, however, not persist in competitive product markets with free firm entry for two reasons: new firms will enter the market as long as they can expect to earn non-zero profits, or existing firms will expand output production.

in some product markets, but not in others (see Section 3.2 for details). In the markets falling under this law, product market competition is lower and profits are higher, even in the long run with an endogenous number of firms, than in the other markets.[10] In a similar vein, labor market institutions can have various forms, including unemployment insurance, employment protection or minimum wages. The institution that we consider here directly regulates workers' influence on firm decision-making. As explained further in Section 3.3, the German Works Constitution Act regulates the creation and embodiment of work councils and induces strong worker influence in some establishments, but not so in others. The representatives of incumbent workers in work councils participate in pay scheme decisions at the establishment level, they have veto rights in hiring and firing decisions, and they have to be continuously informed about the firms' performance and prospective management strategies. Accordingly, they are aware of the firm's profit situation, including the profit consequences of newly hired East German employees, and will only approve personnel measures accompanying new hiring decisions when the incumbent workers do not suffer as a result.

The interaction of a product market regulation restricting firm entry with a labor market institution giving workers influence in firm decision-making generally creates the opportunity for a wedge between real wages and the marginal product of labor, and this shields incumbent native workers from negative wage effects owing to the immigration of close substitutes in production. Altogether, we expect no negative response of natives' wages to immigration of East Germans in the labor market segment in which product and labor market regulation interact.

In addition to the two polar cases, we also consider an intermediate segment that covers two groups of employees:

- Employees in product markets with almost free firm entry and in establishments with strong worker influence on the decision-making of firms;
- Employees in product markets with strong firm entry regulation and in establish-

[10]Note here that we consider market entry for potential entrepreneurs as being *almost* free in product markets that do not fall under the firm entry regulation of the German Trade and Crafts Code. This is because some entry costs apply to both types of product markets to a similar degree, such as various administrative costs (see, among others, Djankov et. al., 2002).

ments with weak worker influence on firm decision-making.

Despite strong worker influence, the wedge between real wages and the marginal product of labor will be small for the first group, as the level of persistent profits is low in product markets with almost free firm entry. In case of free entry, firms cannot pass on wage costs surpassing the marginal product of labor to consumers by charging prices above marginal costs. Firms attempting this would be forced out of the market by competitors. As a result, there is not much available that could be used for disentangling real wages and the marginal product of labor. In the second group, worker influence is too weak to cause a noticeable wedge between real wages and the marginal product of labor. Even though the product markets are non-competitive and allow for persistent profits, the labor market is competitive and real wages in a competitive labor market will reflect the marginal product of labor. Taken together, we expect the response of native wages to immigration in these intermediate groups to be negative as in the classical segment, but possibly to a lesser degree.

3 Migration, Regulation and Wages

3.1 Migration pattern after the fall of the Berlin Wall

Germany was divided for 45 years following World War II. While East-West migration was still common in the initial years after the creation of the German Democratic Republic (GDR) in 1949, it became virtually impossible soon after the Berlin Wall had been built in 1961. After the sudden fall of the Berlin Wall on November 9, 1989, migration from East to West Germany became straightforward again, and a massive, unanticipated wave of migration set in.[11] According to the administrative data used for Figure 1, migration from East to West between 1989 and 1992 increased the population of West Germany by 2.3 percent in net terms, and migration up to 1999 increased it by 2.8 percent.[12]

[11]Migration of East Germans who fled their home country and reached West Germany indirectly, via Hungary and Austria in most cases, set in slightly earlier, as several Central and Eastern European countries bordering the GDR lifted travel restrictions as early as 1988. The majority of the migrants in 1989 came directly from East to West Germany after the collapse of the German-German border in November 1989.

[12]The West German population aged 15 to 65 years was 42.9 million in 1989.

Using our survey data, we can also provide information on employment shares. In the survey waves of 1992 and 1999, the proportions of East Germans among medium-educated German employees in the West German labor market were 3.1 and 4.3 percent respectively. Our figures compare well with those reported in D'Amuri et al. (2010). Employees with a medium level of education, on whom we focus in this paper, have a vocational training degree either from the dual system of apprenticeship or a vocational school.[13,14] In our data, 73.2 percent of all East German employees emigrating to West Germany have a medium education level.[15] Hunt (2006) reports a similar share of 69 percent using a different data set.

The Germans who migrated after reunification from the East to the West are distinct from "traditional" immigrants in a number of dimensions and they are similar in many respects to native workers in West Germany. Migrants from East Germany face no language difficulties[16], they are well educated compared to traditional immigrants and easier to integrate into the West German labor market than traditional migrants. This is because the GDR had a vocational training system with several similarities to the West German system dating back to the common history of both parts of Germany before World War II. In addition, the reunification contract acknowledged all training degrees from the former GDR, and East German migrants were to be considered Germans with full political and economic rights. The results from Krueger and Pischke (1995) and Fuchs-Schündeln and Izem (2012), for example, corroborate the argument that human capital accumulated in East Germany before 1990 was transferable to the West German economy.

[13]Among German employees with high education, i.e. those who hold a degree from a university or a technical college, the shares of East Germans in the West German labor market were 3.5 percent in both 1992 and 1999. The shares of East Germans among German employees with low education (neither a vocational training degree nor a higher educational degree) were 3.9 and 3.4 percent in 1992 and 1999 respectively. Note that the immigration shares are at a similar level in all three education groups. Accordingly, the large inflow of East Germans onto the West German labor market caused no major shifts in the relative supplies of different types of labor in West Germany.

[14]In the U.S., the immigrant share of total employment increased from 6.7 to 8.9 percent between 1980 and 1990 (Jaeger, 2007). The immigration wave of the 1980s led to the largest influx into the U.S. since the first decade of the 20th century.

[15]Among West Germans in West Germany, the share is 72.3 percent. All the descriptive statistics reported in this paragraph are for the raw sample of 46,890 employees from the survey waves 1992 and 1999 who have German nationality, grew up in Germany, reside in West Germany and report the data relevant here.

[16]See Lewis (2011b) for a study that highlights language skills as important determinants of the degree of substitutability between natives and immigrants.

Altogether, we focus on a wave of internal migration, like Boustan et al. (2010), for example, in which the specific characteristics of the migrants place the labor supply shock to the receiving region somewhere between labor supply changes due to migration from a foreign country and shifts in birth cohort sizes or changes in female labor force participation (Welch, 1979; Card and Lemieux, 2001, Acemoglu et al., 2004).[17]

3.2 Firm Entry Regulation in the German Trade and Crafts Code

The German Trade and Crafts Code (GTCC; *Handwerksordnung, HWO*) regulates firm entry into certain product markets, but not into others.[18] The roots of the law go back to times long before World War II. In 1897, parts of the historical guild system in Germany became institutionalized as a first backlash to the introduction of the freedom of trade ("Gewerbefreiheit") in the German Reich in 1871. In 1908, the master craftsman certificate was imposed on individuals who wanted to train apprentices in one of the regulated occupations ("Kleiner Befähigungsnachweis"), but in 1935, it gained a substantially different role:[19] individuals who wanted to be registered so that they could start a legally independent business in one of the regulated product markets needed a relevant master craftsman certificate ("Großer Befähigungsnachweis"). This firm entry regulation was confirmed in the post-war version of the West German Trade and Crafts Code of 1953,

[17]In addition to our empirical analysis and the above cited papers on migration from East to West Germany, there are a number of studies that have analyzed the labor market consequences of immigrant groups from other source regions to the West German labor market in recent decades. Glitz, 2011, for example, investigates the immigration of ethnic Germans from the former Soviet Union and the Warsaw Pact countries to West Germany. For the time period 1996 to 2001, Glitz does not find a negative effect of the influx of these ethnic Germans on the wages of West German residents observed in the data before 1996, either as workers or unemployed persons. He reports evidence pointing towards a short-term displacement effect. Importantly for our study, the descriptive results in Glitz, 2011, indicate similarities of ethnic Germans who migrated from the former Soviet Union and the Warsaw Pact countries to West Germany after reunification to low-educated West Germans. This is not surprising given that these immigrants came from countries with education systems that differed substantially from the West German one. In addition, their German language skills were often poor. Other recent studies on immigration into West Germany include Bonin, 2005, Felbermayr et al., 2010, or Brücker and Jahn, 2011. These studies do not focus on the immigration waves of Germans to West Germany after 1989.

[18]The law that was in force during the 1990s is the version of 1953 accompanied by the "Ergänzende Vorschriften zur Handwerksordnung", including some minor updates up to the end of the 1990s.

[19]This law reform was meant to increase support among the members of trade and crafts organizations for the bringing into line ("Gleichschaltung") of their organizations during the Nazi regime.

and it is still relevant to many product markets today.[20,21]

The set of product markets to which the GTCC entry regulation applies covers many occupations that were organized as guilds in the Middle Ages, along with various later additions (Boyer 1990, Deregulierungskommission 1991). Accordingly, the regulated product markets are in fields as diverse as metalworking, food, or clothing and textiles. Regulated product markets can be found in similar fields to unregulated ones: for example, confectionary, hairdressing, and printing and bookbinding are regulated, but ice cream production, beautician services and copy and paper production are not. Moreover, the regulated and unregulated product markets are remarkably similar with regard to the employer size distribution: in both groups, 74 percent of all workers are in small or medium-sized establishments with between 5 and 499 employees (see Table A-2 for descriptive statistics on the sub-group level). The share of workers in micro establishments is about 8 percent in regulated product markets, while in unregulated ones it is about 12 percent. In contrast, the share of workers in large establishments is greater in regulated than in unregulated product markets: about 18 versus 14 percent.

A person can acquire a master craftsman certificate after several stages of training, collecting work experience and examination – with each stage taking several years to complete. First, the individual needs a basic vocational training degree in a relevant occupation; this typically involves two or three years of apprenticeship training ("Lehre und Lehrabschluss"). Following that, the individual needs to work in the occupation for several years and must earn the related journeyman degree ("Gesellenzeit und -brief"). The journeyman degree certifies a high level of vocational training in all occupation-specific tasks and

[20]See §1 and §7 HWO for exceptions and extensions. In principle, individuals with skills considered to be adequate can become registered without a relevant master craftsman certificate, but such exceptions were rarely granted during the 1990s. The public administration, with the involvement of the Trade and Crafts Chamber ("Handwerkskammer") in charge, decides on the adequacy of skills and on exceptions (§8 HWO, Monopolkommission 1998 and 2001). In addition, there are some educational degrees that are considered equivalent to the master degree by law, but which are similarly time-consuming to acquire (§7 HWO). Non-incorporated firms can be registered if a fully liable owner holds a relevant master craftsman certificate, and in the case of incorporated firms the managing director ("Betriebsleiter") has to fulfill the requirement (see §7 HWO).

[21]Note that this regulation imposes restrictions on firm entry, and not on who works in an occupation. It is therefore different from occupational licensing. Under licensing laws, it is illegal to work in an occupation without meeting standards of practice and minimum qualification requirements typically imposed by the government (see Kleiner, 2000, among others).

is the formal prerequisite for admission to the master examination ("Meisterprüfung"). The master exam covers general parts, i.e. law, book-keeping, controlling, marketing and human resource management, as well as occupation-specific parts. A regional committee of five members examines the master candidate in closed session. Three members of the committee must be incumbents holding a master craftsman certificate from the same occupation as the candidate (and potential entrant). During the 1980s, the candidates in about 25 percent of all exams failed (Deregulierungskommission, 1991). Altogether, earning a master craftsman certificate involves a substantial time investment, in addition to direct costs, such as fees for part- or full-time preparation courses taking up to 3 years.

