Crossing Borders: Labor Market Effects of European Integration*

Hannah Illing†
University of Bonn,
IAB, IZA

Comments welcome!

February 2023

Abstract

This paper studies the labor market effects of out- and in-migration in the context of cross-border commuting. It investigates an EU policy reform that granted Czech citizens full access to the German labor market, resulting in a Czech commuter outflow across the border to Germany. Exploiting the fact that the reform specifically impacted the Czech and German border regions, I use a matched difference-in-differences design to estimate its effects on local labor markets in both countries. Using a novel dataset on Czech regions, I show that municipalities in the Czech border region experienced a decrease in unemployment rates due to the worker outflow, and a corresponding increase in vacancies. For German border municipalities, I find evidence for slower employment growth (long-term) and slower wage growth (short-term), but no displacement effects for incumbent native workers.

Keywords: Out-Migration, In-Migration, Local Labor Markets
JEL codes: J61, J15, R23

*I am grateful to Wolfgang Dauth and Johannes Schmieder for their guidance and invaluable support throughout this project. In addition, I thank Maria Balgova, Christian Dustmann, Bernd Fitzenberger, Anette Haas, Anna Houštecká, Ingo Isphording, Philipp Jaschke, Sekou Keita, Olexiy Kyrychenko, Kevin Lang, Fabian Mierisch, Michael Moritz, Daniele Paserman, Amelie Schiprowski, Uta Schönberg, Hanna Schwank, Michal Svoboda, Erwin Winkler, and Christian Zimpelmann. This paper benefited from comments and suggestions at the CRC retreat in Mainz 2022, the Verein für Socialpolitik conference 2022, the virtual meetings of the EEA-ESEM 2021, the conference of the Czech Economic Society 2021, the Urban Economics Association 2020, ERSA 2020, EALE/SOLE/AASLE 2020, IZA, ZEW, the University of Frankfurt, CReAM, Boston University, and the Institute for Employment Research (IAB). Special thanks to the IAB Data Management Unit for providing the German data. I am moreover grateful to Radek Valenta from the Czech Statistical Office for his help with the Czech data. I acknowledge financial support from the Graduate Program of the IAB and the University of Erlangen-Nuremberg (GradAB). Support by the German Research Foundation (DFG) through CRC TR 224 (Project A05) is gratefully acknowledged. All errors are my own.

†Institute for Applied Microeconomics, Department of Economics, hannah.illing@uni-bonn.de

1 Introduction

The impact of worker outflows and inflows is at the center of recent policy debates in OECD countries. Origin countries, some of which struggle with ageing populations and skilled worker shortages[1], are concerned about dampened economic growth as a result of talent outflows. In destination countries, the policy debate often revolves around fears that migrant inflows may depress wages and result in job losses for native workers. In both types of countries, there are public discussions on whether emigration and immigration may have contributed to the rise in populism in recent years.

While there are extensive bodies of literature on the labor market effects of in-migration on destination countries (e.g., Beerli et al. 2021; Dustmann et al. 2017; Ottaviano and Peri 2012; Borjas 2003; Card 1990) and on the consequences of out-migration on origin countries (e.g., Bütikofer et al. forthcoming; Dustmann et al. 2015; Aydemir and Borjas 2007), no study has yet analyzed the impact of one immigration policy on both origin and destination countries simultaneously. Previous studies often treat the destination and origin country labor markets as separate; however, in many real-world settings, they are integrated local labor markets with substantial cross-border exchange.

In this paper, I investigate the long-term labor market effects of both out-migration and in-migration using the 2004 EU enlargement as a case study. To estimate causal effects, I exploit the spatial variation in the extent to which the policy affected Czech and German regions: I show that when Germany opened its labor market to workers from its neighboring country the Czech Republic in 2011, the majority of Czech migrants began commuting to German municipalities in close proximity to the border, suggesting that location, rather than the economic situation in a given German municipality, played a role in Czech workers' mobility decisions. On the German side of the border, the labor supply of medium-skilled workers (i.e., workers with vocational training) increased as a result of the Czech worker inflow, which is consistent with the findings from previous studies that migrants from Eastern Europe are relatively high-skilled (Kahanec and Pytliková 2017; Zaiceva and Zimmermann 2008). The great advantage of this setting is that it allows me to investigate the effects of the *same* migration flow on both the origin and destination country.

The opening of the German labor market to Czech workers in 2011 was the result of one

[1]For example, half of all Central, Eastern, and Southeastern European countries are expected to lose 5% of their population by 2030, and 15% by 2050 (Batog et al., 2019).

of the largest policy reforms in the history of the EU: the accession of 8 Central and Eastern European countries in 2004. When Germany opened its labor market to Czech workers in 2011, they were allowed to work in Germany without a visa or work permit and with exactly the same rights as German nationals.[2] Given the substantially lower wages in Eastern Europe than Western Europe, this policy reform led to migration flows from east to west, with very few German workers commuting to the Czech Republic.[3]

To study the labor market effects of this worker outflow and inflow, I analyze a novel dataset on Czech regions provided by the Czech Statistical Office and detailed social-security data for Germany, provided by the Institute for Employment Research (IAB). For each country, I estimate separate difference-in-differences regression models, comparing the border region to a set of matched control regions before and after the policy change.

My dynamic difference-in-differences analysis shows that the reform had a substantial effect on migration flows from the Czech Republic to Germany: Czech labor in the German border region increased by 2.3 percentage points in 2011-2017 compared to matched control regions, which represents a 230% increase of the baseline mean. The Czech immigrants were predominantely medium-skilled, male, and earned about 84% of native workers' wages. One caveat of the policy reform for my empirical analysis is that it granted labor market access not only to Czech workers, but to workers from any EU8 country. This means that migration to the matched control regions also increased after 2011, making the labor market shock less sharp. As a result, the *overall* migrant share of medium-skilled workers in 2011-2017 increased by only about 0.9% in the German border region relative to matched controls. This suggests that my estimates for Germany likely represent lower bounds.

In the Czech border regions, the worker outflow corresponded to approximately 1.2 to 2.8% of the working age population between 2012 and 2018.[4] While the Czech data does not contain information on local out-migration rates, it is highly unlikely that there were large

[2]Germany, together with Austria, had delayed access to its labor market for fear of negative effects on native workers for the maximum possible amount of time (e.g., Sinn, 2000), but it was legally obliged to open it in 2011 (see Section 2 for more details). Other countries such as the UK and Sweden opened their borders immediately. See Figure A1 for the details.

[3]According to data provided by the Czech Statistical Office, the average monthly gross wage in the Czech regions bordering West Germany in 2010 was approximately 840 EUR. The average monthly gross wage of a German worker on the other side of the border in 2010 was approximately twice that.

[4]To get at these figures, I compute the share of Czech workers in Germany by the working age population in Czech counties bordering Germany. I thereby assume that i) Czech workers in Germany live in the Czech border region and ii) most of the Czech emigrants continue to be registered in Czech Republic. I cannot prove the first assumption but I provide evidence for the second assumption, showing that 77% of Czechs in Germany report that they live abroad.

worker outflows from the Czech control regions. All European countries except Germany and Austria opened their labor markets to Czech workers prior to 2011, so such outflows should have occurred much earlier. In fact, according to data from Eurostat (2020), the share of Czechs leaving their country fell from 0.6% in 2009 to just above 0.2% in 2013.

In terms of labor market effects, I show that the integration of the Czech and the German labor market benefited Czech workers while causing shortages of skilled workers for Czech firms. Following 2011, unemployment rates in Czech border counties relative to matched control regions substantially decreased (-7.6% relative to the average in 2010), while vacancies increased (+5.51%). In line with this, the number of applicants per job decreased by almost 10%, indicating an increasingly tight labor market.

For Germany, I document slower native full-time wage and employment growth in border municipalities compared to matched controls. In border municipalities, native employment by 2010 employment was on a 2 to 5 percentage points slower growth trajectory in 2011-2017, with the gap increasing over time as more Czechs started to commute to Germany. Native wages grew more slowly by about 2% in the two years following the labor market opening, but caught up with control regions thereafter. The slower employment growth was particularly salient in the two occupations that experienced a large influx of workers from the new EU member states: "manufacturing & repair" and "traffic & security". Finally, for a cohort of workers who were employed in the matched regions in 2010, I show that there were almost no differences in labor market outcomes. This suggests that incumbent native workers did not lose their jobs or experienced wage cuts as a result of the labor market integration. Instead, firms hired fewer new native workers than they would have in the counterfactual situation, at temporarily lower wages.

Finally, I study the effects of the labor market opening on German firms with strong ties to the Czech Republic. Previous research has demonstrated that the proportion of migrants working in a firm is correlated with the firm's foreign direct investments (e.g., Bhattacharya and Groznik, 2008; Buch et al., 2006). This relationship may also be present in the Czech-German border region, where many German headquarters and their Czech affiliates are located (see Hecht, 2017; Schäffler et al., 2017). To investigate this, I utilize a firm identifier first used in Münich et al. (2014), which classifies which German firms had affiliates in the Czech Republic in 2010. I find that these firms experienced a significant inflow of migrants: Their share of EU migrants increased by 1.1 percentage points, or 93% in the post-treatment period

compared to 2010. The negative wage effects are exclusively concentrated in these FDI firms, possibly as a result of a combined effect of the labor supply shock and increased outsourcing following the labor market opening. As Burchardi et al. (2019) and Javorcik et al. (2011) have demonstrated, a higher share of migrants in the workforce drives foreign direct investment.

My estimates hold up to a variety of robustness checks. For example, I show that they are robust to variations in the matching specification, such as adding additional matching variables, varying the year in which I measure the matching variables, or using propensity score matching instead of mahalanobis distance matching. I also present specifications where I exclude East Germany from my sample and where I focus on the Czech border region to Germany, only. Results from placebo treatment regressions show no effects.

This paper contributes to the literature on the labor market effects of the 2004 EU Enlargement. Most existing studies concentrate on the impact of immigration on destination countries, often in specific industries such as construction (e.g. Kuosmanen and Meriläinen, forthcoming; Bratsberg et al., forthcoming; Åslund and Engdahl, 2019; Schmieder and Weber, 2018; Lemos and Portes, 2014). Hammer and Hertweck (2022) is a comparable study for Germany, which shows how immigration after 2011 affected native workers' wages and employment. Using an instrumental variable approach, they find negative short-term wage effects and positive effects on native employment. I add to these studies by showing how local labor markets evolved in response to the policy reform in both the destination and origin country. The conclusions I draw are not only relevant for policymakers interested in evaluating the labor market effects of the EU enlargement. More generally, I provide insights into the dynamics involved in the event of the large-scale, long-term labor market integration of two neighboring countries during a period of economic growth.

More generally, this paper is related to studies on the labor market effects of cross-border commuting, in particular to Dustmann et al. (2017) and Beerli et al. (2021). Dustmann et al. (2017) assess a commuting policy in the Czech-German border region from 1991-1993, 20 years prior to the policy studied here. They focus on regional labor market effects on the German side of the border only and report a sharp decline in regional-level native employment and a moderate decline in regional-level native wages. Beerli et al. (2021) consider a commuting reform that granted European cross-border workers free access to the Swiss labor market in 2004. They show that the reform led to increased labor demand in skill-intensive firms, benefitting the firms in terms of size, productivity, and innovation.

In addition, my analysis is inspired by studies investigating the effects of out-migration. DiCarlo (2022) studies a Swiss commuting policy and shows that worker outflows resulted in decreased productivity for Italian firms. Bütikofer et al. (forthcoming) and Hafner (2020) find positive wage and employment effects for stayers as a result of out-migration in relatively wealthy European border regions. Studies on out-migration more generally, such as Dustmann et al. (2015), Elsner (2013), and Aydemir and Borjas (2007), document that stayers benefit from worker outflows in terms of wage increases. I contribute to this literature by providing evidence on regional unemployment rates and vacancies in a context with high cross-country wage differentials and cross-border flows.

The remainder of the paper is organized as follows. Section 2 describes the 2004 EU enlargement and the resulting policy on the free movement of labor, followed by a simple conceptual framework in Section 3. Section 4 provides an overview of the Czech and German data used in this study. Section 5 discusses the empirical strategy, including a detailed account of the matching method. Section 6 presents the results, with a discussion of robustness checks in Section 7. Section 8 concludes.

2 Institutional Background

The Policy Reform: EU Enlargement The focus of this paper is the 2004 EU enlargement in which eight Central and Eastern European countries (EU8) as well as Malta and Cyprus joined the EU.[5] The enlargement corresponds to one of the largest policy reforms in the history of the EU, resulting in 75 million new citizens, a number just below the overall population of the EU's largest member state, Germany.

Within the EU, the "four freedoms" apply: the free movement of capital, goods, services, and labor.[6] I focus on the free movement of labor, a regulation entailing that any EU citizen can work in another EU country without the need to apply for a visa or work permit. This means that the same hiring conditions apply for a worker from, e.g., the Czech Republic as for a German worker, and native workers are not given priority.

When the Central and Eastern European countries accessed the EU in 2004, some countries, such as the UK and Sweden, immediately opened their labor markets to workers from

[5]The full list of countries is Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia.

[6]See Dorn and Zweimüller (2021) for a more general overview on migration in the course of European integration.

Central and Eastern Europe, while other countries delayed access. Countries could delay access to their labor markets for up to seven years in what became known as the "2+3+2" regulation. Germany and Austria were the only countries to delay access for the maximum possible time span of seven years; in May 2011, they were finally obliged to open their labor markets.[7]

Note that the opening of the German labor market was widely discussed in advance and both firms and workers may thus have anticipated the worker flows; pre-reform adjustments to firms' capital could have helped local labor markets to better absorb the shock. Another potential concern is that during the period under study, not only migration flows changed, but trade flows between Germany and the Czech Republic increased, potentially reinforced by migration flows (cf. Muñoz, 2022). This was indeed the case: According to the UN Comtrade Database (UN Comtrade, 2022), goods exports from Germany to the Czech Republic increased by a factor of 1.3 between 2007 and 2017. This rate was however almost three times as large in the 1990s and early 2000s.[8] Similarly, while German firms had started investing in the Czech Republic in the 1990s and 2000s already (cf. Körner et al. (2021)), I cannot rule out that the 2011 labor market opening reinforced these investments. In Section 5.4, I discuss the challenges for my empirical strategy in more detail, and I also provide evidence to alleviate some of the concerns.

Figure A1 provides an overview of the Eastern-Western European integration process, which began with the fall of the iron curtain in 1989. Around this time, German citizens began crossing the border into the Czech Republic to buy, e.g., relatively cheap cigarettes and fuel. In 2004, the Czech Republic became a member of the EU, resulting in increased political and economic exchanges between the two countries. Cross-border exchanges increased once more with the elimination of border controls (the *Schengen Agreement*) in 2007.