Proponents of this entry regulation argue that the regulated markets would work inefficiently or would fail without this regulation due to information asymmetries and external effects.[22] The German monopoly commission and other German or EU institutions have long criticized this view (Deregulierungskommission 1991, Monopolkommission 1998 and 2001). Firstly, they stress that individuals with a journeyman degree have a similar occupational qualification to those with a master craftsman certificate. In addition, many of the goods that are produced in the regulated markets are standard experience goods. Reputation effects, among other things, should work towards efficient market outcomes regarding product quality. Private training incentives of firms should foster the efficient provision of training activities. The firm entry regulation is argued to come with the drawbacks of higher product prices and lower production quantities. In addition, entry and industry dynamics, competition, job creation, innovation and economic growth in the regulated markets is thought to be lower than without that regulation.[23]

3.3 Work Councils based on the German Works Constitution Act

The labor market institution crucial in our context is the work council. Work councils constitute one component of the German industrial relations system, the other two

[22]They claim that the regulatory benefits are the high quality of goods and services produced in the regulated markets, including consumer protection, and training activities providing skilled workers for other segments of the labor market.

[23]Empirical evidence indicating that the firm entry regulation in the GTCC lowered entry into self-employment during the 1990s can be found in Prantl and Spitz-Oener, 2009.

components being trade unions and employer associations (see Appendix C).

Work councils are organizations that represent worker interests at the firm level. The German Work Constitution Act (*Betriebsverfassungsgesetz, BetrVG*) regulates their rights and obligations, prescribing, among other things, under which conditions a firm must establish a work council in an establishment (§1 and §4 BetrVG), the size and the composition of the work council, and in which management organs of the firm members of the work council must be granted seats.[24] The first Works Constitution Act that was nationally binding in the Federal Republic of Germany came into effect in 1952, but the roots of the law go back to the labor movement in the mid-1800s. Before the 1950s, there were many local laws that were typically binding for specific industries, for example a law for mining in Bavaria from 1900. The law that was in force during the 1990s dates back to 1972 (BetrVG, 1972).

Work councils determine workers' involvement in hiring, firing and pay scheme decisions on the establishment level. Paragraph 99 of the Works Constitution Act from 1972 is particularly relevant in our context as it regulates the involvement of work councils in human resource measures. A work council in an establishment with more than 20 employees must be involved in every hiring decision. It must be informed in advance about the consequences of the hiring for the incumbent employees, the targeted wage classification of the vacancy, possible transfer of personnel associated with it etc. It has a veto right, in particular when there is the possibility that owing to the new hiring, incumbent workers will be fired or will have to endure other disadvantages (§99(2)3 BetrVG). A work council in a firm with more than 100 employees must set up an economic committee ("Wirtschaftsauschuss"), and the management of the firm must inform the committee (fully and in sufficient time) about the current and future economic and financial situation of the firm (§106(1) BetrVG).

Work councils are prevalent in large establishments, but not so in small establishments. The institutional details are such that work councils must be set up in establishments

[24]The law also stipulates that firms must pay for operating expenditures of the work council, provide office space and office personnel, and exempt a certain number of members of the work council from work so that they can devote all their work time to their council duties. The number of exempted council members depends on the council size, and thus on establishment size (§38(1) BetrVG).

with more than 5 employees if demanded so by the work force, and the size of the work council then depends on the size of the establishment (§9 BetrVG). Empirical evidence from Addison et al. (1997) shows that about 92 percent of the employees in establishments with 50 or more employees work in establishments with work councils, while the figure is only 18 percent in establishments with less than 50 employees.[25] Accordingly, we distinguish between establishments with weak worker influence in the decision-making of firms (small establishments with less than 50 employees), and establishments with strong worker influence (large establishments with 50 or more employees).

3.4 Wages in the West German labor market

Table 1 shows the evolution of real hourly wages in 1991 Euro between 1986 and 1999 for the four employee groups of the West German labor market that differ with respect to product and labor market regulation.

West German employees in product markets not subject to the GTCC entry regulation and in small establishments with weak worker influence earned about 7.8 Euro per hour in 1986; by 1999, the real hourly wages had increased to 9.2 Euro for this group of workers. West German employees in the same product markets, but in large establishments with strong worker influence, earned about 9.3 Euro in 1986, that is, 1.5 Euro per hour more than employees in the same product markets, but in small establishments. By 1999, their real hourly wages had increased to 11.4 Euro. The means were higher in the two corresponding labor market segments with the GTCC entry regulation, although comparable in size (between 8.4 Euro in 1985 and 11.6 Euro in 1999). East Germans earned less than West Germans in all survey waves and segments of the West German labor market.

Our data also reflect the evolution of wage dispersion over time that is typically found for wages in the West German labor market: stable or slightly declining wage dispersion until the beginning of the 1990s and rising wage dispersion thereafter (Dustmann et al. 2009, or Antonczyk et al., 2010).[26]

[25] Beckmann et al., 2010, among others, report similar results on the presence of work councils across establishment size classes using an alternative data source.

[26] The standard deviation of real hourly wages paid in the West German labor market was 3.8 Euro in 1986 (mean wage: 8.6 Euro). While the mean wage increased up to 1992 and 1999 (9.7 and 10.2 Euro), the standard deviation decreased to 3.6 Euro in 1992 and then increased substantially to 6.0 Euro in

4 Methodology

4.1 Empirical model

The basic empirical specification that we estimate has the following form:

$$\log w_{ijgt}^{W} = \alpha + \beta m_{jgt}^{E} + \varrho_{jg} + \varsigma_{jt} + \phi_{zt} + \tau_{gt} + \gamma' X_{ijgt} + \nu_{ijgt}. \quad (1)$$

The outcome variable w_{ijgt}^{W} indicates the real hourly wage of a West German employee i who works in occupation j in the West German labor market and belongs to age group g in time period t. Our main explanatory variable, m_{jgt}^{E}, is the share of East Germans in a West German occupation-age-time cell.[27] The equation also includes the full set of occupation-age interactions ϱ_{jg} to account for different permanent levels of native wages across occupation-age cells. Wage changes over time that are specific to occupations are captured by the set of occupation-time interactions ς_{jt}, while those specific to age groups are captured by the set of age-time interactions τ_{gt}. In addition, we include a full set of interactions between time and 2-digit employer industry z (ϕ_{zt}). The fall of the Berlin Wall not only resulted in East Germans migrating to West Germany, but also in East Germans asking for products and services of Western quality. Both the industry-time interactions and the occupation-time interactions capture potential demand shocks specific to certain industries or occupations. In addition, the industry-time interactions also capture potential time-varying effects of collective bargaining on wages, especially wage floors for some worker groups, in specific industries.[28]

The column vector X_{ijgt} covers demographic and work-related characteristics of individuals: quadratic polynomials in age as well as in tenure, and a dummy for male employees. The error term is denoted by ν_{ijgt}, β is the coefficient on the immigration measure and γ is the column vector of coefficients on X_{ijgt}. We estimate this equation using data from repeated cross-sections on employees with a medium level of education.

1999. In addition, Table 1 indicates that the segment-specific standard deviations decreased or remained nearly constant between 1986 and 1992. Between 1992 and 1999, all group-specific standard deviations increase, except for East German workers in unregulated product markets and in establishments with weak influence on decision-making.

[27] Alternatively, we use the corresponding absolute number of migrants E_{jgt}.

[28] Collective bargaining in Germany mainly takes place on the industry level (see Appendix C).

Specifications similar to Equation (1) are commonly estimated in the immigration literature (see Friedberg, 2001, Borjas, 2003, and Ottaviano and Peri, 2010, among others). Our set-up differs by allowing for workers within the same education-age group but in different occupations to be imperfect substitutes in production, and by restricting the analysis to employees with a medium level of education. The reasons for the first adaptation are twofold. Firstly, human capital is, to a substantial extent, occupation-specific.[29] Secondly, the product market regulation in which we are interested splits product markets along the occupational dimension. In section 6.3, we show that the empirical findings are not driven by native West Germans changing occupations in response to the inflow of East Germans. A discussion of our focus on medium-educated employees follows in Section 5.1.

We then gradually augment the specification of equation 1 with two final objectives: firstly, to isolate the segment of the labor market in which institutions play a minor role, and secondly, to determine the mechanism through which institutions affect observed labor market outcomes. We therefore estimate flexible variants of specification 1. In the most comprehensive specification, we include separate immigration terms for each of the four groups of employees that arise when partitioning the West German labor market along the dimensions of product and labor market regulation. Then, we focus on the following specification with three labor market segments as introduced in Section 2:

$$\begin{aligned} \log w_{ijgt}^{W} &= \alpha + \beta^{C} m_{jgt}^{E} C + \beta^{B} m_{jgt}^{E} B + \beta^{I} m_{jgt}^{E} I + C + B + V + \nu_{ijgt}, \\ \text{with } V &= \varrho_{jg} + \varsigma_{jt} + \tau_{gt} + \phi_{zt} + \gamma^{C\prime} X_{ijgt} C + \gamma^{B\prime} X_{ijgt} B + \gamma^{I\prime} X_{ijgt} I. \end{aligned} \tag{2}$$

Employees in the segment of the labor market indexed by C are in product markets in which firm entry is almost free and in establishments in which worker influence on decision-making is weak. This segment fits best with the classical case of textbook immigration models. The segment of the labor market in which substantial product and labor market regulation interact is denoted by B. Here, the GTCC entry regulation is relevant and worker influence on the decision-making of firms is strong due to the German Works Constitution Act. All other employees are in the intermediate segment I. In this segment,

[29] See Card, 2001, Kambourov and Manovskii, 2009, Gathmann and Schönberg, 2010, or Poletaev and Robinson, 2008, on occupation-specificity of human capital.

either firm entry is strongly restricted or strong worker influence on decision-making of firms is in place, but not both. To allow for segment-specific effects of the measure of the inflow of East Germans into the West German occupation-age-time cells, m^E_{jgt}, we interact it with the indicators of the different labor market segments, C, B and I. The model specification also includes the segment indicators C and B directly. These indicators capture differences in wage levels across segments not already captured by the occupation-age interactions ϱ_{jg}.

The coefficients of main interest are β^C, β^B, and β^I. As explained in Section 2, we expect the estimate of β^C to be negative. We expect the estimate of β^I to be similar to β^C, but weaker. In contrast to these two coefficients, we expect β^B not to be negative.

We identify immigration effects on native wages from the combination of variation of the inflow of East Germans across time and across occupation-age groups. The β-coefficients reflect the degree to which wage changes in occupation-age cells over time vary with the size of the influx of East Germans into that occupation-age cell over the same time period. Therefore, our individual-level analysis is comparable to a change analysis at the group level, rather than a level analysis. The main advantage of using individual data instead of mean data at the occupation-age-time level is that we can extend the set of explanatory variables to mitigate potential omitted variable biases. Suppose that the inflow of East Germans into occupation-age cells led to a change in the demographic characteristics of West German employees in that cell over time, and that this change differed across the three labor market segments in which we are interested. To deal with the concern that such differences could contribute to the differential effects of immigration that we observe for the three segments, we allow for segment-specific effects of the vector of demographic and work-related characteristics of individuals, X_{ijgt}, by interacting it with the segment indicators.

4.2 Identification and Instrumental Variation

The core identification issue that we address is the fact that immigration can be endogenous in equations explaining native wages. There are various sources of potential biases in this context. Most importantly, East German migrants arriving in West Germany after

the fall of the Berlin Wall may have self-selected themselves into occupations in the West German labor market based on their anticipation of future profit and wage developments, and hiring decisions of employers may also have depended on these considerations.

To deal with endogeneity resulting from immigrants and employers taking time-varying occupation-age-specific wage changes into account, we implement an IV approach.[30] East Germans may be attracted to occupations in West Germany for which they expect a positive shock and corresponding future wage increases in the age-class relevant to them. In that case of positive covariance between immigration and the error term in natives' wage equations, OLS estimates of the causal effect of immigration on native wages would be upwardly biased, leading to an underestimation of a negative immigration effect on native wages.[31]

The instrumental variation that we use follows from the creation of the GDR and the erection of the Berlin Wall in 1961, and from its sudden, unexpected fall in 1989 and German reunification. Our instrument, denoted by p^E_{jgt}, is a measure of the pool of all medium-educated employees who work in age-group g in East *or* West Germany in time period t, grew up in East Germany and received a vocational training degree in the former GDR that is relevant for occupation j. Note that we exploit two important advantages of our data here: firstly, we use data on East German employees who moved to West Germany as well as on those who stayed in East Germany; secondly, we rely on information on the occupations in which these East Germans received their vocational training degrees during GDR times.[32] The measure is a proxy for the pool of East Germans who exert a push effect on the occupation-age-time cell jgt in the West German labor market.

[30]Note that the occupation-age interactions included in the empirical specification (Equation 2) already account for endogenous decisions of immigrants or employers based on time-constant, unobservable heterogeneity across occupation-age cells. In addition, the occupation-time and age-time interactions included control for time-varying, unobservable heterogeneity that is specific to occupations and age groups respectively.

[31]Alternatively, immigrants may be able to enter an occupation-age cell more easily in the case of a negative shock that is accompanied by future wage decreases.

[32]Using data on training occupations before reunification is inspired by Friedberg, 2001, who studies the effects of Russian immigrants on native labor market outcomes in Israel and uses data on the movers' former occupations in Russia for instrumenting. We can, instead, use data on movers' *and* stayers' vocational training in East Germany.

All East Germans with a vocational training degree relevant to occupation j have, to some extent, human capital that is specific to occupation j. This part of their human capital tends to be remunerated highly in occupation j, particularly so if they combined it with human capital specific to an occupation k that is of high relevance to occupation j. Accordingly, these East Germans are more likely to enter the occupation-age-time cell jgt in the West German labor market than other East Germans.[33]

We argue that the source of instrumental variation which we use is uncorrelated with unobserved factors influencing West Germans' labor market outcomes for the following reasons: firstly, it is widely known that German reunification came unexpectedly and migration from East to West Germany was effectively impossible during GDR times. We are therefore confident that East Germans did not take into account the profits and earnings potential in occupations in West Germany when deciding on their vocational training in the GDR system. Note here that almost 90 percent of East German migrants in our main sample completed their vocational training before 1985.[34] Secondly, the planned economy system in the GDR restricted individuals' choice of their training occupation. One political aim of the GDR vocational system was to increase social equality. Accordingly, children and parents were encouraged not to choose the same occupation. Finally, the annual number of training positions per occupation depended on inflexible 5-year production plans and several ad-hoc changes to education policy. Altogether, East Germans were often prevented from choosing a vocational training in line with their preferences, and future developments in West Germany were irrelevant to the training allocation in the GDR.

We endogenize the terms $m^E_{jgt} * C$, $m^E_{jgt} * I$, and $m^E_{jgt} * B$ in Equation (2), estimating two-stage least square regressions. The straightforward approach is to interact the instrumental variable, p^E_{jgt}, with the indicators for the three labor market segments, C, I, and

[33] If, for example, there were many East Germans at the age of about 42 in 1992 who were trained as watchmakers in the GDR, we expect more immigration into the age group 40-44 in that occupation in West Germany at that time, relative to the immigration into other occupation-age-time cells.

[34] Assuming that East Germans undertook their vocational training when they were about 16 years old, the detailed distribution is as follows: 10 percent undertook their training before 1960, 22 percent during the 1960s, 36 percent during the 1970s, 22 percent between 1981 and 1985, and 10 percent between 1986 and 1990.

B, and use these three instrumental variables in the three first-stage equations. In our preferred specifications, we use four instrumental variables: the interactions of the main instrumental variable with the indicators for the two polar labor market segments and the two groups of employees belonging to the intermediate segment. In both specifications, the identification of immigration effects on native labor market outcomes also builds on the additional assumption that the full set of instruments effects immigration into the various labor market segments differently.

5 Data and Definition of Main Variables

5.1 Data

We use the "Qualification and Career Survey" for the empirical analysis, a survey carried out by the German Federal Institute for Vocational Training (*Bundesinstitut für Berufsbildung, BIBB*) and the Research Institute of the Federal Employment Service (*Institut für Arbeitsmarkt- und Berufsforschung, IAB*).[35]

The data source has several advantages for the purposes of our study. Firstly, we can use data on employed individuals from survey waves before and after reunification, specifically the waves of 1986, 1992 and 1999.[36] Secondly, we can directly identify East and West Germans in both the East and West German labor market, on the individual level, since we have information on the current residence of survey participants, their citizenship and the region in which they grew up. This is an important data-related aspect that distinguishes our work from various other recent studies on immigration in Germany.[37]

Thirdly, we have detailed information on the occupation in which an individual worked when participating in the survey. This information is crucial for distinguishing between employees in product markets with the firm entry regulation in the GTCC and in those without it. Fourthly, we know the occupation in which an employee was trained. This

[35]See Appendix B for more details on the survey design.

[36]Note that the data for the survey waves, referred to here as 1986, 1992 and 1999 for the sake of brevity, were collected in the winter months 1985/86, 1991/92 and 1998/99. The data have been used many times in the literature, with early examples including DiNardo and Pischke, 1997, and Harhoff and Kane, 1997.

[37]Data that only include information on citizenship or nationality, for example, would not allow for identifying inter-regional migrants and natives in the East and West German labor markets, as all these employees have German citizenship.

provides us with instrumental variation that we can use to address the identification problem arising due to potentially endogenous immigrants and employer decisions. Finally, we can use detailed information on individual characteristics such as age, gender, tenure with the current employer or production tasks, and we know core employer characteristics, such as employer size and industry affiliation.

Our main sample consists of 17,776 observations on employees in the West German labor market who have German citizenship and grew up in West Germany.[38] All individuals are between 25 and 54 years old, work between 10 and 75 hours per week, and report the relevant data for our analysis. We focus on individuals in the medium-education category who have a vocational training degree either from the dual system of apprenticeship or a vocational school. We thus exclude highly educated individuals with a degree from a university or a technical college and individuals with a low level of education, holding neither a vocational training degree nor a higher educational degree. Medium-educated employees account for by far the largest proportion of West German employees in all three segments of the labor market. In addition, medium-educated employees account for the largest group of immigrants from East Germany to the West German labor market, and the influx of East Germans did not cause major shifts in the relative supplies of different education groups (see Section 3.1).[39]

The main sample includes only individuals in occupations that are accredited by the Federal Ministry of Education and Research (BMBF) and the German Federal Institute for Vocational Training (BIBB). Accredited occupations are all covered by the dual system of apprenticeship, that is, training consists of on-the-job training and school training, and there is an official educational degree involved. Accredited occupations account for 60 percent of employment in our raw data. This is our population of interest, as the

[38]We exclude foreigners in the West German labor market, as the survey coverage of foreigners varies between waves.

[39]Since low education is defined as having no occupational training, we cannot construct instruments for employees with low education. The share of low-skilled employees varies between 17 and 11 percent across the three labor market segments. Highly skilled employees are too strongly clustered for inclusion in our empirical analysis: the share of highly skilled employees is higher than 5 percent of all employees in 9 occupational classes only. The descriptive statistics here are for the sample of 21,620 observations that results when applying all exclusion restrictions that we use for the main sample, except for the elimination steps that exclude employees with low or high education.

GTCC restricts firm entry in some of the accredited occupations, but none of the non-accredited occupations. Specifically, the GTCC entry regulation applies to 40 percent of employment in all accredited occupations in our main sample. In addition to focusing on accredited occupations only, we have excluded employees in the public sector, in non-profit organizations or the mining and quarrying sector. Finally, we have eliminated all small occupation-age-time cells with less than 5 native employees.[40]

5.2 Definition of Main Variables

Immigration: East Germans migrating from East to West Germany are those survey participants who grew up in the region of the former GDR,[41] currently reside in West Germany, and have German citizenship.

We measure the size of the labor supply shock that hit an occupation j and age group g in time period t in the West German labor market as the share of medium-educated East German employees in the cell: $m^E_{jgt} = \frac{E_{jgt}}{N_{jgt}}$. We denote by E_{jgt} the number of medium-educated German employees who grew up in the East and now work in cell jg in West Germany, and N_{jgt} is the total number of medium-educated German employees in cell jg in West Germany at time t. In addition, we use the migrant number E_{jgt} as an alternative measure to show that our main empirical results are not driven by changes of the denominator. For the survey wave that we observed before German reunification (that of 1986), E_{jg1986} and m^E_{jg1986} are equal to zero. We classify employees into the following six age groups: 25-29, 30-34, 35-39, 40-44, 45-49 and 50-54.

Instrument: Our instrument is a measure of the pool of all medium-educated East Germans who exert a push effect on the occupation-age-time cell jgt in the West German labor market (see also Section 4). Specifically, the instrument for each cell is defined as: $p^E_{jgt} = \sum_{s=1}^{S} \omega_{js} D_{gts}$, where D_{gts} is a dummy variable indicating medium-educated employees s in age-group g and time period t who work in East *or* West Germany,

[40] If we do not impose this restriction, all OLS and IV estimation results reported in the Tables below remain robust. The IV estimation results involving the alternative instruments, however, suffer from the influence of noisy immigration rate and instrument values in some of these small cells.

[41] The relevant survey question was "Where did you grow up, that is, where did you spend most of your youth?". The answer categories provided were: East Germany; West Germany; former German territories in Eastern Europe; in a country that belonged to the EU in the year of the survey; in an Eastern European country; or other regions.

grew up in East Germany and received a vocational training degree in the former GDR in an occupation that is relevant for occupation j.[42] Relevant for occupation j are all vocational training degrees represented among East German workers in occupation j. Across all occupations, 8 different degrees on average are relevant per occupation. The weighting variable, ω_{js}, reflects the relevance of the individuals' human capital for working in occupation j. For employees in occupation j, the weight equals one. For employees in occupations $k \neq j$, the weight is equal to the share of East German workers in occupation j with a vocational training in occupation k.[43]

Product market regulation: Our main measure of product market regulation closely follows the definition in the German Trade and Crafts Code, and distinguishes between employees in product markets with and without the firm entry regulation in the GTCC using occupational information. We first rely on the GTCC enumerating the occupations for which it regulates firm entry and identify employees in these regulated occupations using the occupational information in our data set. This data follows the 3-digit classification of occupational titles of the Federal Employment Bureau (BA) in the version of 1988 with 334 occupational classes. In our main sample, the indicator of the GTCC entry regulation is equal to one for 21 grouped 3-digit or 2-digit occupation classes with GTCC entry regulation, and zero for 27 occupation classes without it. In the context of our robustness analyses, we also use an industry-level measure of the firm entry regulation in the GTCC.[44]

Labor market institution: Through work councils, the German Works Constitution

[42]The data set used for constructing the instruments covers 5,214 East Germans in the survey waves 1992 and 1999; 12 percent of these East Germans reported living in West Germany.