Access to the German Labor Market for Czech Workers Prior to 2011 Czechs first started to work in Germany after the fall of the iron curtain in the beginning of the 1990s (Dustmann et al., 2017; Moritz, 2011). They were allowed to work in Germany under the so-called *Anwerbestoppausnahmeverordnung*, a regulation that allowed specific groups of workers to take up employment, despite a more general ban on immigration.

[7]For workers from Malta and Cyprus, the German labor market was opened immediately in 2004. Note that in this paper, I therefore refer to the EU8 countries, excluding Malta and Cyprus.

[8]See Dauth et al. (2014) for detailed evidence on German trade with Eastern European countries.

Czech workers were able to take up work in specified counties in the German border region, as long as they i) commuted across the border daily, or ii) worked in Germany not more than 2 days a week. This regulation was valid with minor modifications up to 2011, when it was repealed alltogether. This is the reason why the share of Czech workers prior to the reform was not 0, but stayed relatively constant at around 1% (cf. Figure A5).

The opening of the German labor market under the free-movement-policy in 2011 resulted in two key changes: First, Czech workers could now work in Germany without needing a visa or work permit, significantly reducing the bureaucratic burden and thus costs for both firms and workers. Second, the principle of prioritizing native workers was lifted, meaning that firms no longer had to demonstrate that there were no suitable native workers available for the job.

It is possible that Czech or EU8 workers worked in the informal sector prior to 2011, in which case the migrant inflows I measure may partially reflect a shift from non-formal to formal employment. In that scenario, Figure 2 should exhibit a substantial increase in the share of Czech workers when the reform was implemented, between 2010 and 2011.

According to a study by Schneider and Boockmann (2022), Germany ranks low in estimates of its shadow economy relative to GDP: In 2022, it placed 7th, behind the US and Switzerland but with a smaller share than Canada, Norway, or France. The share of its shadow economy to GDP has steadily declined in Germany in recent decades. It was at its highest in 2003 at 16.7%, decreased to 13.6% in 2010, and further to 10% in 2017. It is possible that this decline was partially due to introduction of the free movement of labor policy.

3 Conceptual Framework

The canonical model of labor supply shocks offers predictions of the potential effects of a policy reform. I base my discussion in this section on Borjas (2014).

Let us assume a world according to neoclassical theory, where labor markets are fully competitive, workers are perfectly substitutable, labor and capital are the sole production inputs, and both inputs are fully mobile. Imagine that one country in this frictionless world - the Czech Republic - offers relatively low wages, whereas another country - Germany - offers high wages. This is the steady state as long as there is no exchange of workers between these two countries. If the two countries' labor markets integrate, theory predicts that the workers will move from the Czech Republic to Germany until the wages in both countries equalize.

If we allow for mobility to be costly, the Czech workers would not move to just anywhere in Germany but would prefer the border region.

For the Czech Republic, this means the following: a negative labor supply shock, as would be induced by a worker outflow, increases the return to labor and decreases the return to capital. The standard model predicts that in the long term, firms would adjust their stock of capital to return to the original capital/labor ratio. However, in the case of Czech-German labor market integration, there are two factors that may make it harder for firms to react optimally. First, the outflow of Czech workers was not sharp and sudden but happened gradually over time. The share of Czech workers in the German border region increased slightly even during 2016-2017, the last years in my data. Firms have thus faced a constant outflow of workers and may have had to constantly update their expectations. Second, more than 77% of Czech workers employed in Germany commute across the border (see Table 1). This means that the majority of Czech consumption of goods and services occurs in their home country; given Czech workers' higher wages in Germany, demand for local goods is likely to increase. Firms in the border region could thus find themselves in a situation in which they must produce more but face difficulties hiring new workers.

For Germany, theory predicts the reverse pattern: a positive labor supply shock decreases regional wages and increases the return to capital in the short term. Given the cross-border commuting, the increase in labor supply would not be alleviated by an increase in demand for domestic goods in the German border region.[9]

Moreover, the magnitude of the wage effect depends on the tightness of the local labor market. In a setting with an a priori inelastic native labor supply, the native wage decrease is less pronounced. This paper investigates the labor market effects of immigration during a period of relative growth in Germany (in terms of both GDP and the size of the labor force). I therefore expect that relatively high labor demand may cushion the potential negative labor market effects of the immigration shocks. In addition, the opening of the German labor market was announced well in advance, meaning that some firms might have adjusted their investments accordingly.

[9]Note that the setting at hand, in contrast to e.g., Dustmann et al. (2017), does not entail a clear-cut commuting policy. As Figure A5, Panel (a), suggests, a small share of Czech workers actually relocated to Germany. Moreover, Figure A5, Panel (b), shows that about one fifth of the EU8 worker inflow to the border region stemmed from other nationalities (e.g., Slovaks or Poles) many of whom fully relocated to Germany. The opening of the German labor market thus must have increased the demand for goods and services in the German border region, even though this increase would have been much larger had all Czech workers fully relocated to Germany.

4 Czech and German Labor Market Data

For my empirical analysis, I use two datasets on establishments and workers from the IAB as well as regional-level data from the Czech Statistical Office. In addition, I combine my German data with spatial data from the German Federal Institute for Research on Building, Urban Affairs, and Spatial Development (BBSR).

4.1 Regional-Level Analysis

Czech Republic For the Czech Republic, I use county- and municipality-level data from the Czech Statistical Office from 2005-2017. The county-level data have the advantage that of containing a rich set of labor market variables that I use for my matching analysis (see Section 5 for more information on the matching procedure). Importantly, the county-level data (LAU-1) provide information on unemployment rates and vacancies. In addition, they contain information on population size by age group, the number of firms in a given industry, and crime statistics. I define all counties bordering either Germany or Austria as the treatment region. After matching these counties to suitable controls, I enrich the data using information on unemployment rates and vacancies, which is available at the municipality level (LAU-2). I assign all municipalities belonging to a treated county to my treatment group; all municipalities belonging to one of the control counties are defined as the control group. Alltogether, there are 6258 Czech municipalities and 77 Czech counties.

Germany For Germany, I start with establishment-level data, the *Establishment History Panel (BHP)*[10], which contains the universe of German establishments with at least one employee subject to social security contributions as of June 30 each year (Eberle and Schmucker (2017)). The data include an extensive set of establishment variables such as the number of (native) employees, average and median (native) wages, an establishment's skill composition, and its industry. Importantly for my analysis, the data also contain information on the municipality (LAU-1) where an establishment is located. I aggregate the data to the municipality level.[11]

In the next step, I combine the municipality data with spatial data provided by the BBSR.

[10] I use the following version: IAB Betriebs-Historik-Panel (BHP) 1975-2019 version, Grundgesamtheit.

[11] As of December 2018, there were 11,014 municipalities in Germany. The size of a municipality is much smaller than that of a NUTS-3 region (county), of which Germany has 401.

These data contain information on each municipality's centroid, allowing me to compute the airline distance in kilometers to the nearest road border crossing into the Czech Republic. I define my treatment group as all German municipalities located at most 40 km from the nearest border crossing. I then use mahalanobis distance matching to match the treatment municipalities to suitable control municipalities. In Section 5, I describe the matching process in more detail.

Figure 2, Panel (a), provides the intuition for why I chose 40 km as the threshold for my definition of the border region. It plots the share of Czech workers (by 2010 employment) in a given German municipality by the municipality's airline distance to the nearest border crossing into the Czech Republic in kilometer bins. In this figure, I use the complete set of German social security data, restricting it to all municipalities located up to 120 km from the nearest border crossing. The four lines correspond to different years before and after the policy reform (2008, 2011, 2015, and 2017). The figure clearly shows that the closer a municipality is located to the border, the greater the share of Czech workers. In 2017, the share of Czech workers ranged from just above 5% in municipalities located at most 10 km from the border to almost 0% in municipalities located more 100-120km from the border. Between 2008 and 2017, the share of Czech workers increased from 1.2% to 5% in municipalities located very close to the border.

Establishments For my analysis of German establishments, I use the *Establishment History Panel (BHP),* which has information on the workforce composition of an establishment (i.e., the total workforce, full-time workers, natives, migrants, number of workers by skill group, etc.) and the establishment's wages (both mean and median), overall and for selected groups. Note that throughout this paper, I use the terms "firm" and "establishment" interchangeably, but what I observe in the data are establishments that could belong to several firms.

For part of my analysis, I merge a "relocation" classifier to these establishments. This classifier is based on the dataset and linkage process described in Schäffler (2014) and indicates whether an establishment had a Czech affiliate by 2010. Schäffler (2014) obtained this information from the Czech Commercial Register, which lists the owners of Czech firms, including name and countries of origin.

4.2 Worker-Level Analysis

For the second part of my paper, I follow Dauth and Eppelsheimer (2020) in preparing worker-level data from the *Integrated Employment Biographies (IEB), Version 16*, which comprise the universe of workers subject to social security contributions in Germany. From this dataset, I draw a 10% sample of workers in matched municipalities from 2007-2017. This dataset contains a rich set of variables and comes with several advantages. Importantly, it includes administrative information on worker nationalities, which enables me to cleanly identify Czech workers. It moreover reports both native and Czech workers' exact workplaces at the municipality level, helping me to identify the treated workers. For the Czech workers, I also know whether they live in Germany or abroad. In addition, the data include information on days worked, daily wages, and skill group for each worker. From the spell data, I construct a yearly panel based on observations on June 30. I correct implausible education entries following Fitzenberger et al. (2006) and deflate wages using the consumer price index for Germany with base year 2010.

Czech and German Workers Table 1 presents the summary statistics for native and Czech workers in the German border region. Column (1) reports native worker characteristics in 2010, and Column (2) reports Czech worker characteristics in 2012.[12] Perhaps unsurprisingly, the Czech workers' yearly earnings are substantially lower (16,200 EUR vs. 19,000 EUR). This is because they earn lower wages (difference of 7 EUR/day) while they work almost exactly the same number of days per year (269). A total of 68% of the Czech workers are male, and 77% report that they do not live in Germany. The Czech migrants are somewhat younger (39.1 vs. 41.3 years), and most of them - 62.8% - are medium-skilled, meaning that they acquired vocational training.[13]

In Table A6, I provide additional evidence on the industries in which EU8 migrants work

[12]Note that to understand the inflows of workers to Germany, a comparison of native workers with EU8 workers may be more relevant. I include such a table in the Online Appendix (Table A4) showing that the main patterns are very similar.

[13]The vocational training systems in the Czech Republic and Germany are comparable in type and length; in both countries, training lasts approximately 2-3 years. In the Czech Republic, vocational training is referred to as *Střední odborné učiliště*. It includes a 2-3 year curriculum with alternating periods of education and apprenticeship work for individuals without a high school diploma. The typical occupations are craft trades. Previous studies have found that migrants are often downgraded upon entering the German labor market, as labor market experience is not fully transferable across countries (see, e.g., Brücker et al. (2021)). It is thus not clear that a Czech worker with vocational training is a perfect substitute for a German worker with vocational training.

in compared to natives. The table shows the share of EU8/native workers in a given industry relative to overall EU8/native employment. EU8 workers are clearly overrepresented in industries such as production goods, investment goods, restaurants, and construction. In turn, they are underrepresented in sectors such as public administration and education. As Table A5 shows, EU8 workers are even more concentrated in certain occupations. Their employment share is particularly large in i) machine operations and maintenance, and ii) food and cleaning.

Finally, Table A7 provides an intuition on the establishments where EU8 migrants work at compared to natives. Panel A shows that they work in establishments with a lower share of high-skilled workers and a higher-share of marginally employed workers. In Panel B, we see that they also work for slightly older establishments (16.5 vs. 15.8 years) and establishments that pay lower average wages (73 vs. 79 EUR). EU8 workers are also twice as likely to work for business service firms (14% vs. 7%), and almost three times as likely to work for temporary work agencies (7.9% vs. 2.9%).

5 Empirical Strategy: Difference-in-Differences and Matching

The aim of my study is to estimate the effect of cross-border commuting by Czech workers on local labor markets in both the Czech Republic and Germany as well as on native incumbent workers' labor market outcomes. To achieve this, I proceed in three steps. First, I apply mahalanobis distance matching to match border municipalities to suitable control municipalities. I match without replacement, meaning that each region is assigned one distinct control observation.[14] Second, I use a dynamic difference-in-differences regression analysis to estimate the effect of the labor supply shock on labor market outcomes in the regions on either side of the border. For Germany, I complement this with an analysis of establishment-level outcomes.

Third, I conduct an additional analysis focusing on native incumbent workers in Germany. Here, I use a combination of exact matching and mahalanobis distance matching to find a unique match for each native worker in the border region (under common support) from the pool of workers in the control municipalities. All workers are employed in the matched regions in 2010. I match exactly within 1-digit industry, 1-digit occupation, and gender, and minimize the distance between matched worker pairs based on several individual characteristics.

[14] For the Czech Republic, matching is done at the county level.

5.1 Mahalanobis Distance Matching

I start with 1:1 mahalanobis distance matching for the Czech counties. The treatment region is defined as all Czech counties bordering either Germany or Austria. I match these counties to suitable control counties using a number of matching variables that are plausible predictors of the future development of wages and employment in the Czech regions. These are the population's working age share, the share of firms in manufacturing, the share of firms in agriculture, the unemployment rate, vacancies in levels, and population size (all measured in 2010). Panel (b) of Figure 1 shows how the treatment and control counties are spatially distributed across the Czech Republic. For the dynamic diff-in-diff regressions, I enrich these county-level data with municipality-level data on unemployment rates and vacancies.

For Germany, I complete a very similar matching exercise. Using data on the universe of German establishments aggregated to the municipality level, I first identify my treatment region as all German municipalities located up to 40 km from the nearest Czech-German road border crossing. I then match these municipalities, separately for East and West Germany, to suitable German control municipalities using the following variables: age shares (2010), skill shares (2010), share of female workers (2010), share of foreign workers (2010), share of firms in the service sector (2010), share of firms in the manufacturing sector (2010), log employment (2009, 2010), growth in migrant workers' employment in 2004-2010, and log wages (2009)[15]. From the pool of potential controls, I drop municipalities located less than 80km from the German-Polish border, since they could be subject to increased immigration from Poland.

Note that I match on the growth in migrant workers' employment in 2004-2010 to ensure that treated and control regions are on a similar track with respect to their pre-reform experience in migrant employment. Moreover, I do so to ensure that if there were network effects in the sense that EU8 workers moved to municipalities with a high share of workers of the same nationality, these effects would be similar across treatment and control regions. To account for the type of region, I allow matches only within five municipality types: large city, medium city, large town, small town, and rural municipality.[16] Panel (a) of Figure 1 shows how the treatment and control municipalities are spatially distributed across Germany.

[15] I match on wages in 2009 to account for the fact that wages in 2010 might have been affected by anticipation effects of the policy change.

[16] For this purpose, I use the definition provided by BBSR, which is based on population densities.