[43]We test the sensitivity of our results by considering two alternative pool measures. Firstly, we consider not all relevant vocational training degrees, but exclusively those in occupation j: $p^{E,1}_{jgt} = \sum_{s=1}^{S} \omega_{js} J_{gts}$, where J_{gts} is equal to one for a medium-educated employee s in age-group g and time period t who works in East *or* West Germany, grew up in East Germany and received a vocational training degree in occupation j in the GDR, and zero otherwise. The second alternative measure is the variant of this latter one that does not involve the weighting variable ω_{js}: $p^{E,2}_{jgt} = \sum_{s=1}^{S} J_{gts}$.

[44]To construct the industry-level measure of product market regulation, we exploit the survey data on entrepreneurs, their occupational activities, as well as the 2-digit industries in which their firms are active (industry classification following the NACE Rev. 1). Specifically, we calculate for each 2-digit industry the share of entrepreneurs who indicated that their entrepreneurial activity in 1986, 1992 or 1999 was in an occupation subject to GTCC entry regulation, and encode the industry-level measure with one if this share is higher than one half, and zero otherwise. We merge the industry-level measure with our main sample of employees using the available data on the employers' industry codes.

Act imposes a stronger degree of worker involvement in hiring, firing and pay scheme decisions in large than in small establishments. As outlined in Section 3.3, about 92 percent of all employees in establishments with 50 or more employees work in establishments with work councils, whereas only 18 percent of the employees in establishments with less than 50 employees do so. Based on this evidence, we define a dummy variable proxying the influence of workers on the decision-making of firms. The dummy is coded one in the case of strong worker influence, that is for employees working in establishments with 50 or more employees, and zero otherwise.

Wages: Our main dependent variable is the logarithm of the real hourly wage in Euro for West Germans in the West German labor market (base year: 1991). The survey data contains information on monthly gross earnings, rank-ordered into 18 brackets, for each employee participating in the survey. To calculate hourly wages for an employee, we divided the midpoint of the monthly earnings bracket of that employee by the employees's usual hours of work per month.[45] Hourly wages are then deflated to 1991 values using the consumer price index.

Other variables: Further demographic and work-related variables are relevant for our empirical analysis. To capture influences of individual heterogeneity on wages in our main regressions, we use the following variables: age in years, gender (coded one for men, zero for women), and tenure with the current employer.[46] In Section 6.3 we also use information on the activities that employees perform at the workplace. We consider two production task categories as being relevant for the analysis at hand. Firstly, interactive tasks, and secondly, advanced tasks. Our interactive task measure is a share measure reflecting the number of the following five interactive tasks that an individual performs: teaching, advising, buying and selling, coordinating, negotiating. The advanced task measure is defined analogously, involving the following five advanced tasks: researching, designing, restoring, servicing machines and equipping machines.[47]

[45]Comparable procedures have often been used in the literature. See, for example, DiNardo and Pischke, 1997, or Entorf and Kramarz, 1997.

[46]The tenure measure is based on the answers to the survey question "In which year did you start working for your current employer?". We define tenure as the survey year minus the year in which the survey participants started to work for their current employer.

[47]Further discussion of the task information in the data can be found in Spitz-Oener, 2006.

Appendix Table A-1 shows descriptive statistics on our main sample. As we identify immigration effects on native wages using data variation across time and across occupation-age cells, it is an important prerequisite for our study that the wage profile as well as the immigration pattern vary sufficiently along these dimensions. The descriptive statistics in Tables A-3 and A-4 are in line with substantial variation in both West Germans' real hourly wages, averaged at the occupation-age-time level, and in the labor supply shock resulting from East Germans migrating to West Germany. In addition, the wage distributions specific to the three labor market segments overlap considerably; similarly so the segment-specific immigration rate distributions.

6 Empirical Results

In our empirical analysis we exploit the large wave of East Germans migrating to West Germany after German reunification. East Germans are similar to West Germans, meaning that we can investigate how the immigration of close substitutes in production impact on the wages of competing natives. As we expect the effects of immigration on natives' wages to vary between labor market segments with differential product and labor market regulation, we allow for effect heterogeneity in our empirical specifications.

6.1 Basic Model Estimates

Before investigating effect heterogeneity, however, we consider the average effect of immigration on the wage growth of natives by estimating the standard specification in the migration literature (Equation 1 in section 4.1). The OLS regression results in Table 2, Column 1, indicate ceteris paribus (c.p.) no significant correlation between the share of East German immigrants, m^E_{jgt}, and the logarithm of West Germans' real wages in the West German labor market (coefficient -0.134; *standard error (s.e.) 0.117*). As is the case with all specifications discussed below, we have included as additional explanatory variables: a full set of occupation-age interactions, age-time interactions, occupation-time interactions and industry-time interactions, as well as individual characteristics (age, age^2, a gender dummy, tenure, tenure^2).[48] The sample covers 17,776 observations on West Ger-

[48]The coefficient estimate for the immigration measure remains robust if we eliminate the individual characteristics from the model specification (coeff. -0.118, *s.e. 0.127*).

man employees in the West German labor market; these come from repeated cross-sections of individual data (see Section 5.1 for details). Standard errors allow for correlation between employees within the same occupation-age cell, and we weight observations to take into account the sampling design of the data set (see also Appendix B).

Next, we explore how natives' wage responses to immigration change when we distinguish between two different labor market segments defined by the relevance of product market regulation. We partition the labor market into the group of employees working in product markets under the GTCC firm entry regulation (R) and the group of workers in product markets with almost free firm entry (N). The two dummies defining the two types of product markets enter the estimation equation interacted with the immigration measure, as well as with the individual characteristics.[49] The OLS estimates are displayed in Column 2 of Table 2. These suggest c.p. a negative and significant correlation between the share of East German immigrants and the log of West Germans' real wages for workers in West German product markets without GTCC entry regulation, whereas there is no significant correlation found for the complementing group. Testing for equality of the two group-specific coefficients shows that the two estimates are statistically different from each other (see bottom of Column 2 in Table 2 for the F-test result).

We also find evidence for heterogeneity in Column 3 of Table 2, in which we allow the relationship between immigration and native wages to vary across two labor market segments with different labor market institutions. Due to the German Works Constitutions Act, work councils are prevalent in large establishments, implying strong worker influence on the decision-making of firms. In small establishments with less than 50 employees, however, worker influence is weak. Accordingly, we distinguish between the group of workers in small establishments with less than 50 employees (weak worker influence, W) and in large establishments with more than 50 employees (strong worker influence, S). The two dummies defining the two worker groups enter the estimation equation interacted with the immigration measure, as well as with the individual characteristics. In addition, we also include the indicator for workers with weak influence directly. Here, we find an

[49] Adding a dummy for the group with GTCC entry regulation is not necessary, as (time-varying) occupation effects are already taken into account by including the full set of occupation-age interactions as well as occupation-time interactions.

insignificant coefficient estimate, suggesting no general differences in wage changes over time across the two worker groups. The correlation between the share of immigrants and native wages for the group of workers with weak influence is, however, negative. No significant correlation is found for the immigration term that is specific to the group of workers with strong worker influence. Again, these estimates on the group-specific immigration terms are statistically different from each other.

Immigration measures are potentially endogenous in equations explaining natives' wages. To address this key identification issue, we implement an instrumental variables approach, estimate two-stage least square regressions and show second stage estimates in Columns 4 to 6 of Table 2.

The instrument for the occupation-age-time-specific share of East Germans (m^E_{jgt}) in our model of the average immigration effect (column 1 in Table 2) is the measure of the pool of East Germans with relevant vocational training from GDR times (p^E_{jgt}) which we introduced in Sections 4.2 and 5.2. The first stage results are shown in Column 1 of Table 3. We find a positive and strongly significant partial correlation of the excluded instrument with the immigration rate. The test statistic takes a value of 23.38 in the corresponding F-test on the irrelevance of the excluded instrument (see bottom of Column 1 in Table 3) and we can reject the null hypothesis of the 2SLS bias exceeding 10 percent of the OLS bias in the weak identification test (see bottom of Column 4 in Table 2 and Stock and Yogo, 2002 and 2005). Consistent with the OLS result in Column 1, the second stage IV estimate in Column 4 of Table 2 indicates no effect of the influx of East Germans into a given occupation-age cell in West Germany over time on the wage growth of West Germans in that cell over the same time period.

In the model in which we allow the relationship between immigration and native wages to differ for workers in product markets with and without GTCC entry regulation, we interact the pool measure with the two relevant group indicators and estimate two first-stage equations. In the model in which we allow the relationship between immigration and native wages to vary across worker groups with strong and weak influence on the decision-making of firms, we proceed analogously. The first-stage results are shown in Columns 2 and 3 (4 and 5) of Table 3. For each group-specific instrument, we find a

positive and strongly significant partial correlation with the respective immigration term. The off-diagonal partial correlations are, in contrast, insignificant. The test statistics of the corresponding F-tests on the irrelevance of the excluded instruments range between 5.6 and 40 (see bottom of Columns 2 to 5 in Table 3) and we can reject the null hypothesis of the 2SLS bias exceeding 10 percent of the OLS bias in the weak identification test (see bottom of Columns 5 and 6 in Table 2). The second stage IV estimates in Column 5 (6) in Table 2 indicate heterogeneous effects that correspond with the patterns of correlations found in the OLS regressions in Column 2 (3). The inflow of East Germans had a strong negative impact on the wage growth of West German workers in product markets with almost free firm entry, whereas the coefficient is insignificant for workers in product markets with GTCC entry regulation (Column 5). In addition, we find a negative effect for workers in establishments with weak influence on the decision-making of firms, and an insignificant coefficient for workers in establishments with strong worker influence (Column 6).