Summary Statistics Tables 2 presents summary statistics on how the Czech matched regions differ before the policy change in 2011, and how they compare to the average Czech region. A comparison of all regions (Column (1)) to the matched regions (Columns (2) and (3)) shows that the matched regions are slightly negatively selected: their unemployment rates were, on average, higher. There were no large differences with respect to firm composition or demographics, except that the working age population in matched counties is substantially lower. Column (4) reports the differences between Columns (2) and (3) and shows that the propensity score matching worked well in terms of balancing treatment and control group: while the Czech border region in 2010 had a slightly higher unemployment rate (8.94% vs. 8.6%) and slightly more applicants per job (30.2 vs. 27.5), this difference was not statistically significant at the 5%-level. As Panel B shows, Czech treated and control counties displayed a similar industry structure, with a slightly higher share of manufacturing firms in the border region. Panel C reports a lower average age (40.2 vs. 40.7) in the border region, which is statistically significant at the 5% level.

Table 3 provides summary statistics for Germany. Comparing the matched regions (Columns (2) and (3)) to all German municipalities in the dataset (Column (1)) shows that the matched regions have a lower average share of foreign workers somewhat lower wages. With respect to the demographic composition, the matched regions are slightly younger and have a higher percentage of medium-skilled workers in their workforce. Comparing the matched regions, Column (4) shows that there are small differences between treated and control regions, which - albeit statistically signficiant - are not large in economic terms. The share of migrant workers in border municipalities is slightly lower (difference of 0.3ppt), and the share of EU migrants slightly higher (difference of 0.4 ppt). Reassuringly, as I show in Figure A5, the trend in the share of workers from the EU8 is similar, and constant, in both groups. In addition to the share of migrant workers, average (native) daily wages are somewhat higher in the matched controls relative to the border region (EUR 1.5 per day). Despite this difference in levels, my event study coefficients in Figure 3 show that native wages were on the same trend before 2011. The workforce composition after matching is very comparable, with treated and control municipalities having a similar share of workers in specific age and skill groups.

5.2 Dynamic Difference-in-Differences Regression

After completing the matching procedure, I estimate dynamic difference-in-differences (event study) regressions at the regional level, which - for German municipalities - take the following form:

$$y_{rt} = \sum_{t=2007}^{2017} \beta_t * I(year = t) * [I(Treated_r)] + \alpha_r + \alpha_t + \varepsilon_{rt} \quad (1)$$

where y_{rt} is the outcome variable, e.g., native wages, in region r in year t. I interact each year t with a dummy indicating whether region r is in the treatment group $I(Treated_r)$, i.e., whether it is located up to 40 km from the nearest border crossing into the Czech Republic.[17] The coefficients of interest are β_t, which indicate the differential development of treatment municipalities compared with that of control municipalities by year. I estimate all coefficients relative to the base year, 2010, which I omit. The municipality and year fixed effects α_r and α_t in the regression model account for time-invariant municipality characteristics and year trends. I report standard errors clustered at the county level. The key identifying assumption of my regression model is that in the absence of the labor supply shock, the treatment and control regions would have evolved in the same way. I cannot test this assumption, but I can show how the two groups evolved pre-treatment. Ideally, I would not observe any significant differences pre-treatment. As Figures 2 and 3 show, my main results pass the visual inspection of no statistically significant pre-treatment trends across groups.

5.3 Worker-Level Matching and Regression Analysis

Next, I prepare the worker-level data for Germany. I consider only incumbent workers; these are workers who were employed in the treated and control municipalities on June 30 in 2010. Then, I find a unique control match for each worker in the border region. As with the regional matching, I use a combination of exact matching with mahalanobis distance matching to find matched worker pairs. I match workers exactly using gender, 1-digit industries, and 1-digit occupations. Within these cells, I then minimize the distance between worker pairs based on the following variables: Age (2010), experience (2010), years of education (2010), full-time job (2009, 2010).

[17] Note that the regression model for the Czech regional-level analysis is very similar, with the exception that my treatment region is defined as all municipalities located in counties with a direct border with Germany or Austria.

The reason for the additional matching is that while I could simply compare all workers in the border region to all workers in the control region, this comparison is not necessarily valid. This is because for the regional matching, I considered solely regional-level outcomes stemming from the establishment-level data. These characteristics, such as wages or workforce composition, also affect worker outcomes, but they do not necessarily ensure that native incumbent workers are on the same labor market trajectories before 2011.

This is also evident from the data. Table A1 presents summary statistics for all treated and control workers in the matched regions (Columns (1) and (2)), and for the sample where each treated workers has a unique control match (Columns (3) and (4)). While a number of characteristics such as days worked per year and age are already very similar in the unmatched sample, control workers in the unmatched sample earn higher wages and are more likely to be male and work in larger firms. The matching helps me to make workers more similar both in levels and in employment and wage trends before 2011.

For the worker-level analysis, the baseline regressions equation changes as follows:

$$y_{it} = \sum_{t=2007}^{2017} \beta_t * I(year = t) * [I(Treated_i)] + \alpha_i + \alpha_t + \varepsilon_{it} \tag{2}$$

where y_{it} is the outcome variable, e.g., native wages, for worker i in year t. I interact each year t with a dummy indicating whether a worker i is in the treatment group $I(Treated_i)$, meaning that they were empoyed in the German border region to the Czech Republic in 2010. As in Equation 1, I estimate coefficients relative to 2010. I add worker and year fixed effects α_i and α_t, and cluster standard errors at the worker level.

5.4 Challenges for the Empirical Strategy

One important assumption for my empirical strategy to identify the plain effects of both out-migration and in-migration is that the Czech control regions did not experience emigration, while the German control regions did not experience immigration. In both cases, this is unlikely to fully hold: Neither were there mobility restrictions in other parts of the Czech Republic, nor did Germany limit immigration to the border region. The policy reform was moreover widely discussed and could have been anticipated by firms on both sides of the border, meaning that they might have, e.g., adjusted their capital in advance. Taking all of this into account, my point estimates are likely lower bounds of the true effect of both emigration and immigration. However, from a policy perspective, my estimates may hold

more external validity than estimates from a setting of sudden migration flows that are limited both geographically and temporarily.

I provide some evidence to alleviate concerns regarding these potential confounders. While I do not have data on Czech emigration by region in the Czech Republic, I can show that the vast majority of Czech workers is clustered in the German border region contiguous with the Czech Republic. Figure 2, Panel (a), presents evidence on the share of Czech workers strongly declining with distance from the border, and Figure A2 corroborates this, showing in a map that the share of Czech workers is highest in the German counties bordering the Czech Republic. In Figure A5, Panel (a), I then show that the vast majority of Czech workers are reported to live abroad, making it very likely that they commute across the border. This is also suggestive evidence for the Czech border region being particularly affected by worker outflows. While the lack of respective data means that I cannot show Czech out-migration rates by region, it is highly unlikely that high shares of Czechs would commute to Germany from the inner parts of the country. If Czechs relocated to other countries, such as the UK, then this would have mostly happened in the years following 2004. I cannot rule out internal migration within the Czech Republic, and I will investigate this as one outcome in my county-level analysis.

For Germany, I show that the share of migrant workers also increased in German control regions post 2011, although not as much as in the border region. As Figure A5 shows, the raw share of medium-skilled migrants by 2010 employment increased from almost 0 in 2010 to 1% in 2017 (corresponding figure for border municipalities: 0.8% to 3%). Overall, this points to a relatively high labor demand in the years following Germany's quick economic recovery after the financial crisis.[18] Indeed, my results for both Germany and the Czech Republic must be interpreted against the backdrop of a thriving economic situation: according to Eurostat, the overall unemployment rate as a percentage of the population in the labor force decreased from 6.7% (7.3%) in 2009 to 2.9% (3.6%) in 2017 for the Czech Republic (Germany). While the German labor market could thus absorb additional migrants relatively easily, the policy reform came at the wrong time for Czech firms looking for skilled workers.

[18]Migrant inflows to Germany increased not only from EU8 countries. Many migrants from Southern Europe, which had been hit particularly hard by the financial crisis, began working in Germany in the 2010s. For example, according to numbers provided by the German Statistical Office (Destatis), yearly inflows from Italy more than doubled between 2008-2013, increasing from 20,087 to 47,485.

6 The Impact of Out-Migration and In-Migration on Local Labor Markets

6.1 The Inflow of Workers to Germany

From Figure 2, Panel (b), it becomes clear that the share of Czech workers increased by about 2.2 percentage points in 2011-2017 in the German border region compared to matched control municipalities. One potential concern is that while the share of Czech workers increased in the border region, the matched control regions were subject to an inflow of workers from other EU8 countries. In Figure A3, I thus plot the inflow of EU8 workers and migrant workers in general. Panel (a) shows that, for medium-skilled EU8 workers, the geographic pattern looks similar[19]: most EU8 workers locate in municipalities at most 40km from the nearest border crossing into Czech Republic, a pattern that is driven by Czech workers. However, the share of EU8 workers is also quite high (1-2% in 2017) in municipalities located farther away from the border. Panel (b) of Figure A3 plots the event study coefficients, showing that the inflow of both EU8 and migrant workers overall was stronger in the border region compared to matched controls, resulting in an increase of 0.8-1.3 percentage points by 2017, with large confidence intervals. This increase is not as strong as the inflow of Czech workers, meaning that my results for Germany present a lower bound of the labor market effects in a setting where migration was limited to the border region, only.

6.2 The Effect of Out-Migration on Regions in Czech Republic

The upper part of Figure 3 shows the evolution of unemployment rates (Panel (a)) and log vacancies (Panel (b)) in the Czech border region compared to matched controls, plotting the β_t coefficients from Equation 1. In line with the standard assumptions of the difference-in-differences approach, there are mostly no statistically significant differences between treated and control municipalities in the years leading up to the policy change. One exception is an upward and then downward trend in vacancies around 2007, perhaps mirroring small effects from the elimination of border controls as part of the Schengen agreement in 2007. Starting in 2011, there is a clear downward trend in the unemployment rates in the Czech border

[19]Note that I plot the inflow of medium-skilled workers, because there was virtually no difference between the border region and matched control for the inflow of low- and high-skilled migrant workers (see Online Appendix, Figure A4).

region, amounting to approximately 0.7 percentage points.[20] For context, the average border municipality reported unemployment rates of approximately 9.4% in 2010. For vacancies, we observe the reverse pattern: vacancies started to increase in the border region relative to the control municipalities after 2011, peaking at about 20 log points in 2017. The average border municipality reported about 4 vacancies in 2010, implying an additional 0.8 vacancies per municipality.[21]

In addition to these event study results, I report regression coefficients from a standard difference-in-differences regression model on the county level in Table 4 (see Appendix Figure A8 for the corresponding event study coefficients). These corroborate the findings from the municipality-level regressions, showing a statistically significant decline in unemployment rates, which is a bit stronger for women. Overall, unemployment rates declined by about 7.5% compared to the average county unemployment rate in the border region in 2010.

In terms of vacancies, the county-level evidence again confirms the results of the municipality-level regressions: vacancies increased by 3.16% compared to the average number of vacancies in a border county in 2010. At the same time, the number of applicants per job strongly decreased, by a striking 9% compared to the pre-policy average.

I then investigate a variety of additional outcomes that could have been affected by the policy change, but for which I do not find statistically significant effects. While there is a positive number of inflows (measuring the newly registered population in a given county, regardless of age) to the border region amounting to an increase of almost 5% compared to 2010, this is not statistically significant. The same holds for measures of the population's age composition, for which I document a not statistically significant decrease in the prime working age population, amounting to 1% relative to 2010. Last, I report some measures of crime rates. Here, it is a priori unclear whether one would expect an effect: On the one hand, crime rates may decrease once the economic situation for workers in the border region improves, on the other hand this may also attract more crime. The insignificant regression

[20]The Czech Statistical Office did not record data for 2012 and 2013, which is why they are missing from the graph. Event study coefficients for the complete time series of Czech counties confirm the patterns from the municipality-level analysis (see Figure A8).

[21]Most of the studies that investigate the effects of out-migration on labor markets focus on wages, which makes it difficult to compare these employment effects to those in the existing literature. Two exceptions are Elsner (2013) and Škuflić and Vučković (2018), who find no or positive effects of worker outflows on unemployment rates in the context of European immigration. These studies investigate general out-migration and not cross-border commuting, which suggests that increased labor demand rather than decreased labor supply may play an important role in explaining my effects. Note that, unfortunately, the Czech Statistical Office data do not allow me to study wage adjustments on a fine-grained regional level.

coefficients I report may exactly mirror these opposing mechanisms.

Overall, my results suggest that open positions due to the Czech commuter outflow were only partially filled by unemployed individuals or Czechs moving to the border region from other places. The policy change thus likely resulted in worker shortages and subsequent productivity constraints for local Czech firms.[22] It is possible that the increase in vacancies was a result not only of the negative labor supply shock but also of the positive demand shock due to increased consumption by Czech commuters. As Panels (a) and (b) of Figure A6 show, vacancies were increasing and unemployment rates were decreasing in both the border region and its controls, reflecting the overall positive economic situation in the Czech Republic in the 2010s. The coefficients from the event study analysis thus reflect the fact that in the border region, this process happened even quicker than in the rest of the country.

6.3 The Effect of In-Migration on Regions and Establishments in Germany

German Municipalities The bottom part of Figure 3 shows the evolution of native employment (Panel (c)) and wages (Panel (d)) in the matched German municipalities. It plots the event study coefficients from Equation 1, where I define the outcome as the share of employed native workers in a given year relative to native employment in 2010 and log native full-time wages. In line with the key identifying assumption of the difference-in-differences model, there are no statistically significant pretrends between the border and control municipalities.

For the period following 2011, the graph shows an increasing downward trend in native employment, amounting to between 1 and 5 percentage points in 2011 to 2017. Importantly, this downward trend does not imply that firms displaced native workers to replace them with migrants. Instead, as Panel (c) of Figure A6 shows, native employment was on an upward trend both in the border region and in matched controls. The negative coefficients reflect the fact that native employment grew at a slower pace in the border region. While part of this was likely due to the additional supply of Czech workers, another part of it might have been due to the increased outsourcing of new jobs to the Czech Republic.

For native full-time wages, the event study coefficients in Panel (d) of Figure 3 show a decrease (relative to controls) in the short-run. More specifically, wages decrease by about 1.8 log points in 2012 and 2013, and they then catch up with the control group from 2014

[22] This is also supported by anecdotal evidence from German employment agencies active in informing Czech workers about employment opportunities in Germany. Allegedly, Czech firms in the border region have asked for a reduction in the frequency of such information events in recent years.

onwards. Again, native wages in both treatment and control group were on an upward path from 2011 onwards (cf. Figure A6, Panel (d)). The negative coefficients thus merely reflect weaker wage growth in the treatment regions compared to controls in 2012 and 2013, no actual drop in native wages. This is consistent with lower wage bargaining power of native workers, due to the threat that they may be replaced by Czech workers (both in Germany and in the Czech Republic). The observation that wages in the border region caught up from 2014 may in part be due to the introduction of the German minimum wage in 2015.