6.2 The Source of Effect Heterogeneity

So far, we have shown that the influx of East Germans, representing close substitutes in production, has a negative effect on the wage growth of competing natives in segments of the West German labor market without product market regulation or without labor market regulation, but in each case not in the complementing segment. In this section, we will investigate the source of the heterogeneous wage reactions to immigration in greater detail. As discussed in Section 2, we expect that the interaction of product market regulation restricting firm entry and of labor market institution giving workers strong influence on the decision-making of firms creates the opportunity for a wedge between real wages and the marginal product of labor (segment B). The wedge shields incumbent native workers from negative wage effects owing to immigration. In the segment of workers in product markets with almost free firm entry and in establishments with weak worker influence on firms' decision making (C), real wages are rather expected to be determined by the marginal product of labor. A labor supply shock resulting from immigration of close substitutes in production then exerts downward pressure on native wages. Such an effect we also expect for intermediate worker groups in which either product market

regulation ($I.1$) or labor market regulation ($I.2$) is weak, but possibly to a lesser degree. In Column 1 of Table 4, we show the OLS estimates of a specification in which the logarithm of West Germans' real wages is explained by interactions of the share of East German immigrants (m^E_{jgt}), as well as the vector of individual characteristics (X_{ijgt}), with the indicators for the two polar labor market segments (C, B) and the two intermediate groups of employees ($I.1$, $I.2$).[50] We find a negative and statistically significant coefficient estimate on the immigration term for the classical labor market segment; but none of the estimates on the other immigration terms are statistically different from zero. In addition, the F-test result at the bottom of Column 1 indicates that the coefficients for $I.1$ and $I.2$ are not statistically different from each other. This fits with our discussion in Section 2: there are no reasons known that would lead to the expectation of distinct wage reactions to immigration in these two intermediate groups of native workers. Accordingly, we pool these two groups into the intermediate segment I, and provide the OLS estimates of the more parsimonious specification in Column 2 (this specification corresponds to Equation 2 in Section 4.1). The coefficients on the immigration terms for the two polar cases C and B turn out to be very robust towards this change. In both specifications, the coefficients on B and C are statistically different from each other.[51]

As in our basic models in section 6.1, we address the issue of immigration measures being potentially endogenous in equations explaining native wages. In Column 3 of Table 4, we present the second stage results of the 2SLS-regression corresponding to the OLS-regression in Column 1.[52] In Column 4, we present the second stage results of the 2SLS-regression corresponding to the OLS-regression in Column 2.[53] Finally, Column 5 provides the second stage results for our preferred variant of these specifications: it involves the

[50]Indicators for the segments C and B, occupation-age interactions, age-time interactions, occupation-time interactions and industry-time interactions are also included in the specification.

[51]The results reported in this paragraph are robust towards using the corresponding number of immigrants E_{jgt} instead of the immigration rate m^E_{jgt} as the explanatory variable (see Appendix Table A-5). We also find similar coefficients on the immigration terms as shown in Table 4 if we eliminate individual characteristics as explanatory variables or add group-specific age-gender and tenure-gender interactions.

[52]This 2SLS-regression involves four first-stage equations, one for each of the four group-specific immigration terms in the second stage equation, and four excluded instruments, one for each of the two polar labor market segments and one for each of the two intermediate worker groups (C, B, $I.1$, $I.2$).

[53]Here, we use three first-stage equations, one for each of the three immigration terms in the second stage equation, and three excluded instruments, one for each of the three labor market segments (C, B, I).

three second-stage immigration terms, one per labor market segment (C, B, I), and the more disaggregated set of four excluded instruments, one per worker group (C, B, $I.1$, $I.2$). The value of the Hansen J statistic testing for over-identifying restrictions indicates no rejection of the exclusion restrictions in this specification (see the bottom of Column 5 in Table 4).

The first stage results that belong to the second stage results in Column 5 of Table 4 can be found in Table 5. For each instrument specific to a polar labor market segment, we find a positive partial correlation with the respective segment-specific immigration term. The two instruments that correspond to the two worker groups in the intermediate segment are both positively correlated with the immigration term specific to the intermediate segment. All other partial correlations between excluded instruments and second-stage immigration terms are insignificant. The test statistics take values between 24.7 and 17.2 in the corresponding F-tests on the irrelevance of the excluded instruments (see bottom of Table 5).

The IV results consistently indicate a negative effect of immigration on the wage growth of natives in the classical labor market segment with almost free firm entry and weak worker influence on the decision-making of firms (C). We observe no effect in the segment in which product market regulation and labor market regulation interact (B), and the coefficient estimates on the immigration terms specific to the segments C and B are statistically highly different from each other (see F-test results at the bottom of Table 4). We find qualitatively similar results if we estimate the specification of Column 5 using the two sets of alternative instruments.[54]

All second stage IV estimates on the immigration terms in Column 5 of Table 4 are larger in absolute terms than the corresponding OLS estimates. In the case of the classical labor market segment, for example, the difference between the 2SLS and the OLS estimate is

[54]Firstly, we use the alternative set of four excluded instruments involving the pool of all employees in age-group g and time period t who work in East *or* West Germany, who grew up in East Germany and have vocational training in occupation j ($p^{E,1}_{jgt}$ in Footnote 43). Then, the estimation results (coeff. *(s.e.)*) are: -2.218** *(1.009)* for the immigration term specific to C, -2.045 *(1.494)* for the one specific to I, and .615 *(1.596)* for the one specific to B. Secondly, using the alternative set of instruments based on the unweighted pool measure ($p^{E,2}_{jgt}$ in Footnote 43), the estimation results (coeff. *(s.e.)*) are: -2.531* *(1.360)* for the immigration term specific to C, -2.302 *(1.638)* for the one specific to I, and -0.052 *(1.750)* for the one specific to B.

consistent with migrants selecting themselves into thriving occupations, leading the OLS estimate to underestimate the negative impact of immigration on the wage growth of natives. Note, however, that the differences are also in line with an attenuation bias towards zero in the OLS regressions, owing to measurement error.

The polar labor market segments are the ones of primary interest. The classical segment C corresponds best with standard immigration models where product and labor markets are assumed to be perfectly competitive. In this setting, real wages are expected to reflect the marginal product of labor and the sudden increase in the labor supply due to immigration of close substitutes, which should thus exert downward pressure on native wages. Our empirical findings support this hypothesis.

The size of the coefficient in Column 5 indicates that a one percentage point increase in the share of East Germans leads to a 1.6 percent decline in native West Germans' wages, which – evaluated at the mean immigrant share – implies an elasticity of -.03.[55]

The segment B in which product and labor market regulation interact is the opposite to the classical one, in the sense that neither product markets nor labor markets are competitive. Product market conditions allowing for persistent profits and labor market conditions implying strong worker influence on the decision-making of firms open up the opportunity for a wedge between real wages and the marginal product of workers. Again, our empirical findings corroborate this hypothesis. The results are in line with native workers in this labor market segment being shielded from negative wage effects owing to immigration.

The results in Columns 4 and 5 also show that the effect of immigration is similar in the classical segment C and the intermediate segment I; the F-test results indicate that the respective coefficient estimates are statistically not different from each other.[56] This is consistent with our argumentation in Section 2: in the intermediate worker group, there is not much room for real wages to deviate from the marginal product of labor, as either product markets ($I.1$) or labor markets are competitive ($I.2$). The estimates for

[55]The mean share of immigrants is .02 (see Table A-1), an increase by 1 percentage point in the immigrant share thus represent a 50 percent increase. The elasticity is therefore -1.6/50=-.03.

[56]The estimate on the intermediate segment is, however, not individually significant.

the intermediate segment I and for the segment with both regulations B, however, differ significantly.

6.3 Robustness of the Main Results

So far, we have considered firms that produce goods using immigrant and native labor, with immigrants and natives in the same occupation-age cell being treated as close substitutes in production. Now, we assume instead that immigrants and natives in the same occupation-age cell are imperfect substitutes with regard to the tasks they perform at the workplace. Natives may then choose to specialize in different tasks in response to immigration. If the tasks to which natives move are highly remunerated, this could mitigate negative consequences of immigration on natives' wages.[57] Accordingly, our finding of differential responses of natives' wages to immigration in different regulatory labor market segments might be a consequence of differential specialization of natives and immigrants taking place, rather than of differential product and labor market regulation.

To investigate this possibility, we investigate whether West Germans' occupational task content shifted towards more interactive tasks or advanced tasks in the wake of the inflow of East Germans to the West German labor market. East Germans speak German, but the ability to interact effectively with others depends not only on language proficiency. East Germans and West Germans might, for example, have different interactive skills due to the newly arriving East Germans being less integrated in the social networks of the company than incumbent West Germans. In a similar vein, East and West Germans in the West German labor market might be imperfect substitutes with respect to tasks related to the operating environment. While the occupational skill acquisition in East and West Germany had many common features, such as the vocational training system, the part concerning on-the-job skill acquisition was different as a result of the contrasting business environments and differential technology adoption in the two regions. West Germans should, therefore, have a comparative advantage in tasks that require detailed knowledge of the specific operating environment: researching, designing, restoring, servicing machines or equipping machines. We call these advanced tasks.

[57] Such mechanisms have been investigated by Peri and Sparber, 2009, and D'Amuri and Peri, 2010, among others.

We estimate equations explaining the extent to which West Germans perform interactive tasks or advanced tasks on the job. As main explanatory variables, we use, as above, our immigration measure interacted with the indicators for the three regulatory labor market segments. The results shown in Table 6 suggest that task reallocation of natives did take place (in Column 4, for example, all segment-specific coefficients are positive and individually significant). However, there is no indication of natives' specialization in interactive tasks or advanced tasks in response to immigration being different across the three segments: the F-test results at the bottom of the table reject effect heterogeneity in all specifications. Therefore, the empirical evidence provides no support for differential task specialization as alternative explanation for the differential wage effects that we observe across labor market segments.

As discussed in Section 4.1, we define our immigration measures on the occupation-age-time level within the group of workers with a medium level of education. While being the appropriate approach for the purpose of our analysis, it is subject to the criticism that native West Germans could, in principle, change the occupation in response to the influx of East Germans.[58] We test, therefore, whether the segment-specific effects of immigration on wage growth of natives that we find could reflect segment-specific occupational change patterns of West Germans.

The survey data allow us to identify occupational changes and when these occurred.[59] Based on this information, we exclude observations involving an occupational change after 1989 from the sample. We re-estimate our preferred model specification from Columns 2 and 5 in Table 4 based on this restricted sample. As shown in Columns 1 and 2 of Table 7, the results corroborate our previous findings. We conclude that the differential effects of immigration on the wage growth of natives that we observe in the different regulatory segments of the labor market are not driven by differential occupational mobility patterns of West Germans.

[58]Note that due to the importance of the apprenticeship system in Germany, occupational changes are costly, as one is usually considered an unskilled worker in occupations in which one is not trained.

[59]The exact survey questions used here were: 1. "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?"; 2. "If you experienced such an occupational change, when was the last year this happened?".

Next, we address the concern that differing wage reactions in the three labor market segments might be a reflection of differential employment responses after the influx of East Germans to West Germany that are not already captured by the industry-time or occupation-time interactions included in our previous specifications.[60] We introduce, as additional regressors, the logarithm of the size of the native workforce with medium education per occupation-age-time cell in the West German labor market, interacted with the dummies for the three labor market segments. In addition, we include as further regressors the ratio of medium-educated natives relative to the total native workforce per West German occupation-age-time cell (low, medium or high level of education), also interacted with the dummies for the labor market segments. This specification tests whether differential employment responses to changes in the supply of West Germans, or to differential changes in demand or growth perspectives across the three regulatory segments drive our findings. The IV results for the adapted specification are shown in Column 4 of Table 7, and the estimated coefficients on the immigration terms are in line with our previous findings.[61]

Finally, we test the robustness of our main results with respect to changes in the definition of regulated and unregulated product markets. Our main measure of product market regulation follows the definition in the German Trade and Crafts Code and separates employees in product markets with and without the firm entry regulation in the GTCC using occupational information (see section 5.2). One concern with this measure is that an individual worker's occupation does not necessarily indicate the product market focus of the firm in which he or she works. In particular, employees with an occupation not falling under GTCC entry regulation may work for a firm that is primarily active in

[60] In the literature on the different dimensions of labor market adjustment to shifting demand or supply, there is the common notion that the major burden of adjustment falls on quantities if prices are inflexible (see Boeri, 2011, for a review). Bertrand and Kramarz, 2002, is an early example of an empirical analysis focusing on the dependence of employment growth on product market regulation. As discussed above, Angrist and Kugler, 2003, investigate native employment reactions to immigration considering the relevance of product market and labor market institutions.

[61] In column 3, we also provide the OLS results, but note that the employment variables are potentially endogenous in natives' wage equations, and that the OLS estimates might thus be biased. We do not, however, expect a similar bias for the IV estimates of the segment-specific immigration effects, since our instruments should have no direct effect on the size of the native workforce (See Angrist and Kugler, 2003, for a similar argument).

a product market which does fall under the regulation, and vice versa (for example, a beautician may work at a hairdressers). To explore whether the empirical results depend on this issue, we impose a stricter separation between product market types. We do so by applying the occupational-level measure of firm entry regulation jointly with an industry-level measure (see Footnote 44). This procedure restricts our main sample to the sub-sample of 14,061 employees, a sample size reduction of 20 percent. In this sample the group of employees under GTCC entry regulation consists of those who work in regulated occupations and in industries with more than 50 percent of all entrepreneurs reporting a regulated activity. The group of employees not falling under the regulation covers those working in unregulated occupations and for firms in industries with less than 50 percent of all entrepreneurs reporting a regulated activity. As can be seen in Table 8, Columns 1 and 2, the estimated coefficients on the segment-specific immigration terms are robust to the sample change.

A related concern could be that very large establishments are the most likely candidates for being active in many product markets – partly markets covered by the firm entry regulation in the GTCC and partly markets which are not. As classifying the employees of these establishments into one of the three regulatory segments of the labor market may be questioned, we re-estimate our preferred model specification on the sub-sample of 15,710 employees in establishments with less than 1000 employees. Our results remain stable in these regressions (see Columns 3 and 4 of Table 8).

7 Conclusions

In this paper, we contribute to the recent immigration literature by reporting comprehensive empirical evidence regarding the impact of a large internal migration wave of close substitutes in production on the wages of competing native workers in the receiving region, including evidence of substantial impact heterogeneity. The migration wave under consideration is the large influx of Germans who grew up in the former German Democratic Republic onto the labor market of the Federal Republic of Germany after the fall of the Berlin Wall in 1989. To investigate the role of the regulatory setting in product and labor markets as a source of systematic effect variation, we isolate different segments

of the labor market and compare the impact of immigration on natives' wages across the segments.

For the segment of the West German labor market that consists of employees in product markets with almost free firm entry and in establishments with strong worker influence on the decision-making of firms, we find a negative effect of immigration of close substitutes in production on the wage growth of competing native workers. This finding fits with the standard immigration model with perfect competition in product and labor markets, predicting real wages to reflect the marginal product of labor and immigrants who represent close substitutes in production to exert a downward pressure on the wages of competing native workers.

For the labor market segment of employees in product markets with strong regulatory restrictions to firm entry and in establishments with strong worker influence on firm decision-making, we observe instead that natives turn out to be shielded from such wage pressure. This result is consistent with effect dependence on interacting product market regulation and labor market regulation. Strong worker influence on the decision-making of profit-making firms creates a wedge between real wages and the marginal product of employees in this labor market segment, allowing for natives' wages to vary independently from changes to the marginal product of labor resulting from the immigration shock.

Our empirical analysis thereby reveals how regulatory conditions can obscure effects of labor market shocks on labor market outcomes which one might otherwise observe. In addition, we find indication of interacting product market regulation and labor market regulation being crucial, and indeed more so than one type of regulation in isolation. The implications of this finding are manifold and extend beyond the immigration literature; in particular, it suggests that the standard approach in the labor market literature that focuses on labor market institutions when investigating the impact of regulation on labor market outcomes misses an important part of the picture.

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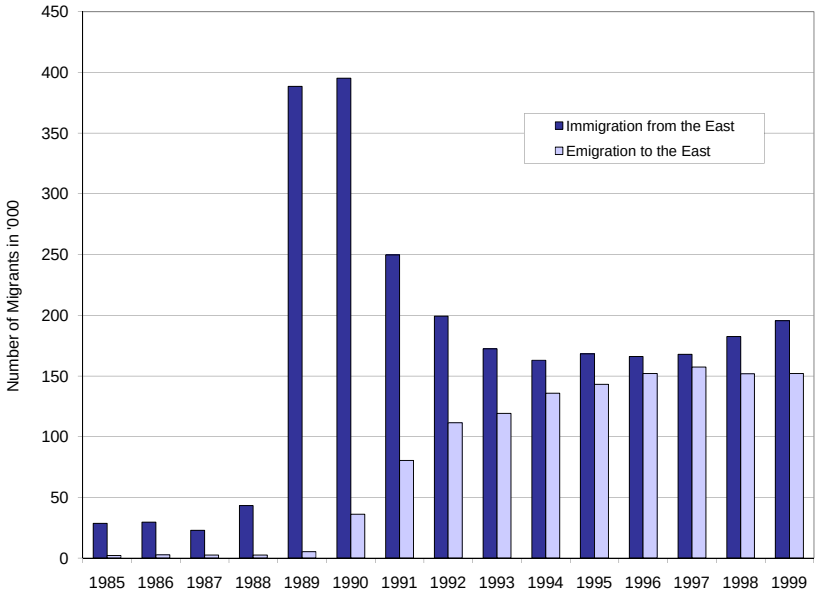
Figures and Tables

Figure 1: Migration between East and West Germany, 1985-1999



In this figure we show the pattern of migration between East and West Germany for the time period between 1985 and 1999.
Data source: Federal Statistical Office of Germany (Statistisches Bundesamt Deutschland).

Table 1: Mean real hourly wages of East and West Germans in the West German labor market

	West Germans			East Germans	
	1986	1992	1999	1992	1999
Employees in product markets without GTCC entry regulation and establishments...					
with weak worker influence	7.75	8.72	9.24	8.16	7.57
	(4.04)	(4.18)	(6.82)	(3.63)	(2.62)
with strong worker influence	9.29	10.61	11.37	10.06	10.94
	(4.45)	(3.58)	(7.01)	(3.45)	(4.82)
Employees in product markets with GTCC entry regulation and establishments...					
with weak worker influence	8.37	9.36	9.43	9.12	9.44
	(2.97)	(2.74)	(3.40)	(2.87)	(4.12)
with strong worker influence	9.25	10.69	11.57	9.73	10.58
	(2.80)	(2.78)	(3.78)	(2.76)	(3.42)

Notes: This table displays means of real hourly wages of employees in the West German labor market in 1991 Euro with standard deviations in brackets (see section 5.2 for details on the wage definition). We provide means per survey wave for four employee groups that differ with respect to product and labor market regulation. The calculations are based on a sample of 18,928 employees who participated in the survey waves 1986, 1992 or 1999, work between 10 and 75 hours per week in West Germany, grew up in East or West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report the relevant data for our analysis. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, and in occupations that are not accredited by the BMBF and the BIBB.

Table 2: The impact of East German immigrants on West Germans' wages, OLS and second stage estimates

	Dependent variable: log real hourly wages (w^W_{ijgt})					
	OLS	OLS	OLS	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory Variables:						
Share(East Germans, m^E_{jgt})	-.134			-.683		
	(.117)			(.674)		
No GTCC entry regulation (N) * m^E_{jgt}		-.341*			-1.613*	
		(.179)			(.977)	
GTCC entry regulation (R) * m^E_{jgt}		.073			.679	
		(.152)			(.852)	
Weak workers' influence (W) * m^E_{jgt}			-.426**			-1.157**
			(.155)			(.595)
Strong worker influence (S) * m^E_{jgt}			.168			.008
			(.149)			(.776)
Small establishment indicator			.001			-.003
			(.210)			(.206)
Individual characteristics (group-specific in col. 2-6)	Yes	Yes	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes	Yes	Yes
F-test: $\beta^R=\beta^N$ (p-value)		.085			.104	
F-test: $\beta^W=\beta^S$ (p-value)			.003			.079
Weak identification test: Kleibergen-Paap rk Wald F statistic				32.83 [1]	8.70 [2]	16.52 [2]

Notes: This table provides OLS and IV estimates of wage equations for our main sample with 17,776 employees in the survey waves 1986, 1992 or 1999 who work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, in occupations not accredited by the BMBF and the BIBB, and in occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions. See Table 3 for first stage results corresponding to columns (4)-(6). The individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2. In columns 2 and 5, these are interacted with the dummies for the different product market groups (N and R); in columns 3 and 5 these are interacted with the dummies for the different worker influence groups (W and S). Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. The numbers of first stage equations are given in brackets in the bottom row. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Table 3: First stage results for Table 2, columns (4)-(6)

	Dependent variables:				
	Share(East Germans, m^E_{jgt})	N*m^E_{jgt}	R*m^E_{jgt}	W*m^E_{jgt}	S*m^E_{jgt}
	(1)	(2)	(3)	(4)	(5)
Explanatory variables:					
Pool(East Germans with relevant training, p^E_{jgt})	.0013*** (.0003)				
No GTCC entry regulation (N)*p^E_{jgt}		.0012*** (.0003)	.0001 (.0001)		
GTCC entry regulation (R)*p^E_{jgt}		.0002 (.0001)	.0012*** (.0004)		
Weak worker influence (W)*p^E_{jgt}				.0011*** (.0002)	.0002 (.0001)
Strong worker influence (S)*p^E_{jgt}				.0002 (.0002)	.0012*** (.0002)
Establishment size indicator	No	No	No	Yes	Yes
Individual characteristics (group-specific in col. 2-5)	Yes	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes	Yes
F-test: $\beta^{excl.instr.} = 0$ (p-value)	23.38 (.00)	8.13 (.00)	5.59 (.00)	40.05 (.00)	39.74 (.00)

Notes: This table provides estimates of the first stage equations for the models in columns 4-6 of Table 2. All specifications use the main sample with 17,776 employees in the survey waves 1986, 1992 or 1999 who work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, in occupations not accredited by the BMBF and the BIBB, and in occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions. The individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2. In columns 2 and 3, these are interacted with the dummies for the different product market groups (N and R); in columns 4 and 5, these are interacted with the dummies for the different worker influence groups (W and S). Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Table 4: The Impact of East German Immigrants on West Germans' Wages by Labor Market Segment, OLS and Second Stage Estimates