Overall, these negative labor market effects in the German border region are thus in line with what one would expect from standard economic theory. They are also in line with previous literature on immigration finding negative effects for native workers or other immigrants (e.g. Signorelli, 2020; Glitz, 2012; Manacorda et al., 2012; Cohen-Goldner and Paserman, 2006; Borjas, 2003; Card, 2001).

Labor Market Effects by Occupations and Industries I next investigate how the inflow of migrants from EU8 countries was distributed across industries and occupations. Figure 4 shows that the worker inflow was concentrated in three sets of occupations in particular: "manufacturing & repair", "traffic & security", and "food & cleaning". The figure plots difference-in-differences coefficients from a regression with municipality and year fixed effects. In the figure, "pre 2010" refers to an interaction of the average effect for 2005-2009 with a dummy for border region, and "post 2010" refers to the average effect for 2011-2017 interacted with a dummy for border region. All effects thus must be interpreted relative to 2010.

As Panel (a) of Figure 4 shows, the sector "manufacturing & repair" received the highest inflow of EU8 workers, amounting to approximately 0.5 percentage points in the post-reform period. This inflow was somewhat lower for "traffic & security" (0.3 ppt) and "food & cleaning" (0.2 ppt). The inflow to all other occupations was substantially lower and even negative in one case ("raw materials").

The effect on native employment (measured as the share of native employment by 2010 employment) in Panel (b) corresponds to the inflow: The only occupations that report negative employment effects (i.e., slower growth rates) are "manufacturing & repair" (albeit with large confidence intervals that include 0) and "traffic & security". Note that, on average, these effects are substantially larger than the increase in the share of EU8 workers, so I am cautioius in relating them directly. These large employment effects suggest that jobs in these occupations underwent transformation beyond the EU8 worker inflow, such as potential outsourcing of

jobs. It is also possible that labor market entrants avoided these occupations, even though none of the other occupations experienced a significant increase in the native employment share.

The effects on native full-time log wages presented in Panel (c) turn out to be mostly statistically insignificant, with the exception of office services, where wages post 2010 increased. This is in line with Figure 3, Panel (d), which documents only a short-term decrease in full-time wages for the years 2013 and 2014. This effect disappears when considering the full post-treatment period. Note that one has to be careful with the interpretation of Figure 4, Panels (b) and (c), because the inflow of EU8 workers to specific occupations was likely driven by labor demand. If these occupations were characterized by skilled worker shortages, then my estimates of native labor market outcomes might be lower bounds of the true effect.

Figure A9 presents the corresponding graphs for 1-digit industries, showing that the share of EU8 workers increased in alltogether 8 industries by about .1 and .2 percentage points. Three of these industries report the slowest growth in employment relative to controls. These are i) "traffic and telecommunications", ii) "production goods", and iii) "construction". Wage effects are again mostly insignificant, although confidence intervals show quite some variation around the point estimates.

Inflows and outflows One potential margin of adjustment are inflows and outflows from and to unemployment, non-employment, or adjacent regions. To investigate this, I use the sample of workers who are employed in either border or control regions at least once in 2007-2017. From this, I construct a dataset that has a balanced set of workers from their first appearance in the data to their exit.

For example, if a worker only appears in the data on June 30, 2007, this will be the worker's only entry in the final dataset. If a worker instead appears on June 30, 2007, and then again on June 30, 2010, I will classify them as non-employed in 2008 and 2009. This is based on workers who show up in the data at least once; I cannot observe workers who do not enter the labor market at all. With this data, I then compute inflows and outflows from/to unemployment, non-employment, a different 1-digit industry, and a different 1-digit occupation and aggregate these to the municipality level.

Figure A7 presents the results of difference-in-differences regressions with coefficients for the pre and post policy time periods, relative to 2010. It shows that there are virtually no adjustments in terms of inflows and outflows, and no increase in the share of unemployed

workers, suggesting that insiders were not affected by the labor market opening. Instead, the slower native employment growth will likely be due to fewer new hires relative to the control regions.

German Establishments Some of the recent literature has highlighted that positive labor supply shocks may increase firms' productivity (e.g., Beerli et al. (2021) and Kerr et al. (2015)). While I cannot analyze productivity directly with the data at hand, I can use the BHP data on German establishments and consider a variety of establishment outcomes, such as establishment entry and exit as proxies for productivity. For this purpose, I next provide evidence on a variety of outcomes for establishments in the 8 most affected 1-digit industries.[23] For the workforce shares, I use the BHP data to compute the number of workers in a given group (e.g. low-skilled workers) as a share of the total amount of employees of the establishment in 2010. The wage measures report average establishment wages by group (e.g. native workers).[24]

Table 5 provides an overview of the results. Most of the measures pool native and migrant workers, meaning that they combine potentially counteracting directions of the effects. The table shows that post 2011, the relative shares of workers aged 15-29 and 50+ decreased (4.3% and 1.7% relative to the mean in 2010), while the share of workers aged 30-49 increased (2.7% relative to mean in 2010). While this could suggest that younger and older workers were most affected by the worker inflow, it may also simply reflect the demographic distribution of the migrant inflow.

There are no statistically significant effects on establishment entries, establishment exits and different wage measures, suggesting no productivity effects with the available measures. This might look different with more refined measures, e.g., when analyzing patent applications as in Beerli et al., 2021.

German Establishments with Investments in the Czech Republic For a sub analysis, I split the sample of German establishments in the border region into establishments with and without a Czech affiliate, using the dataset provided by Schäffler (2014). Restricting

[23] These are i) restaurants, ii) traffic and telecommunication, iii) investment goods, iv) retail, v) production goods, vi) construction, vii) commercial services and viii) traffic and telecommunication.

[24] Note that to keep the composition of establishments constant, I restrict the sample to a balanced panel of establishments during the observation period 2005-2017. This does not hold for the regressions where I analyze establishment entries and exits.

the treated establishments to FDI establishments shows that the migrant inflow was fully concentrated in these firms: The average share of EU migrants in a German headquarter increased by 1.1 percentage points, a striking 93% relative to their mean in 2010 (see Table A11). In contrast, there was a 0% increase in establishments without Czech affiliates (see Table A12).

The wage and employment effects mirror this difference: There are no statistically significant effects on native employment and wages in non-FDI firms, but negative coefficients for the FDI sample. The difference-in-differences coefficient on the share of Germans by 2010 employment is negative (-2ppt), though not statistically significant. In addition, average wages of native workers post 2010 decreased by 1.9 log points. In line with this, wages of low-skilled workers (-4 log points) and medium-skilled workers (-2.4 log points) decreased, but this is likely the combined effect of lower wages for Czech commuters and a wage decrease of natives in the treated establishments relative to controls.

These effects may be driven by both the inflow of Czech workers and increased outsourcing of the German headquarters to their affiliates in the Czech Republic; since the data on firm relocations ends in 2010, I do not have information on how investments of these establishments in the Czech Republic developed after the labor market opening.

Native incumbent workers in Germany Finally, Figure 5 reports evidence on the labor market outcomes of matched native workers (see Section 5.3 for more detail on the matching algorithm). It shows how the evolution of log earnings (Panel (a)), full-time log wages (Panel (b)), full-time employment (Panel (c)), and days worked per year (Panel (d)) differ for workers in the border region relative to matched control workers.

Coefficients for both pre- and post-treatment years are close to 0 and insignificant in most cases. Panels (c) and (d) show weak but imprecisely estimated increases in full-time employment (short-term) and days worked (long-term). Alltogether, Figure 5 clearly shows that incumbent workers were not negatively affected by the 2011 opening of the German labor market.

7 Robustness Checks

Narrow vs. Wider Border Region I show that my results are robust to a variety of different specifications. First, one obvious question is whether, as in Beerli et al. (2021) and

Dustmann et al. (2017), the "wider border region", i.e., the municipalities bordering those in the treatment group, would be an alternative control group. In terms of labor market structure and history, they may be more similar to the border region. There are two main reasons why I do not use them as the control group in my baseline specification:

First, as evident from Figure A3, there was also an increase in the share of migrant workers in the wider border region, and this could potentially confound my estimates. Table A8, which compares the key characteristics of the municipalities in the narrow vs. wider border region, suggests that there could be additional confounders: The workforce composition between the two regions differed, with the narrow border region reporting more younger workers, more female workers, and more low-skilled workers.

Second, there may be spillover effects between the narrow and wider border regions, triggered for example by the internal workplace relocation of native workers. If such relocation had an impact on the labor market in the wider border region, I would potentially underestimate wage and employment effects on native workers. Similar arguments hold for the Czech wider border region: it could be subject to the out-migration of workers both to Germany or to the narrow border region (because firms must fill the empty positions left by Czech cross-border commuters).

In a robustness check, I nevertheless investigate what happens if I compare the narrow border region to adjacent municipalities. Figure A11 provides an overview of the geographic definition of the border and control municipalities in this case. For Germany (Panel (a)), the narrow border region remains the same as in the baseline specification (all municipalities are located at most 40km from the nearest road border crossing into the Czech Republic). I then define all control municipalities to include municipalities in the distance range 40-80km from the nearest road border crossing. For the Czech Republic (Panel (b)), the definition of the narrow border region differs somewhat from the one in the baseline specification: mirroring the German definition, it now includes all municipalities located at most 40km from the nearest road border crossing into Germany. Analogously, the wider border region includes municipalities in the 40-80km distance range. I exclude municipalities located up to 40km from the nearest border crossing to Austria, given that the Austrian labor market also opened for Czechs in 2011.

Figure A12 plots the "first stage" results, i.e., the inflow of medium-skilled EU8 workers to the narrow vs. wider German border region. The coefficients are estimated very imprecisely

with large confidence intervals, but the point estimates are in a similar ballpark as those of the baseline analysis sample.

Figure A13 then presents the main results for the Czech Republic and Germany. For the Czech Republic (Panels (a) and (b)), the decrease in unemployment rates (Panel (a)) is, at 1.5 percentage points, substantially larger. For vacancies (Panel (b)), the coefficients are a bit smaller than in the baseline analysis (around 15 log points).

For Germany coefficients are estimated very imprecisely, in particular in Panel (c) with native employment as outcome variable, making it difficult to interpret them directly. Overall, Panels (c) and (d) of Figure A13 show no differential effect on native employment and full-time wages in the narrow compared to the wider border region, which is in line with potential confounding factors such as regional mobility.

Changing the Reference Year to 2009 One might be concerned that there was already some effect on labor markets in the border region in 2010 and that using this year as the reference could bias the results. In Figure A14, I therefore show what happens when I use 2009 instead of 2010 as the reference year. It does not substantially change the results.

Border Region to West Germany In my baseline analysis, I include both East and West Germany. However, during my period of observation, there were still structural differences between East and West Germany. For example, firms in East Germany, on average, pay lower wages.[25] This may affect my results for both the Czech Republic and Germany. On the one hand, Czech workers in the Czech-East German border region may have lower incentives to commute across the border because the only slightly higher wages in East Germany may not compensate their commuting costs. I would then underestimate the labor market response in the Czech border region. On the other hand, the scope for reducing native wages may be lower in East Germany, which suggests that I might underestimate the impact of the worker inflow on native workers in Germany.

To account for this, in an additional robustness check, I restrict my sample to i) only Czech municipalities bordering West Germany and thus Bavaria, and to ii) only German border and control municipalities in West Germany. I then conduct the baseline mahalanobis matching exercise as described in Section 5, and the matched municipalities comprise my regression

[25] According to a report by the German Federal Statistical Office (Destatis (2015)), the gross monthly income in East Germany was just 71% of the West Germany gross monthly income in 2014.

sample.

Figure A15 plots the main results. Panel (a) shows that the migrant worker inflow is somewhat stronger, which is consistent with the hypothesis that moving to West Germany might pay off more. Panels (b) and (c) show that restricting the sample to Czech municipalities bordering West Germany captures a somewhat larger labor market response, with unemployment rates decreasing more strongly (about -10 ppt), and vacancies increasing more (about 25 log points). Figure A15, Panels (d) and (e), show that the response on the West German border does not substantially differ from the rest of Germany.

In an additional robustness check for the Czech Republic, I show that restricting the sample to municipalities bordering Germany yields very similar labor market effects (cf. Figure A16).

Placebo Treatment As another check, I conduct a placebo treatment analysis for Germany, depicted in Figure A10. For this purpose, I change my sample period to 1999-2008 and pretend that the policy reform took place in 2004. I make this choice because in 2004, the Czech Republic and the other EU8 countries joined the EU, so a treatment in 2004 is somewhat plausible. I then estimate my baseline regression model (see Equation 1), where I omit 2003 as the reference year.

Figure A10, Panel (a), shows that there was virtually no inflow of EU8 workers following the EU enlargement in 2004. For native employment and Panel (b), there were also no differential effects between treated and control regions post 2004. For native wages and Panel (c), there are again no substantial differences.

Due to data limitations, I cannot perform a similarly rigorous placebo analysis for the Czech Republic. My Czech data start in 2005, meaning that I cannot observe what happened around the 2004 EU enlargement. Instead, I run a simple diff-in-diff placebo regression, where I restrict the sample for the Czech Republic to 2005-2010 and assign the placebo treatment to 2007. Table A10, Column (7), reports the coefficients, which are insignificant.

Different Matching Specifications Finally, I conduct several robustness checks with respect to the matching specification for both Germany and the Czech Republic. For Germany, Table A9 reports the results for the baseline sample (Column 1), the narrow vs. wider border region (Column 2), West Germany only (Column 3), and a number of alternative matching algorithms (Columns 4-7).

Column (4) shows what happens if I use a propensity score matching algorithm instead

of mahalanobis distance matching, where I match exactly within regional type (5 categories ranging from very rural to city) and East/West Germany. The following variables enter the probit regression to compute the propensity scores: skill shares, age shares, share of foreign workers, growth in migrant workers' employment in 2004-2010, share of women, share of firms in the manufacturing sector, and share of firms in the service sector (all in 2010).

In Column (5), I repeat my baseline matching but with all matching variables measured in 2008. This ensures that I match on characteristics that were for sure unimpacted by (anticipations of) the worker inflow. Column (6) repeats the baseline matching but additionally matching exactly on regional type. Finally, Column (7) reports coefficients when excluding municipalities in the same commuting zone as the border municipalities from the pool of potential controls. The reasoning behind this is that these municipalities may have been affected by the workplace relocation of native workers, which could mean that I underestimate the natives' labor market response.

With the exception of Column (2), all of the coefficients on native employment in Panel B are negative, ranging from scaled effects (% of mean in 2010) from -1.15% to -7.16%. While the coefficients on native full-time log wages are also negative, they are very small and insignificant. This reflects the evidence from the event study regressions where native wages displayed slower growth only in the short run.