	Dependent variable: Log real hourly wages (w^W_{ijgt})				
	OLS	OLS	IV	IV	IV
Explanatory variables:	(1)	(2)	(3)	(4)	(5)
(C) Classical labor market segment* Share(East Germans, m^E_{jgt})	-.634*** (.231)	-.675*** (.228)	-1.856** (.849)	-1.544** (.674)	-1.565** (.677)
(I.1) No GTCC entry regulation*Strong worker influence*m^E_{jgt}	-.0001 (.216)		-.892 (1.189)		
(I.2) GTCC entry regulation*Weak Worker Influence*m^E_{jgt}	-.177 (.198)		.080 (.874)		
(I) Intermediate labor market segment*m^E_{jgt}		-.092 (.147)		-.515 (.735)	-.527 (.745)
(B) Labor market segment with both regulations*m^E_{jgt}	.248 (.214)	.275 (.216)	1.113 (.927)	.698 (.819)	.704 (.816)
Group/Segment-specific individual characteristics	Yes	Yes	Yes	Yes	Yes
Group/Segment indicators	Yes	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes	Yes
F-test: $\beta^{I.1}=\beta^{I.2}$ (p-value)	.547		.547		
F-test: $\beta^C=\beta^I$ (p-value)		.024		.198	.190
F-test: $\beta^B=\beta^I$ (p-value)		.139		.075	.075
F-test: $\beta^B=\beta^C$ (p-value)	.007	.003	.026	.015	.013
Weak identification test:					
Kleibergen-Paap rk Wald F Statistic			4.29 [4]	11.28 [3]	8.56 [3]
Hansen J statistic (p-value)					.527

Notes: In this table, we show OLS and IV estimates of wage equations for our main sample with 17,776 employees in the survey waves 1986, 1992 or 1999 who work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, in occupations not accredited by the BMBF and the BIBB, and in occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions. Group/Segment-specific individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2, all interacted with the dummies for the different labor market segments or worker groups considered in the respective model. Indicators for the classical segment and the segment with both regulations are also included. The set of excluded instruments in columns 3 and 4 consists of interactions between the labor market segments/worker groups considered in the second stage equation with the pool of East German employees in age-group g and time period t who work in any occupation in East or West Germany, who grew up in East Germany and received a vocational training degree during GDR times that is relevant to occupation j. In column 5, the set of instruments consists of the four interactions of the pool measurement with the four worker groups C, B, $I.1$ and $I.2$. See Table 5 for first stage results corresponding to column 5. Observations are weighted to take the sampling design into account. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. The numbers of first stage equations are given in brackets in the bottom row. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Table 5: First stage results for Table 4, column 5

Explanatory variables:	Dependent variables: Classical segment *Share(East Germans, m^E_{jgt}) (1)	Intermediate segment *m^E_{jgt} (2)	Segment with both regulations *m^E_{jgt} (3)
(C) Classical labor market segment* Pool(East Germans with relevant training, p^E_{jgt})	.0011*** (.0002)	.0002 (.0002)	-.00001 (.00006)
(I.1) No GTCC entry regulation*Strong worker influence*p^E_{jgt}	.0002 (.0002)	.0012*** (.0002)	-.00002 (.00006)
(I.2) GTCC entry regulation*Weak worker influence*p^E_{jgt}	.0001 (.0001)	.0013*** (.0003)	.00004 (.0002)
(B) Labor market segment with both regulations*p^E_{jgt}	.0001 (.0001)	.0001 (.0002)	.0013*** (.0002)
Segment-specific individual characteristics	Yes	Yes	Yes
Segment indicators	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes
F-test: $\beta^{excl.instr.} = 0$ (p-value)	18.58 (.00)	24.70 (.00)	17.17 (.00)

Notes: This table provides estimates of the first stage equations for the model in column 5 of Table 4. We use the main sample with 17,776 employees in the survey waves 1986, 1992 or 1999 who work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, in occupations not accredited by the BMBF and the BIBB, and in occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions. Segment-specific individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2, all interacted with the dummies for the three labor market segments considered here. Indicators for the classical segment and the segment with both regulations are also included. Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age-group cells. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Table 6: The impact of East German immigrants on West Germans' on-the-job tasks by labor market segment

OLS and second stage estimates

	Dependent variable:			
	Interactive tasks		Advanced tasks	
	OLS	IV	OLS	IV
Explanatory variables:	(1)	(2)	(3)	(4)
(C) Classical labor market segment*	.100	.906*	.239*	.962**
Share(East Germans, m^E_{jgt})	(.165)	(.489)	(.131)	(.441)
(I) Intermediate labor market	-.047	.683	.178*	.751*
segment*m^E_{jgt}	(.111)	(.524)	(.091)	(.399)
(B) Labor market segment with both	.088	1.403**	.140	1.063*
regulations*m^E_{jgt}	(.193)	(.626)	(.187)	(.594)
Segment-specific				
individual characteristics	Yes	Yes	Yes	Yes
Segment Indicators	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes
F-test: $\beta^C=\beta^I$ (p-value)	.438	.513	.659	.456
F-test: $\beta^B=\beta^I$ (p-value)	.522	.150	.854	.490
F-test: $\beta^B=\beta^C$ (p-value)	.963	.402	.664	.859
Weak identification test:				
Kleinbergen-Paap rk Wald F statistic		8.56[3]		8.56[3]
Hansen J statistic (p-value)		.516		.521
Observations	17,776	17,776	17,776	17,776

Notes: In columns 1 and 2, we provide OLS and IV estimates of equations explaining the extent to which employees perform interactive tasks on the job. OLS and IV estimates of equations explaining the extent to which they perform advanced tasks like designing, making plans, monitoring machines etc. are shown in columns 3 and 4. We use the main sample with 17,776 employees in the survey waves 1986, 1992 or 1999 who work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, in occupations not accredited by the BMBF and the BIBB, and in occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions. Segment-specific individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2, all interacted with the dummies for the three labor market segments considered here. Indicators for the classical segment and the segment with both regulations are also included. Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. The numbers of first stage equations are given in brackets in the bottom row. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Table 7: The Impact of East German immigrants on West Germans' wages; Alternative models and samples

OLS and second stage estimates

	Dependent Variable: Log real hourly wages (w^W_{ijgt})			
	OLS	IV	OLS	IV
Explanatory variables:	(1)	(2)	(3)	(4)
(C) Classical labor market segment* Share(East Germans, m^E_{jgt})	-.518** (.246)	-1.607** (.749)	-.631*** (.228)	-1.392** (.677)
(I) Intermediate labor market segment*m^E_{jgt}	-.066 (.150)	-.663 (.800)	-.081 (.148)	-.409 (.709)
(B) Labor market segment with both regulations*m^E_{jgt}	.386 (.219)	.642 (.877)	.318 (.218)	.450 (.741)
C*ln(West Germans$_{jgt}$)			.009 (.022)	.003 (.023)
I*ln(West Germans$_{jgt}$)			.018 (.018)	.012 (.021)
B*ln(West Germans$_{jgt}$)			.038* (.021)	.035 (.024)
C*Ratio(West Germans with medium education$_{jgt}$)			.014 (.091)	.015 (.010)
I*Ratio(West Germans with medium education$_{jgt}$)			-.054 (.063)	-.040 (.066)
B*Ratio(West Germans with medium education$_{jgt}$)			-.007 (.011)	-.004 (.108)
Segment-specific individual characteristics	Yes	Yes	Yes	Yes
Segment Indicators	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes
F-test: $\beta^C=\beta^I$ (p-value)	.106	.308	.036	.149
F-test: $\beta^B=\beta^I$ (p-value)	.065	.068	.110	.163
F-test: $\beta^B=\beta^C$ (p-value)	.009	.029	.003	.020
Weak identification test:				
Kleinbergen-Paap rk Wald F statistic		8.88[3]		8.72[3]
Hansen J statistic (p-value)		.209		.573
Observations	16,531	16,531	17,776	17,776

Notes: In columns 1 and 2, we provide OLS and IV estimates of wage equations for a subsample of 16,531 observations from the main sample (see Table 4 for details). All observations used here are for employees who did not experience an occupational change after 1989. In columns 3 and 4, we provide the estimates of a model specification with additional interactions between the dummies for the three labor market segments and the following variables: 1) the logarithm of the size of the native workforce with medium education per occupation-age-time cell in the West German labor market as well as 2) the ratio of medium-educated natives relative to the total native workforce per West German occupation-age-time cell. For these regressions, we use the main sample with 17,776 observations. Segment-specific individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2, all interacted with the dummies for the three labor market segments considered here. Indicators for the classical segment and the segment with both regulations are also included. Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. The numbers of first stage equations are given in brackets in the bottom row. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Table 8: The Impact of East German immigrants on West Germans' wages; Alternative measures and samples

OLS and second stage estimates

	Dependent variable: Log real hourly wages (w^W_{ijgt})			
	OLS	IV	OLS	IV
Explanatory variables:	(1)	(2)	(3)	(4)
(C) Classical labor market segment* Share(East Germans, m^E_{jgt})	-.787***	-1.819***	-.669***	-1.320**
	(.278)	(.727)	(.238)	(.645)
(I) Intermediate labor market segment*m^E_{jgt}	-.016	-.866	-.082	-.352
	(.166)	(.885)	(.160)	(.850)
(B) Labor market segment with both regulations*m^E_{jgt}	.229	.414	.456	.726
	(.256)	(.951)	(.261)	(.910)
Segment-specific individual characteristics	Yes	Yes	Yes	Yes
Segment Indicators	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes
F-test: $\beta^C=\beta^I$ (p-value)	.015	.303	.034	.224
F-test: $\beta^B=\beta^I$ (p-value)	.379	.085	.079	.135
F-test: $\beta^B=\beta^C$ (p-value)	.008	.033	.002	.028
Weak identification test:				
Kleinbergen-Paap rk Wald F statistic		9.61[3]		8.08[3]
Hansen J statistic (p-value)		.218		.543
Observations	14,061	14,061	15,710	15,710

Notes: In columns 1 and 2, we provide OLS and IV estimates of wage equations for a subsample of 14,061 observations from the main sample (see Table 4 for details). All these observations fulfill a stricter definition of product markets with and without the firm entry regulation in the GTCC; this definition relies on information on the occupations and industries employees are active in and on the occupational distribution among entrepreneurs in these industries (see Footnote 44). In columns 3 and 4, we exclude establishments that have more than 1000 employees, reducing the main sample to 15,710 observations. Segment-specific individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2, all interacted with the dummies for the three labor market segments considered here. Indicators for the classical segment and the segment with both regulations are also included. Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. The numbers of first stage equations are given in brackets in the bottom row. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Appendix A: Tables

Table A-1: Definitions of variables and descriptive statistics

Variable	Definition	Mean/ share	Standard deviation
Wage_{ijgt}	real hourly wage of medium educated employee i in Euro (base year: 1991)	9.59	4.28
$\text{Immigration rate}_{jgt}$	share of medium-educated East Germans in occupation-age-time cell jgt of the West German labor market	.02	.04
$\text{Number of immigrants}_{jgt}$	number of medium-educated East Germans in occupation-age-time cell jgt of the West German labor market	1.54	2.88
Pool(East Germans with relevant training)$_{jgt}$	weighted pool of medium-educated East Germans in age-time cell gt in East/West Germany with a training degree relevant to occupation j (p^{E}_{jgt})	15.57	17.15
1^{st} alternative pool_{jgt}	weighted pool of medium-educated East Germans in age-time cell gt in East/West Germany with vocational training in occupation j ($p^{E,1}_{jgt}$)	4.96	7.16
2^{nd} alternative pool_{jgt}	unweighted pool of medium-educated East Germans in age-time cell gt in East/West Germany with vocational training in occupation j ($p^{E,2}_{jgt}$)	8.77	11.94
$\text{Firm entry regulation}_{j}$	1: firm entry regulation of the German Trade and Crafts Code in occupation j, 0: otherwise	.40	
$\text{Worker influence}_{ijgt}$	1: strong worker influence on decision-making of firms (worker in establishments with $\geq$ 50 employees), 0: weak worker influence ($<$ 50 employees)	.55	
Age_{ijgt}	age of employee i in years at the survey date	37.32	8.28
Tenure_{ijgt}	years of work for current employer	11.52	8.17
Gender_{ijgt}	1: male, 0: female	.64	
$\text{Interactive tasks}_{ijgt}$	share of interactive tasks of all tasks performed by i (teaching, advising, buying and selling, coordinating, negotiating)	.27	.30
$\text{Advanced tasks}_{ijgt}$	share of advanced tasks of all tasks performed by i (researching,designing, restoring, servicing machines, equipping machines)	.18	.25
$\text{West Germans}_{jgt}$	number of medium-educated natives in occupation -age-time cell jgt of West German labor market	64.17	60.47
Ratio(West Germans with medium education_{jgt})	ratio of medium-educated natives to total native workforce in occupation-age-time cell jgt of West German labor market	.86	.13

Notes: This table provides non-weighted descriptive statistics for the main sample of 17,776 employees who participated in the survey waves 1986, 1992 or 1999, work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, and in occupations that are not accredited by the BMBF and the BIBB. In addition, we excluded all occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions.