For the Czech Republic, Table A10 reports my robustness checks with different matching specifications. Column (1) starts with the baseline analysis sample, Column (2) reports results when restricting the sample to the border region with Bavaria, Column (3) restricts the sample to the border region with Germany, and Columns (4)-(6) report coefficients with different matching specifications.

Column (4) shows what happens if I use propensity score matching instead of mahalanobis distance matching as the matching algorithm. The following variables enter the probit regression to compute propensity scores: The share of the working age population, the share of firms in manufacturing, the share of firms in agriculture, unemployment rate, number of vacancies, population size, number of applicants per job, average age, and the number of individuals receiving benefits (all measured in 2010).

Column (5) repeats the baseline matching but adds the shares of firms in a given 1-digit industry, measured in 2010, to control for the regions' industry structure. Column (6) repeats the baseline matching but matching on variables measured in 2008, only.

Results for unemployment rates (Panel A), log vacancies (Panel B), and log applicants per job (Panel C) are robust, with scaled effects for unemployment rates ranging from -5.29% to -9.52%. Scaled effects for log vacancies range from 2.81% to 6.84%, and sclaed effects for log applicants per job have a relatively wide range from -7.62% to -20.8%. Restricting the border region to Bavaria always yields the strongest effects.

Incumbent Worker Matching In a last robustness check, I show what happens if I change the matching for the incumbent worker analysis to a more restrictive version. In variations to the baseline matching (see Section 5.3), I match workers exactly within 2-digit instead of 1-digit occupations, and I add years of education to the list of exact matching variables. I then vary the list of mahalanobis distance matching variables to include age, experience, and employment status, all measured in 2010.

As Figure A17 shows, this yields very similar results, with a somewhat more pronounced increase in full-time employment for treated workers in Panel (c). One notable difference is a small relative decrease in full-time wages (about -0.2 log points) for treated workers in 2013 and 2014, which somewhat mirrors the short-term trend from the regional event study coefficients, but with the effect being much smaller.

8 Conclusion

This paper investigates the labor market effects of out-migration and in-migration in the Czech-German border region. I use a dynamic difference-in-differences analysis, exploiting the fact that many Czech workers started commuting across the joint border following the opening of the German labor market in 2011. A novel dataset on Czech municipalities allows me to investigate the labor market effects of the same immigration policy reform on both origin and destination country, simultaneously. The setting has the advantage that it features migration from an emerging economy to the largest economy in the EU, with large cross-country wage differentials.

I show that the integration of the two countries' labor markets resulted in a positive labor supply shock on the German side of the border, with a 2.3-percentage-point increase in the share of Czech workers by 2017. In the Czech border region, the size of the outflow corresponded to approximately 2.8% of the working age population by 2018. I conclude that the worker outflow from the Czech Republic led to a persistent decrease in unemployment

rates, accompanied by an increase in vacancies and a decrease in applicants per job. For Germany, I observe slower regional employment growth for natives in the long run and slower full-time wage growth in the short run. Native incumbent workers were not affected by the policy change, suggesting that new hires drive this effect.

While existing studies usually treat the labor markets of the destination and origin country as separate, it is informative to consider both sides for a complete picture. I show that workers in the origin country always benefit, but that fears of brain drains from emigration leading to tighter labor markets are justified. On the flip side, while incumbent native workers in destination countries do not need to worry about being replaced by native workers, the overall employment growth in the affected region may be slower as a result of immigration. It is important for policymakers to be aware of these dynamics.

References

Åslund, Olof and Mattias Engdahl, "Open borders, transport links, and local labor markets," *International Migration Review*, *53* (3), (2019), 706–735.

Aydemir, Abdurrahman and George J Borjas, "Cross-country variation in the impact of international migration: Canada, Mexico, and the United States," *Journal of the European Economic Association*, *5* (4), (2007), 663–708.

Batog, Cristina, Ernesto Crivelli, Ms Anna Ilyina, Zoltan Jakab, Mr Jaewoo Lee, Anvar Musayev, Iva Petrova, Mr Alasdair Scott, and Ms Anna Shabunina, *Demographic Headwinds in Central and Eastern Europe*, International Monetary Fund, (2019).

Beerli, Andreas, Jan Ruffner, Michael Siegenthaler, and Giovanni Peri, "The abolition of immigration restrictions and the performance of firms and workers: evidence from Switzerland," *American Economic Review*, *111* (3), (2021), 976–1012.

Bhattacharya, Utpal and Peter Groznik, "Melting pot or salad bowl: Some evidence from US investments abroad," *Journal of Financial Markets*, *11* (3), (2008), 228–258.

Borjas, George J, "The labor demand curve is downward sloping: Reexamining the impact of immigration on the labor market," *The Quarterly Journal of Economics*, *118* (4), (2003), 1335–1374.

_ , *Immigration economics*, Harvard University Press, (2014).

Bratsberg, Bernt, Andreas Moxnes, Oddbjørn Raaum, and Ulltveit-Moe Karen-Helene, "Opening the Floodgates: Industry and Occupation Adjustments to Labor Immigration," *International Economic Review*, (forthcoming).

Brücker, Herbert, Albrecht Glitz, Adrian Lerche, and Agnese Romiti, "Occupational recognition and immigrant labor market outcomes," *Journal of Labor Economics*, *39* (2), (2021), 497–525.

Buch, Claudia M, Jörn Kleinert, and Farid Toubal, "Where enterprises lead, people follow? Links between migration and FDI in Germany," *European Economic Review*, *50* (8), (2006), 2017–2036.

Burchardi, Konrad B, Thomas Chaney, and Tarek A Hassan, "Migrants, ancestors, and foreign investments," *The Review of Economic Studies*, *86* (4), (2019), 1448–1486.

Bütikofer, Aline, Katrine Vellesen Løken, and Alexander Willén, "Building bridges and widening gaps: Efficiency gains and equity concerns of labor market expansions," *Review of Economics and Statistics*, (forthcoming).

Card, David, "The impact of the Mariel boatlift on the Miami labor market," *ILR Review*, *43* (2), (1990), 245–257.

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

Cohen-Goldner, Sarit and M Daniele Paserman, "Mass migration to Israel and natives' employment transitions," *ILR Review*, *59* (4), (2006), 630–652.

Dauth, Wolfgang and Johann Eppelsheimer, "Preparing the Sample of Integrated Labour Market Biographies (SIAB) for Scientific Analysis: A Guide," *Journal for Labour Market Research*, *54* (1), (2020), 1-14.

_ , Sebastian Findeisen, and Jens Suedekum, "The rise of the East and the Far East: German labor markets and trade integration," *Journal of the European Economic Association*, *12* (6), (2014), 1643–1675.

Destatis, "25 Jahre Deutsche Einheit," Technical Report, German Federal Statistical Office (2015).

DiCarlo, Emanuele, "How Do Firms Adjust to Negative Labor Supply Shocks? Evidence from Migration Outflows," Technical Report, Institute of Labor Economics (IZA) (2022).

Dorn, David and Josef Zweimüller, "Migration and labor market integration in Europe," *Journal of Economic Perspectives*, *35* (2), (2021), 49–76.

Dustmann, Christian, Tommaso Frattini, and Anna Rosso, "The effect of emigration from Poland on Polish wages," *The Scandinavian Journal of Economics*, *117* (2), (2015), 522–564.

_ , Uta Schönberg, and Jan Stuhler, "Labor supply shocks, native wages, and the adjustment of local employment," *The Quarterly Journal of Economics*, *132* (1), (2017), 435–483.

Eberle, Johanna and Alexandra Schmucker, "The Establishment History Panel–Redesign and Update 2016," *Jahrbücher für Nationalökonomie und Statistik*, *237* (6), (2017), 535–547.

Elsner, Benjamin, "Does emigration benefit the stayers? Evidence from EU enlargement," *Journal of Population Economics*, *26* (2), (2013), 531–553.

Eurostat, "Migration and migrant population statistics," (2020). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Migration_and_migrant_population_statistics, Last accessed on 2020-12-12.

Fitzenberger, Bernd, Aderonke Osikominu, Robert Völter et al., "Imputation Rules to Improve the Education Variable in the IAB Employment Subsample," *Schmollers Jahrbuch: Journal of Applied Social Science Studies/Zeitschrift für Wirtschafts-und Sozialwissenschaften*, *126* (3), (2006), 405–436.

Glitz, Albrecht, "The labor market impact of immigration: A quasi-experiment exploiting immigrant location rules in Germany," *Journal of Labor Economics*, *30* (1), (2012), 175–213.

Goldschmidt, Deborah and Johannes F Schmieder, "The rise of domestic outsourcing and the evolution of the German wage structure," *The Quarterly Journal of Economics*, *132* (3), (2017), 1165–1217.

Hafner, Flavio, "Labor Market Competition, Wages and Worker Mobility," (2020).

Hammer, Luisa and Matthias S Hertweck, "EU enlargement and (temporary) migration: Effects on labour market outcomes in Germany," *Deutsche Bundesbank Discussion Paper*, (2022).

Hecht, Veronika, "Location choice of German multinationals in the Czech Republic: The importance of agglomeration economies," *Economics of Transition*, *25* (4), (2017), 593–623.

Javorcik, Beata S, Çağlar Özden, Mariana Spatareanu, and Cristina Neagu, "Migrant networks and foreign direct investment," *Journal of development economics*, *94* (2), (2011), 231–241.

Kahanec, Martin and Mariola Pytliková, "The economic impact of east–west migration on the European Union," *Empirica*, *44* (3), (2017), 407–434.

Kerr, Sari Pekkala, William R Kerr, and William F Lincoln, "Skilled immigration and the employment structures of US firms," *Journal of Labor Economics*, *33* (S1), (2015), S147–S186.

Körner, Konstantin, Michael Moritz, and Johannes Schäffler, "Foreign direct investment and onshore employment dynamics: Evidence from German firms with affiliates in the Czech Republic," *The World Economy*, (2021).

Kuosmanen, Isa and Jaakko Meriläinen, "Labor market effects of open borders: Lessons from EU enlargement," *Journal of Human Resources*, (forthcoming).

Lemos, Sara and Jonathan Portes, "New labour? The effects of migration from Central and Eastern Europe on unemployment and wages in the UK," *The BE Journal of Economic Analysis & Policy*, *14* (1), (2014), 299–338.

Manacorda, Marco, Alan Manning, and Jonathan Wadsworth, "The impact of immigration on the structure of wages: theory and evidence from Britain," *Journal of the European Economic Association*, *10* (1), (2012), 120–151.

Moritz, Michael, "The Impact of Czech Commuters on the German Labor Market," *Prague Economic Papers*, *1* (2011), 41.

Münich, Daniel, Martin Srholec, Michael Moritz, and Johannes Schäffler, "Mothers and Daughters: Heterogeneity of German Direct Investments in the Czech Republic," *Prague Economic Papers*, *2014* (1), (2014), 42–62.

Muñoz, Mathilde, "Trading Non-Tradables: The Implications of Europe's Job Posting Policy," Technical Report, Paris School of Economics (2022).

Ottaviano, Gianmarco IP and Giovanni Peri, "Rethinking the effect of immigration on wages," *Journal of the European Economic Association*, *10* (1), (2012), 152–197.

Schäffler, Johannes, "ReLOC linkage: a new method for linking firm-level data with the establishment-level data of the IAB," *FDZ-Methodenreport*, *5* (2014), 2014.

_ , Veronika Hecht, and Michael Moritz, "Regional determinants of German FDI in the Czech Republic: new evidence on the role of border regions," *Regional Studies*, *51* (9), (2017), 1399–1411.

Schmieder, Julia and Andrea Weber, "How did EU Eastern enlargement affect migrant labor supply in Austria?," *Focus on European Economic Integration*, *3* (2018), 113–121.

Schneider, Friedrich and Bernhard Boockmann, "Die Größe der Schattenwirtschaft - Methodik und Berechnungen für das Jahr 2022," Technical Report, Johanes Kepler University Linz (2022).

Signorelli, Sara, "Do Skilled Migrants Compete with Native Workers? Analysis of a Selective Immigration Policy," Technical Report, Paris School of Economics (2020).

Sinn, Hans-Werner, "EU enlargement, migration, and lessons from German unification," *German Economic Review*, *1* (3), (2000), 299–314.

Škuflić, Lorena and Valentina Vučković, "The effect of emigration on unemployment rates: the case of EU emigrant countries," *Economic research-Ekonomska istraživanja*, *31* (1), (2018), 1826–1836.

UN Comtrade, "UN Comtrade - Trade Data," (2022). https://comtrade.un.org/data, Last accessed on 2023-01-26.

Zaiceva, Anzelika and Klaus F Zimmermann, "Scale, diversity, and determinants of labour migration in Europe," *Oxford Review of Economic Policy*, *24* (3), (2008), 427–451.

Tables

Table 1: Native Worker vs. Czech Worker Characteristics

	(1) German Workers 2010		(2) Czech Workers 2012		(3) (1)-(2)	
	Mean	SD	Mean	SD	Difference	p-Value
Panel A: Earnings and Employment						
Total yearly earnings	19084.1	[15168.1]	16206.2	[12602.3]	**2877.9**	0.0000
Daily Wage (EUR)	60.29	[40.14]	53.36	[33.07]	**6.9314**	0.0000
Full-time Daily Wage	75.64	[36.12]	63.52	[29.21]	**12.117**	0.0000
Days worked per year	269.5	[134.0]	269.3	[123.9]	0.1341	0.9756
Panel B: Demographics						
Female	0.502	[0.500]	0.321	[0.467]	**0.1816**	0.0000
Age in years	41.31	[12.88]	39.10	[10.74]	**2.2133**	0.0000
No vocational training	0.135	[0.342]	0.292	[0.455]	**-0.1563**	0.0000
Vocational training	0.749	[0.434]	0.628	[0.484]	**0.1205**	0.0000
University degree	0.116	[0.320]	0.0801	[0.272]	**0.03585**	0.0006337
Residency outside Germany	0.00160	[0.0400]	0.774	[0.419]	**-0.7719**	0.0000
Manufacturing sector	0.428	[0.495]	0.487	[0.500]	**-0.05911**	0.0002704
Service sector	0.550	[0.498]	0.491	[0.500]	**0.05848**	0.0003380
Agriculture	0.00990	[0.0990]	0.00748	[0.0862]	0.002417	0.4562
Observations	140471		936			

Notes: This table presents the characteristics of native workers (Column 1, in 2010) and workers from the Czech Republic (Column 2, in 2012) in the German border region in the 10% worker sample of the German social-security data. Column (3) shows the difference in means and respective p-values from a t-test for equal means. Panel A shows how Czech and native workers differ in terms of earnings, wages, and employment. Panel B shows how Czech and native workers differ with respect to demographics such as gender, age, and education. Residency outside Germany is a dummy indicating whether a worker is reported to 'live abroad' in the administrative data. I show the characteristics of Czech workers in 2012 because this is a year where a substantial number of them is already commuting across the border. In contrast, native workers' characteristics are reported in 2010, to ensure that they are not yet affected by the inflow. Differences in bold signal statistical significance at the 5%-level.

Table 2: Summary Statistics of Czech Counties in 2010

	(1) All Regions		(2) Matched Controls		(3) Border Region		(4) (2)-(3)	
	Mean	SD	Mean	SD	Mean	SD	Difference	p-Value
Panel A: Employment								
Unemployment Rate	7.840	[2.070]	8.006	[2.120]	8.945	[1.916]	-0.9384	0.1502
Number of Unemployed	7292.9	[4885.0]	6458.3	[4194.9]	6970.6	[2541.8]	-512.25	0.6431
Vacancies per Working Age Population	0.00379	[0.00175]	0.00346	[0.00135]	0.00374	[0.00157]	-0.0002792	0.5507
Number of applicants per job	26.13	[14.50]	27.46	[13.10]	30.17	[16.61]	-2.7121	0.5699
Panel B: Firms								
Share Firms in Agriculture in %	0.0511	[0.0238]	0.0537	[0.0212]	0.0563	[0.0339]	-0.002606	0.7723
Share Firms in Manufacturing in %	0.139	[0.0229]	0.140	[0.0192]	0.126	[0.0193]	**0.01456**	0.02183
Share Firms in Construction in %	0.133	[0.0192]	0.140	[0.0178]	0.131	[0.0201]	0.008934	0.1456
Panel C: Population								
Working Age Population	95828.6	[100153.1]	77894.8	[42632.6]	76102.8	[24882.3]	1791.9	0.8719
Average age in region	40.66	[0.770]	40.70	[0.509]	40.18	[0.672]	**0.5188**	0.008999
Deaths	1387.6	[1396.4]	1144.2	[674.1]	1079.3	[358.9]	64.900	0.7060
Births	1521.5	[1672.4]	1216.0	[672.7]	1180.7	[427.4]	35.250	0.8443
Observations	77		20		20			

Notes: This table presents the characteristics of Czech counties in the year before the policy change. Column (1) presents all Czech counties, Column (2) presents all matched non-border counties, Column (3) presents all matched border counties, and Column (4) shows the difference between non-border vs. border counties and respective p-values from a t-test for equal means. Regions are matched using mahalanobis distance matching, based on the population's working age share, the share of firms in manufacturing, the share of firms in agriculture, the unemployment rate, vacancies in levels, and population size (all measured in 2010). Border counties are all counties bordering either Germany or Austria. Differences in bold signal statistical significance at the 5%-level.

Table 3: Summary Statistics of German Municipalities in 2010

	(1) All Regions		(2) Matched Controls		(3) Border Region		(4) (2)-(3)	
	Mean	SD	Mean	SD	Mean	SD	Difference	p-Value
Panel A: Employment								
Native Empl. (levels))	2903.0	[20257.8]	3253.9	[13692.3]	3195.7	[14142.5]	58.196	0.9527
Foreign Workers	0.0414	[0.0496]	0.0227	[0.0196]	0.0194	[0.0181]	**0.003249**	0.01468
EU Workers	0.0193	[0.0319]	0.00896	[0.00822]	0.0129	[0.0151]	**-0.003937**	0.000005002
Full-time Workers	0.509	[0.160]	0.573	[0.108]	0.575	[0.103]	-0.002704	0.7157
Panel B: Average Daily Wages (EUR)								
Native Wages	62.55	[12.33]	60.57	[8.147]	59.05	[7.770]	**1.5206**	0.006845
Total Wages	61.87	[11.86]	60.24	[7.999]	58.77	[7.682]	**1.4693**	0.007979
Panel C: Workforce Characteristics								
Workers Aged 15-29	0.168	[0.0649]	0.173	[0.0365]	0.174	[0.0396]	-0.001110	0.6794
Workers Aged 30-49	0.468	[0.0833]	0.475	[0.0281]	0.475	[0.0322]	-0.0004735	0.8240
Female Workers	0.469	[0.131]	0.486	[0.0856]	0.483	[0.0931]	0.002774	0.6598
High-skilled Workers	0.0687	[0.0534]	0.0727	[0.0372]	0.0714	[0.0430]	0.001314	0.6429
Medium-skilled Workers	0.775	[0.0881]	0.809	[0.0398]	0.815	[0.0421]	**-0.006117**	0.03434
Low-skilled Workers	0.128	[0.0692]	0.104	[0.0475]	0.104	[0.0512]	0.0003363	0.9230
Panel D: Regional Characteristics								
East Germany	0.226	[0.418]	0.429	[0.496]	0.429	[0.496]	0	1
Dist. to CZ Border (km)	267.7	[129.0]	169.5	[105.3]	21.75	[10.61]	**147.74**	7.218e-121
Observations	10806		403		403			

Notes: This table presents the characteristics of German municipalities in the year before the policy change. Column (1) presents all German municipalities, Column (2) presents all matched non-border municipalities, Column (3) presents all matched border municipalities, and Column (4) shows the difference between non-border vs. border municipalities and respective p-values from a t-test for equal means. Municipalities are matched using mahalanobis distance matching, separately within East vs. West Germany. The mahalanobis distance matching algorithm is based on the following variables: Age shares (2010), skill shares (2010), share of female workers (2010), share of foreign workers (2010), share of firms in service sector (2010), share of firms in manufacturing sector (2010), log employment (2009, 2010), growth in EU8 employment 2004-2010, log wages (2009). High-skilled workers have a university degree, medium-skilled workers have completed vocational training, low-skilled workers have no vocational training. Treated municipalities are all municipalities located up to 40km from the nearest road border crossing to Czech Republic (measured by airline distance from municipality centroid). Differences in bold signal statistical significance at the 5%-level.

Table 4: Difference-in-Differences Estimates for County Outcomes - Czech Republic

Panel A:	Unemployment Rate (UR)	UR Men	UR Women	Log Unemployed
Diff-in-Diff	-0.0068	-0.0067	-0.0069	-0.12
	(0.0022)***	(0.0024)***	(0.0023)***	(0.036)***
Observations	560	560	560	560
Dep. Var Mean in BR in 2010	0.089	0.092	0.087	8.77
Scaled Effect (% of Mean)	-7.60	-7.25	-7.95	-1.34
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Panel B:	Log Vacancies	Log Applicants per Job	Log Vacancies f. Youth	Inflows
Diff-in-Diff	0.17	-0.30	0.45	66.5
	(0.087)*	(0.099)***	(0.24)*	(91.4)
Observations	560	531	556	560
Dep. Var Mean in BR in 2010	5.51	3.24	3.35	1411.7
Scaled Effect (% of Mean)	3.16	-9.18	13.5	4.71
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Panel C:	Total Population	Aged 0-14	Aged 15-64	Aged 65+
Diff-in-Diff	-909.2	-404.3	-722.5	217.6
	(925.1)	(299.5)	(994.6)	(448.7)
Observations	480	480	480	480
Dep. Var Mean in BR in 2010	107557.6	16053.8	76102.8	15401.0
Scaled Effect (% of Mean)	-0.85	-2.52	-0.95	1.41
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Panel D:	Total Crime	Property Crime	Economic Crime	Burglary
Diff-in-Diff	-56.3	45.4	-40.0	-1.11
	(198.5)	(155.5)	(33.0)	(6.24)
Observations	560	560	560	560
Dep. Var Mean in BR in 2010	3047.4	2332.4	291.6	87
Scaled Effect (% of Mean)	-1.85	1.94	-13.7	-0.0038
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes: This table shows how a number of regional characteristics in the Czech border region changed following the outflow of Czech workers. It presents coefficients from a difference-in-differences regression with year and county fixed effects and standard errors clustered at the county level. Diff-in-Diff reports the coefficient on the interaction of a dummy for being located in the border region with a dummy for all years from 2011. Panel A reports results for different unemployment outcomes. Panel B reports results for different vacancy outcomes. Note that while 'vacancies' in Column (1) contains all vacancies as reported on December 31 in a given year, 'vacancies for youth' in Column (3) reports the number of vacancies available for young people or recent graduates. 'Inflows' in Column (4) reports the number of individuals of all ages who moved to a given region in a given year. Panel C reports results for different population size outcomes. Panel D reports results for different crime outcomes. 'Economic crime' in Column (3) comprises, for instance, tax fraud, money laundering, counterfeiting, or corruption. *, ** and *** correspond to 10, 5 and 1 percent signficance levels, respectively.

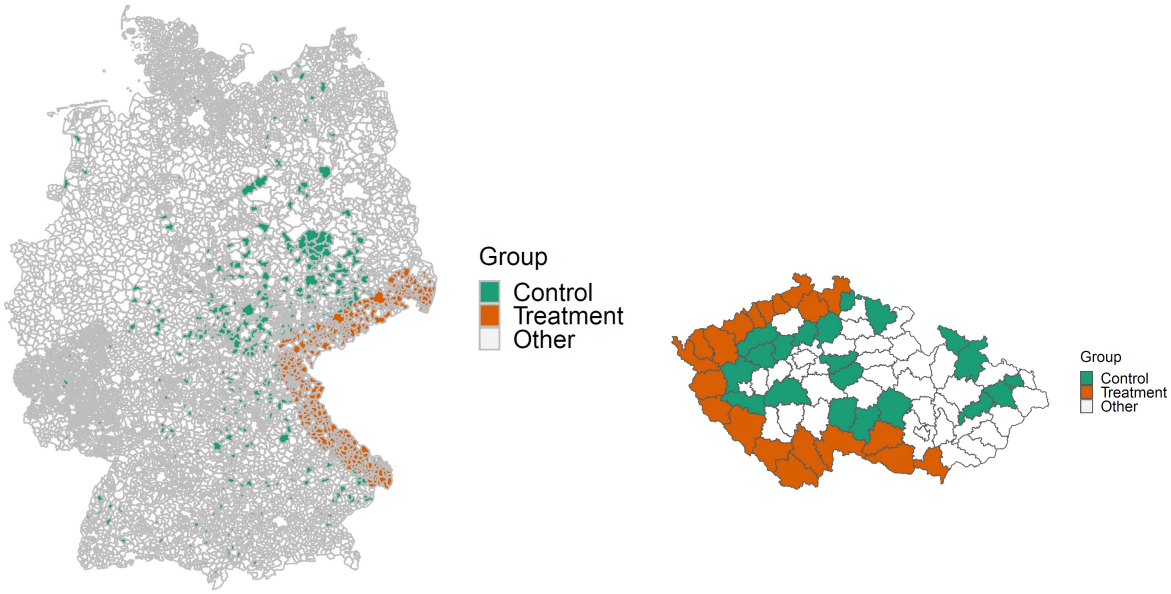
Table 5: Difference-in-Differences Estimates for Establishment Outcomes - Germany

Panel A:	Share Low-Skilled	Share Medium-Skilled	Share High-Skilled
Diff-in-Diff	-0.0015	0.0013	-0.00023
	(0.0013)	(0.0052)	(0.0013)
Observations	766636	766636	766636
Dep. Var Mean in BR in 2010	0.081	0.80	0.10
Scaled Effect (% of Mean)	-1.79	0.16	-0.23
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel B:	Share Aged 15-29	Share Aged 30-49	Share Aged 50+
Diff-in-Diff	-0.0069	0.013	-0.0053
	(0.0019)***	(0.0038)***	(0.0028)*
Observations	766636	766636	766636
Dep. Var Mean in BR in 2010	0.16	0.48	0.32
Scaled Effect (% of Mean)	-4.28	2.70	-1.66
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel C:	Estab. Entries	Estab. Exits	Log Wage Natives
Diff-in-Diff	0.00081	0.00031	-0.0020
	(0.00065)	(0.00083)	(0.0016)
Observations	1988696	1988696	621007
Dep. Var Mean in BR in 2010	0.040	0.044	4.01
Scaled Effect (% of Mean)	2.01	0.70	-0.049
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel D:	Log Wage Low-Skilled	Log Wage Medium-Skilled	Log Wage High-Skilled
Diff-in-Diff	0.0032	-0.0023	-0.00070
	(0.0075)	(0.0015)	(0.0039)
Observations	90794	602122	187552
Dep. Var Mean in BR in 2010	3.82	3.98	4.38
Scaled Effect (% of Mean)	0.083	-0.057	-0.016
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: This table shows how characteristics of treated establishments in the 8 most affected 1-digit industries (restaurants, traffic/telecommunication, investment goods, retail, production goods, construction, commercial services, health) changed post 2010 relative to establishments in the matched control municipalities. It presents coefficients from a difference-in-differences regression with year and establishment fixed effects and standard errors clustered at the establishment level. Diff-in-Diff reports the coefficient on the interaction of a dummy for an establishment being located in the border region with a dummy for all years from 2011. All employment shares are computed as employment in a given group of workers (e.g., low-skilled) by the establishments' total workforce in 2010. Panel A reports results for within-establishment employment shares of different skill groups, where low-skilled workers have no vocational training, medium-skilled workers have vocational training, and high-skilled workers have a university degree. Panel B reports results for within-establishment employment shares of different age groups. Panel C reports results for establishment entries (Column (1)), establishment exits (Column (2)), and mean establishment log full-time wages for native workers. Panel D reports results for mean establishment log wages by skill group. Except for Panel C, Column (3), all outcomes pool native and migrant workers. Balanced panel of establishments (except for estab. entries/exits). In Columns (1) and (2) of Panel C, the regressions contain municipality fixed effects instead of establishment fixed effects. *, ** and *** correspond to 10, 5 and 1 percent signficance levels, respectively.