Table A-2: Employer size distribution across product market groups

Number of employees	Product markets without GTCC entry regulation		Product markets with GTCC entry regulation	
1-4	11.65		8.09	
5-499	74.04		74.11	
5-9		*16.48*		*17.26*
10-49		*28.49*		*31.52*
50-99		*11.58*		*9.45*
100-499		*17.50*		*15.87*
500 or more	14.30		17.81	
500-999		*4.58*		*4.95*
1000 or more		*9.72*		*12.86*

Notes: In this table, we show the distribution of employees in the West German labor market across establishment size classes in product markets with GTCC firm entry regulation and product markets without it. The calculations are based on a sample of 18,928 employees who participated in the survey waves 1986, 1992 or 1999, work between 10 and 75 hours per week in West Germany, grew up in East or West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, and in occupations that are not accredited by the BMBF and the BIBB.

Table A-3: Distribution of West Germans' wages across occupation-age-time cells

	Survey wave		
	1986	1992	1999
	median of natives' average real hourly wage in occupation-age-time cells (10-percent percentile; 90-percent percentile)		
Classical labor market segment	7.8471	9.0982	9.5402
	(6.0649; 10.3743)	(6.6428; 12.1344)	(6.9104; 13.3069)
Intermediate labor market segment	8.6552	9.8702	10.0294
	(6.6389; 11.0630)	(7.5603; 12.4880)	(7.5016; 13.0515)
Labor market segment with both regulations	8.8270	10.2799	10.8333
	(7.3697; 10.7340)	(8.4869; 12.4832)	(8.7485; 13.1514)

Notes: In this table, we describe the sample distribution of West Germans' real hourly wages per survey wave (1986, 1992 and 1999) and per labor market segment (no regulation, intermediate and both regulations). In each class, we display the median, the 10-percent as well as the 90-percent percentile of the average real hourly wage of West Germans in occupation-age-time cells. The calculations are based on the main sample of 17,776 employees. All these individuals participated in the survey waves 1986, 1992 or 1999, work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report the relevant data for our analysis. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, and in occupations that are not accredited by the BMBF and the BIBB. In addition, we excluded all occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions.

Table A-4: Distribution of the immigration rate of East Germans' to West Germany across occupation-age-time cells

	Survey wave		
	1986	1992	1999
	median of immigration rate in occupation-age-time cells (10-percent percentile; 90-percent percentile)		
Classical labor market segment	0	0.0138	0.0388
	(0; 0)	(0; 0.0574)	(0; 0.1056)
Intermediate labor market segment	0	0.0095	0.02914
	(0; 0)	(0; 0.0839)	(0; 0.0906)
Labor market segment with both regulations	0	0.0220	0.0340
	(0; 0)	(0; 0.1108)	(0; 0.0791)

Notes: In this table, we describe the sample distribution of the immigration rate of East Germans to West Germany per survey wave (1986, 1992 and 1999) and per labor market segment (no regulation, intermediate and both regulations). In each class, we display the median, the 10-percent as well as the 90-percent percentile of the immigration rate in occupation-age-time cells. The calculations are based on the main sample of 17,776 employees. All these individuals participated in the survey waves 1986, 1992 or 1999, work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report the relevant data for our analysis. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, and in occupations that are not accredited by the BMBF and the BIBB. In addition, we excluded all occupation-age-time cells that cover less than 5 employees fulfilling the previously mentioned conditions.

Table A-5: The Impact of East German Immigrants on West Germans' Wages by Labor Market Segment, OLS and Second Stage Estimates

	Dependent variable: Log real hourly wages (w^W_{ijgt})				
	OLS	OLS	IV	IV	IV
Explanatory variables:	(1)	(2)	(3)	(4)	(5)
(C) Classical labor market segment* Number(East Germans, E_{jgt})	-.011*** (.003)	-.011*** (.003)	-.013** (.006)	-.014** (.006)	-.013** (.006)
(I.1) No GTCC entry regulation*Strong worker influence*E_{jgt}	-.006 (.004)		-.007 (.009)		
(I.2) GTCC entry regulation*Weak Workers' Influence*E_{jgt}	-.003 (.006)		-.009 (.015)		
(I) Intermediate labor market segment* E_{jgt}		-.006* (.004)		-.007 (.008)	-.007 (.008)
(B) Labor Market Segment with Both Regulations*E_{jgt}	.009 (.005)	.008 (.005)	.009 (.011)	.010 (.010)	.010 (.010)
Group/Segment-specific individual characteristics	Yes	Yes	Yes	Yes	Yes
Group/Segment indicators	Yes	Yes	Yes	Yes	Yes
Occupation-age effects	Yes	Yes	Yes	Yes	Yes
Occupation-time effects	Yes	Yes	Yes	Yes	Yes
Age-time effects	Yes	Yes	Yes	Yes	Yes
Industry-time effects	Yes	Yes	Yes	Yes	Yes
F-test: $\beta^{I.1}=\beta^{I.2}$ (p-value)	.652		.921		
F-test: $\beta^C=\beta^I$ (p-value)		.175		.292	.298
F-test: $\beta^B=\beta^I$ (p-value)		.014		.056	.063
F-test: $\beta^B=\beta^C$ (p-value)	.001	.001	.059	.014	.012
Weak identification test:					
Kleibergen-Paap rk Wald F Statistic			5.81 [4]	12.94 [3]	11.94 [3]
Hansen J statistic (p-value)					.954

Notes: In this table, we show OLS and IV estimates of wage equations for our main sample with 17,776 employees in the survey waves 1986, 1992 or 1999 who work between 10 and 75 hours per week in West Germany, grew up in West Germany, have German citizenship, are between 25 and 54 years old, have a medium level of education, and report all the data relevant here. Excluded are employees in the public sector, in non-profit organizations or the mining and quarrying sector, in occupations not accredited by the BMBF and the BIBB, and in occupation-age-time cells that cover less than 5 employees fulfilling the before-mentioned conditions. Group/Segment-specific individual characteristics are age, age^2, a gender dummy, tenure, and tenure^2, all interacted with the dummies for the different labor market segments or worker groups considered in the respective model. Indicators for the classical segment and the segment with both regulations are also included. The set of excluded instruments in columns 3 and 4 consists of interactions between the labor market segments/worker groups considered in the second stage equation with the pool of East German employees in age-group g and time period t who work in any occupation in East or West Germany, grew up in East Germany and received a vocational training degree during GDR times that is relevant to occupation j. In column 5 the set of instruments consists of the four interactions of the pool measure with the four worker groups C, B, $I.1$ and $I.2$. Observations are weighted to take account of the sampling design. Robust standard errors in parentheses allow for correlation between observations within occupation-age cells. The numbers of first stage equations are given in brackets at the bottom of the table. Statistical significance at the 1% (5%, 10%) level is indicated by *** (**,*).

Appendix B: Data

The "Qualification and Career Survey" is a survey carried out by the German Federal Institute for Vocational Training and the Research Institute of the Federal Employment Service. It includes three cross-sections for the 1980s and 90s: 1985/86, 1991/92 and 1998/99. Each survey wave has about 30,000 observations; men and women are covered. The sampling frame of the survey is the German population of employed individuals aged 16 to 65. The selection of the sample follows a random-route process which is done on the household level. The targeted person in the household was personally interviewed; in later survey years, the interviews were done using a computer-assisted personal interview method (CAPI). In order to guarantee the representativeness of the survey data, the data set includes several weighting factors. One weighting factor accounts for the fact that the sampling probability in random-route processes depends on household size. Another weighting factor allows for the adjustment of the sample to the population according to the characteristics gender, age, occupational status, state, and size of the municipality (the reference statistics come typically from the German micro census, a 1 percent random sample of the German population). We use both weighting factors in the empirical analysis at hand.

For reasons explained in detail in the main body of the paper, the population of interest for our study consists of employees in the West German labor market who grew up in West Germany, currently reside in West Germany, are German citizens and between 25 and 54 years old. They work between 10 and 75 hours per week, have medium education, that is, they graduated from a vocational school or have a vocational training degree from the dual system of apprenticeship, and report the relevant data for our analysis. In addition, occupations that are not accredited by the Ministry of Education and Research (BMBF) and the German Federal Institute for Vocational Training (BIBB) are excluded, as well as employees in the public sector, in non-profit organizations or the mining and quarrying sector. Moreover, we have eliminated all small occupation-age-time cells with less than 5 employees. Altogether, these restrictions reduce our sample size to 17,776 observations.

Appendix C: Work Councils and Wage Bargaining

Work councils are one component of the German industrial relations system, the other two components being trade unions and employers' associations. In the context of wage agreements work councils' decisions are, in principle, subordinate to the decisions made by unions and employers' associations and collective wage bargaining takes place between unions and employers' associations.[62]

The recognition of trade unions is, however, at the discretion of the firm, such that union contracts cover only the workers in firms that recognize the relevant union(s). In addition, these union contracts set wage floors only and work councils have become more involved in wage bargaining in recent decades. Spurred on by the decline in coverage of the German industrial relations system since the late 1980s, the system has been restructured to a large extent. While looking similar from the outside, establishment-level agreements ("betriebliche Bündnisse zur Beschäftigungs- und Wettbewerbssicherung"), for example, have increased the flexibility of the system internally. In addition, "opening clauses" were implemented into collective agreements (see, e.g., Hassel, 1999, Hassel and Rehder, 2001, or Carlin and Soskice, 2009). These measures decentralized wage bargaining in Germany and increased the importance of work councils relative to unions, work councils being the institution of plant-level codetermination. As Addison et al. 2009, p.8, put it: "..., issues that were formerly dealt with only under collective bargaining are increasingly being addressed within the domain of work councils". In a similar vein, Hassel and Rehder, 2001, argue that the hierarchical ordering between collective bargaining and establishment-level negotiation has changed, with collective agreements no longer superseding establishment-level agreements.

In our empirical specifications we control for time-varying effects of industry level wage bargaining on wages by including industry-time effects (in addition to occupation-time effects).

[62]There is far less subordination with respect to the involvement of work councils in hiring and firing decisions.