Figures

Figure 1: Matched Treated and Control Regions: Germany and the Czech Republic

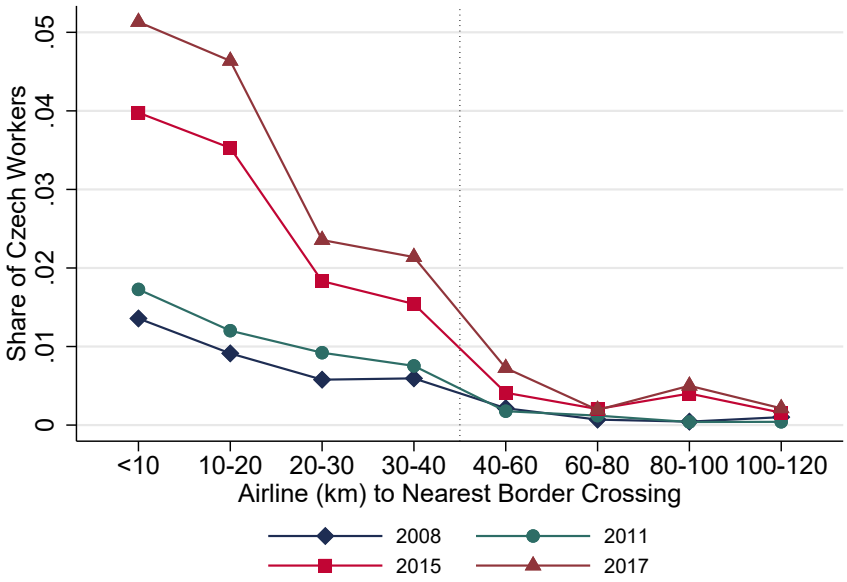


(a) Matched Municipalities, Germany

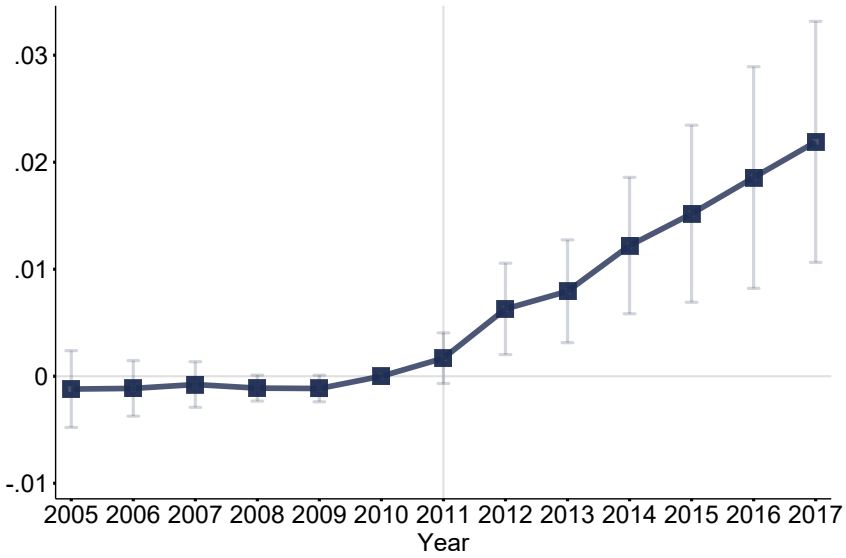
(b) Matched Counties, Czech Republic

Notes: This map shows matched treated and control municipalities (LAU-1) for Germany (Panel (a)), and matched treated and control counties (LAU-1) for the Czech Republic (Panel (b)). For Germany, treated municipalities are all municipalities located at most 40km from the nearest road border crossing into the Czech Republic (airline distance from municipality centroid). For the Czech Republic, treated municipalities are all municipalities located in a county bordering either Germany or Austria. Regions are matched using propensity score matching (see Section 5).

Figure 2: The Inflow of Czech Workers to Germany



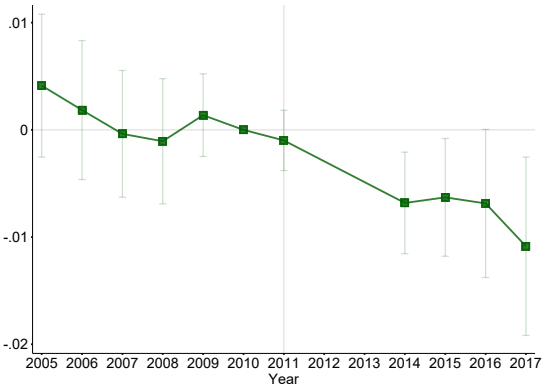
(a) Share of Czech Workers by Airline Distance from the Border



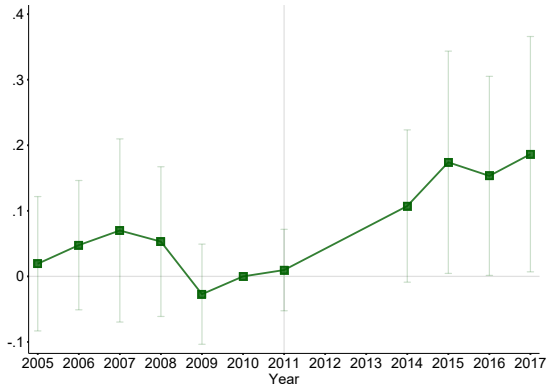
(b) Share of Czech Workers - Matched Municipalities

Notes: This figure shows the inflow of Czech workers to the German border region. Panel (a) presents the share of Czech workers by airline distance (in km) from the nearest Czech-German road border crossing for 4 points in time: 2008 (blue diamonds), 2011 (green circles), 2015 (red squares), and 2017 (darkred triangles). Panel (b) reports event study coefficients on the differential inflow of Czech workers to treated municipalities vs. matched control municipalities over time. I compute all shares relative to employment in 2010. Event study regressions include year and municipality fixed effects. In Panel (b), 95% confidence intervals are derived from standard errors clustered at the county level. The German labor market opened for EU8 workers in 2011.

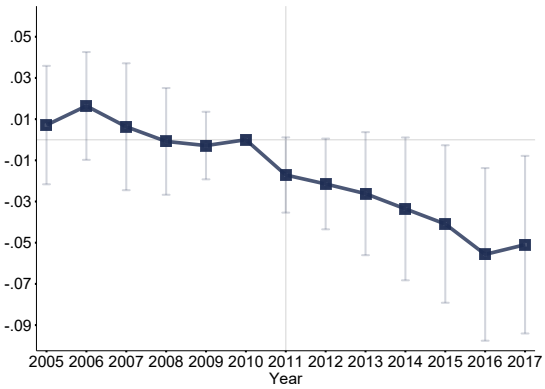
Figure 3: The Impact of Out-Migration and In-Migration on Local Labor Markets in Czech Republic and Germany - Event Study Coefficients for Matched Regions



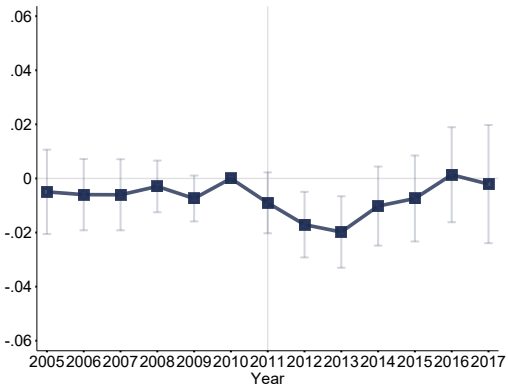
(a) Unemployment Rates in Czech Republic



(b) Log(Vacancies+1) in Czech Republic



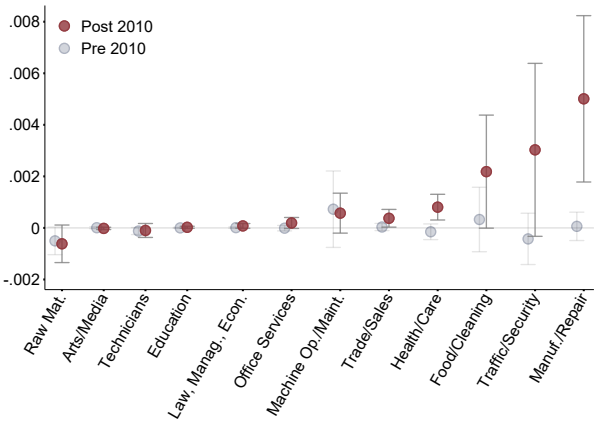
(c) Native Employment in Germany



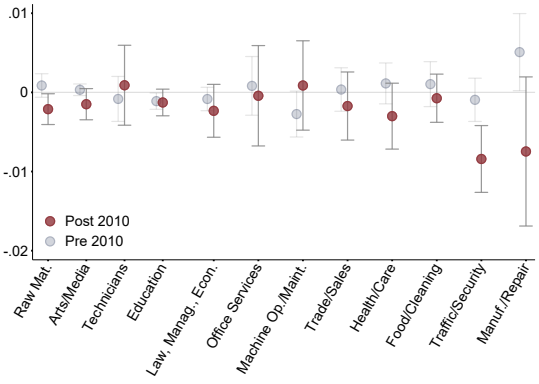
(d) Native Full-time Wages in Germany

Notes: This figure shows the impact of out-migration and in-migration on labor markets in the Czech and German border municipalities compared to matched controls. For the Czech Republic, I define the border region to include all municipalities located in a county with a direct border to Germany or Austria. For Germany, I define the border region as all municipalities located up to 40km from the nearest road border crossing to the Czech Republic. Panels (a) and (b) report event study coefficients on the differential effect on municipality unemployment rates and municipality log(vacancies+1) to treated municipalities vs. matched control municipalities in the Czech Republic. Panels (c) and (d) report event study coefficients on the differential effect on municipality-level native employment and native full-time log wages to treated municipalities vs. matched control municipalities in Germany. For the employment outcome, I compute the share of employed natives relative to native employment in 2010. Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the county level. Czech data for 2012/2013 are missing due to a data revision. The German labor market opened for EU8 workers in 2011.

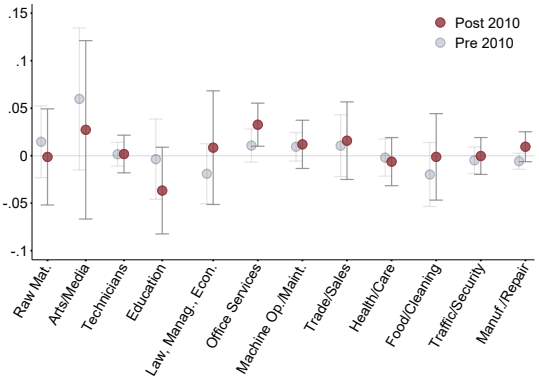
Figure 4: Labor Market Effects by 1-Digit Occupations in Germany



(a) Share of EU8 Workers



(b) Native Employment



(c) Native Log Wages (Full-time)

Notes: This figure plots the coefficients for pre-treatment (2005-2009) and post-treatment (2011-2017) dummies in difference-in-differences regressions which control for municipality and year fixed effects. Panel (a) reports the coefficients for the share of EU8 workers by 2010 employment in each 1-digit occupation. Panel (b) reports the coefficients for the share of native employment by 2010 native employment in each 1-digit occupation. Panel (c) reports the coefficients for native full-time log wages in each 1-digit occupation. 95% confidence intervals are derived from standard errors clustered at the county level. See Figure A9 for corresponding graphs on 1-digit industries.

Figure 5: Labor Market Outcomes for Cohort of Matched Native Workers in Germany

(a) Log Earnings

(b) Log Wage (Full-time)

(c) Full-time Employment

(d) Days Worked per Year

Notes: This figure reports labor market outcomes for a cohort of native workers who were employed in the matched regions in 2010. Within these regions, I use a combination of exact matching and mahalanobis distance matching to find unique matched worker pairs. I match workers exactly within cells of gender, 1-digit industry, and 1-digit occupation. Within these cells, I use mahalanobis distance matching to find unique matches based on age (2010), experience (2010), education (2010), full-time job status (2010, 2008). Days worked refer to social-security employment (excluding minijobs). 95% confidence intervals are derived from standard errors clustered at the worker level.

Online Appendix

List of Tables

List of Figures

A1 Appendix Tables

Table A1: Summary Statistics - Native Workers in Matched Regions in 2010

	(1)	(2)	(3)	(4)
	All		Matched	
	Control	Treatment	Control	Treatment
Panel A: Earnings and Employment				
Total yearly earnings	16055.4	15310.6	27407.7	26792.8
	[16307.3]	[15583.1]	[13574.3]	[13346.8]
Daily wage (EUR)	66.6	63.5	76.7	75.0
	[39.0]	[37.5]	[36.2]	[35.6]
Days per year working	218.8	218.4	353.9	353.4
	[169.7]	[169.3]	[39.8]	[39.9]
Fulltime employed on June 30	0.462	0.452	0.802	0.790
	[0.499]	[0.498]	[0.398]	[0.407]
Panel B: Demographics				
Female	0.484	0.500	0.483	0.483
	[0.500]	[0.500]	[0.500]	[0.500]
Age in years	37.2	37.2	44.0	43.9
	[15.9]	[15.9]	[10.2]	[10.2]
Education in years	11.1	11.2	11.4	11.5
	[1.45]	[1.54]	[1.63]	[1.68]
Tenure in years	6.72	6.77	8.76	9.01
	[6.31]	[6.28]	[6.17]	[6.18]
Panel C: Firm Characteristics				
Log Firmsize	4.06	3.94	4.09	4.16
	[1.92]	[1.85]	[1.79]	[1.87]
Manufacturing sector	0.356	0.356	0.446	0.446
	[0.479]	[0.479]	[0.497]	[0.497]
Service sector	0.399	0.404	0.531	0.531
	[0.490]	[0.491]	[0.499]	[0.499]
Number of Workers	3093831	2974016	76178	76178

Notes: This table presents the characteristics of all native workers in the matched German regions (Columns (1) and (2)), and all native incumbent workers in the matched German regions (Columns (3) and (4)) in 2010. Incumbent workers were employed in a social-security job in the border region in 2010. Panel A shows how workers in the matched regions differ in terms of earnings, wages, and employment. Panel B shows how workers in the matched regions differ with respect to demographics such as gender, age, and education. Standard deviations in brackets.

Table A2: 1-Digit Occupations - Workers in Matched Regions in 2010

	(1)	(2)	(3)	(4)
	All		Matched	
	Control	Treatment	Control	Treatment
Raw Materials	0.03	0.02	0.01	0.01
	[0.2]	[0.1]	[0.1]	[0.1]
Education	0.02	0.02	0.02	0.02
	[0.1]	[0.1]	[0.2]	[0.2]
Machine Operations/Maintenance	0.1	0.10	0.09	0.09
	[0.3]	[0.3]	[0.3]	[0.3]
Trade/Sales	0.1	0.1	0.10	0.10
	[0.3]	[0.3]	[0.3]	[0.3]
Traffic/Security	0.1	0.1	0.1	0.1
	[0.3]	[0.3]	[0.3]	[0.3]
Food/Cleaning	0.09	0.10	0.06	0.06
	[0.3]	[0.3]	[0.2]	[0.2]
Services	0.2	0.2	0.2	0.2
	[0.4]	[0.4]	[0.4]	[0.4]
Technicians	0.06	0.06	0.08	0.08
	[0.2]	[0.2]	[0.3]	[0.3]
Law/Management/Economics	0.03	0.02	0.03	0.03
	[0.2]	[0.2]	[0.2]	[0.2]
Arts	0.007	0.007	0.008	0.008
	[0.09]	[0.08]	[0.09]	[0.09]
Health/Care	0.1	0.1	0.1	0.1
	[0.3]	[0.3]	[0.3]	[0.3]
Education	0.02	0.02	0.02	0.02
	[0.1]	[0.1]	[0.2]	[0.2]
Number of Workers	99801	95936	76178	76178

Notes: This table presents the distribution across 1-digit occupations of all native workers in the matched German regions (Columns (1) and (2)), and all native incumbent workers in the matched German regions (Columns (3) and (4)) in 2010. Incumbent workers were employed in a social-security job in the border region in 2010, and aged 18-55. Standard deviations in brackets.

Table A3: 1-Digit Industries - Workers in Matched Regions in 2010

	(1)	(2)	(3)	(4)
	All		Matched	
	Control	Treatment	Control	Treatment
Agriculture	0.02	0.02	0.01	0.01
	[0.1]	[0.1]	[0.1]	[0.1]
Mining, Energy	0.008	0.008	0.01	0.01
	[0.09]	[0.09]	[0.1]	[0.1]
Food Manufacturing	0.04	0.04	0.03	0.03
	[0.2]	[0.2]	[0.2]	[0.2]
Consumption Goods	0.03	0.05	0.03	0.03
	[0.2]	[0.2]	[0.2]	[0.2]
Production Goods	0.07	0.06	0.06	0.06
	[0.2]	[0.2]	[0.2]	[0.2]
Investment Goods	0.1	0.1	0.1	0.1
	[0.3]	[0.3]	[0.3]	[0.3]
Construction	0.06	0.07	0.07	0.07
	[0.2]	[0.3]	[0.3]	[0.3]
Retail	0.1	0.1	0.1	0.1
	[0.4]	[0.3]	[0.4]	[0.4]
Traffic, Telecommunication	0.05	0.05	0.06	0.06
	[0.2]	[0.2]	[0.2]	[0.2]
Credit, Insurance	0.02	0.02	0.03	0.03
	[0.1]	[0.1]	[0.2]	[0.2]
Restaurants	0.04	0.04	0.02	0.02
	[0.2]	[0.2]	[0.2]	[0.2]
Education	0.03	0.04	0.04	0.04
	[0.2]	[0.2]	[0.2]	[0.2]
Health	0.1	0.1	0.1	0.1
	[0.3]	[0.3]	[0.3]	[0.3]
Commercial Services	0.1	0.1	0.1	0.1
	[0.3]	[0.3]	[0.3]	[0.3]
Other Services	0.04	0.04	0.03	0.03
	[0.2]	[0.2]	[0.2]	[0.2]
Non-Profit	0.01	0.01	0.01	0.01
	[0.1]	[0.1]	[0.1]	[0.1]
Public Administration	0.06	0.06	0.07	0.07
	[0.2]	[0.2]	[0.3]	[0.3]
Number of Workers	99801	95936	76178	76178

Notes: This table presents the distribution across 1-digit industries of all native workers in the matched German regions (Columns (1) and (2)), and all native incumbent workers in the matched German regions (Columns (3) and (4)) in 2010. Incumbent workers were employed in a social-security job in the border region in 2010, and aged 18-55. Standard deviations in brackets.

Table A4: Native Worker vs. EU8 Worker Characteristics

	(1) German Workers 2010		(2) EU8 Workers 2012		(3) (1)-(2)	
	Mean	SD	Mean	SD	Difference	p-Value
Panel A: Earnings and Employment						
Total yearly earnings	19082.1	[15164.5]	16396.5	[13566.7]	**2685.6**	0.0000
Daily Wage (EUR)	60.28	[40.13]	55.11	[36.03]	**5.1676**	0.0000
Full-time Daily Wage	75.62	[36.10]	66.27	[32.40]	**9.3523**	0.0000
Days worked per year	269.5	[134.0]	258.4	[128.5]	**11.108**	0.001375
Panel B: Demographics						
Female	0.502	[0.500]	0.338	[0.473]	**0.1640**	0.0000
Age in years	41.31	[12.88]	38.71	[11.04]	**2.5966**	0.0000
Share without vocational training	0.135	[0.342]	0.288	[0.453]	**-0.1526**	0.0000
Share with vocational training	0.749	[0.433]	0.583	[0.493]	**0.1665**	0.0000
Share with university degree	0.116	[0.320]	0.130	[0.336]	-0.01394	0.09277
Residency outside Germany	0.00148	[0.0385]	0.568	[0.496]	**-0.5666**	0.0000
Panel C: Industry Composition						
Manufacturing sector	0.428	[0.495]	0.443	[0.497]	-0.01487	0.2462
Service sector	0.550	[0.498]	0.536	[0.499]	0.01348	0.2959
Agriculture	0.00990	[0.0990]	0.00664	[0.0813]	0.003256	0.2037
Observations	140197		1505			

Notes: This table presents the characteristics of native workers (Column 1, in 2010) and workers from the EU8 countries (Column 2, in 2012) in the German border region in the 10% worker sample of the German social-security data. Column (3) shows the difference in means and respective p-values from a t-test for equal means. Panel A shows how EU8 and native workers differ in terms of earnings, log wages, and employment. Panel B shows how EU8 and native workers differ with respect to demographics such as gender, age, and education. Panel C shows differences across broad industries. Residency outside Germany is a dummy indicating whether a worker is reported to 'live abroad' in the administrative data. I show the characteristics of EU8 workers in 2012 because this is a year where a substantial number of them is already working in the border region. In contrast, native workers' characteristics are reported in 2010, to ensure that they are not yet affected by the inflow. Differences in bold signal statistical significance at the 5%-level. The German border region comprises all municipalities which are located up to 40km airline distance from the nearest road border crossing to Czech Republic.

Table A5: Summary Statistics - Native and EU8 Worker Distribution Across 1-Digit Occupations

	(1) Natives 2010	(2) EU8 2012
Raw Materials	1.59	2.40
	[12.5]	[15.3]
Education	2.72	1.27
	[16.3]	[11.2]
Machine Operations/Maintenance	8.49	12.1
	[27.9]	[32.7]
Trade/Sales	10.3	2.93
	[30.4]	[16.9]
Traffic/Security	10.8	11.5
	[31.0]	[32.0]
Food/Cleaning	8.92	19.5
	[28.5]	[39.6]
Services	17.2	3.80
	[37.8]	[19.1]
Technicians	7.79	2.80
	[26.8]	[16.5]
Law/Management/Economics	2.94	0.93
	[16.9]	[9.62]
Arts	0.97	1
	[9.82]	[9.95]
Health/Care	12.9	10.6
	[33.5]	[30.8]
Education	2.72	1.27
	[16.3]	[11.2]
Number of Observations	138139	1505

Notes: This table presents the occupational distibution (1-digit) of native workers (Column 1, in 2010) and workers from the EU8 countries (Column 2, in 2012) in the German border region in the 10% worker sample of the German social-security data. I show the characteristics of EU8 workers in 2012 because this is a year where a substantial number of them is already working in the border region. In contrast, native workers' characteristics are reported in 2010, to ensure that they are not yet affected by the inflow. Standard deviations in brackets.

Table A6: Summary Statistics - Native and EU8 Worker Distribution Across 1-Digit Industries

	(1) Natives 2010	(2) EU8 2012
Agriculture	1.23	1.40
	[11.0]	[11.7]
Mining, Energy	1.00	0.66
	[9.96]	[8.13]
Food Manufacturing	2.89	3.32
	[16.7]	[17.9]
Consumption Goods	3.98	2.66
	[19.5]	[16.1]
Production Goods	4.84	7.78
	[21.5]	[26.8]
Investment Goods	11.5	14.0
	[31.9]	[34.7]
Construction	5.96	8.84
	[23.7]	[28.4]
Retail	13.7	7.78
	[34.4]	[26.8]
Traffic, Telecommunication	4.73	4.99
	[21.2]	[21.8]
Credit, Insurance	2.07	0.53
	[14.2]	[7.28]
Restaurants	3.92	12.8
	[19.4]	[33.5]
Education	5.27	1.73
	[22.3]	[13.0]
Health	12.3	9.91
	[32.8]	[29.9]
Commercial Services	14.8	18.1
	[35.5]	[38.5]
Other Services	3.83	4.32
	[19.2]	[20.3]
Non-Profit	1.62	0.60
	[12.6]	[7.72]
Public Administration	6.28	0.60
	[24.3]	[7.72]
Number of Observations	138139	1505

Notes: This table presents the industry distibution (1-digit) of native workers (Column 1, in 2010) and workers from the EU8 countries (Column 2, in 2012) in the German border region in the 10% worker sample of the German social-security data. Standard deviations in brackets.

Table A7: Summary Statistics - Native and EU8 Worker Establishment Characteristics

	(1) 2010 Native Workers	(2) 2012 EU8 Workers
Panel A: Establishment Workforce Composition		
Share high-skilled	0.139	0.082
	[0.199]	[0.156]
Share medium-skilled	0.760	0.722
	[0.220]	[0.222]
Share marginally employed	0.141	0.159
	[0.227]	[0.232]
Panel B: Establishment Type		
Estab. age (in years)	15.8	16.5
	[9.13]	[12.0]
Business service firm	0.070	0.142
	[0.256]	[0.349]
Temporary work agency	0.029	0.079
	[0.168]	[0.270]
Daily ave. wage in estab. (in EUR)	79.4	73.1
	[34.4]	[29.8]
Number of Workers	138139	1505

Notes: This table presents establishment characteristics of native workers (Column 1, in 2010) and workers from the EU8 countries (Column 2, in 2012) in the German border region in the 10% worker sample of the German social-security data. Panel A presents the establishment skill composition, where high-skilled workers have a university degree, medium-skilled workers have completed vocational training, and low-skilled workers have no vocational training. Panel B presents additional characteristics on the establishment's age, its type, and average daily full-time wages. I follow Goldschmidt and Schmieder (2017) in their definition of business service firms. These include food, cleaning, security, and logistics establishments. I show the characteristics of EU8 workers in 2012 because this is a year where a substantial number of them is already working in the border region. In contrast, native workers' characteristics are reported in 2010, to ensure that they are not yet affected by the inflow. Standard deviations in brackets.

Table A8: Summary Statistics of Narrow and Wider Border Region in Germany in 2010

	(1) All Regions		(2) Wider Border Region		(3) Narrow Border Region		(4) (2)-(3)	
	Mean	SD	Mean	SD	Mean	SD	Difference	p-Value
Panel A: Employment								
Native Employment (levels))	2903.0	[20257.8]	1811.4	[6030.5]	2538.9	[12241.0]	-727.51	0.1789
Foreign Workers	0.0414	[0.0496]	0.0164	[0.0237]	0.0178	[0.0220]	-0.001369	0.3027
Foreign Workers from EU	0.0193	[0.0319]	0.00805	[0.0168]	0.0118	[0.0186]	**-0.003769**	0.0002294
Full-time Workers	0.509	[0.160]	0.582	[0.151]	0.584	[0.111]	-0.002430	0.7551
Panel B: Daily Wages (EUR)								
Native Average Wages	62.55	[12.33]	57.56	[10.36]	57.49	[8.566]	0.06978	0.9002
Average Wages	61.87	[11.86]	57.26	[10.16]	57.27	[8.486]	-0.006426	0.9906
Panel C: Workforce Characteristics (Shares)								
Workers Aged 15-29	0.168	[0.0649]	0.164	[0.0657]	0.172	[0.0449]	**-0.007425**	0.02519
Workers Aged 30-49	0.468	[0.0833]	0.466	[0.0850]	0.472	[0.0384]	-0.005574	0.1574
Female Workers	0.469	[0.131]	0.459	[0.142]	0.481	[0.0997]	**-0.02229**	0.002070
High-skilled Workers	0.0687	[0.0534]	0.0714	[0.0521]	0.0741	[0.0479]	-0.002677	0.3570
Medium-skilled Workers	0.775	[0.0881]	0.826	[0.0706]	0.819	[0.0516]	**0.007501**	0.03918
Low-skilled Workers	0.128	[0.0692]	0.0890	[0.0591]	0.0972	[0.0557]	**-0.008219**	0.01375
Panel D: Regional Characteristics								
Share Rural Regions	0.492	[0.500]	0.675	[0.469]	0.641	[0.480]	0.03381	0.2178
Distance to CZ Border (km)	267.7	[129.0]	60.16	[11.05]	21.34	[10.76]	**38.822**	0
Observations	10806		664		543			

Notes: This table presents the characteristics of German municipalities in the year before the policy change. Column (1) presents all German municipalities, Column (2) presents all municipalities in the wider border region (located 40-120 airline distance from the nearest road border crossing to Czech Republic), Column (3) presents all municipalities in the narrow border region (located up to 40km airline distance from the nearest road border crossing to Czech Republic), and Column (4) shows the difference between wider vs. narrow border municipalities and respective p-values from a t-test for equal means. High-skilled workers have a university degree, medium-skilled workers have completed vocational training, low-skilled workers have no vocational training. Differences in bold signal statistical significance at the 5%-level.

Table A9: Robustness Checks - Germany

	(1) Baseline	(2) Narrow vs. Wider BR	(3) West Germany	(4) Propensity Score Matching	(5) Matching in 2008	(6) Add. Matching Var.	(7) Exclude Same Comm. Zone
Panel A: Share Foreign Workers by 2010 Employment							
Diff-in-Diff	0.0048	0.0048	0.0056	0.0075	0.0062	0.0048	0.0043
	(0.0016)***	(0.0014)***	(0.0042)	(0.0019)***	(0.0015)***	(0.0018)***	(0.0026)
Observations	10400	15186	5863	11978	11178	9204	9581
Dep. Var Mean in BR in 2010	0.012	0.012	0.019	0.013	0.012	0.013	0.013
Scaled Effect (% of Mean)	39.9	41.3	29.2	56.9	50.2	37.3	32.8
Muni. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Native Employment by 2010 Employment							
Diff-in-Diff	-0.039	0.00081	-0.072	-0.046	-0.011	-0.038	-0.037
	(0.014)***	(0.016)	(0.028)**	(0.019)**	(0.015)	(0.017)**	(0.018)**
Observations	10400	15089	5863	11943	11178	9204	9581
Dep. Var Mean in BR in 2010	1	1	1	1	1	1	1
Scaled Effect (% of Mean)	-3.95	0.081	-7.16	-4.57	-1.15	-3.81	-3.70
Muni. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Native (Full-time)							
Diff-in-Diff	-0.0046	0.0068	-0.0061	-0.0065	-0.0037	-0.0047	-0.0040
	(0.0050)	(0.0055)	(0.0077)	(0.0060)	(0.0056)	(0.0057)	(0.0054)
Observations	10386	15087	5849	11850	11157	9186	9566
Dep. Var Mean in BR in 2010	4.24	4.20	4.34	4.23	4.23	4.24	4.25
Scaled Effect (% of Mean)	-0.11	0.16	-0.14	-0.15	-0.088	-0.11	-0.094
Muni. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each column in this table represents a different robustness check for different samples of German municipalities. Each column presents coefficients from a difference-in-differences regression with year and municipality fixed effects and standard errors clustered at the municipality level. Diff-in-Diff reports the coefficient on the interaction of a dummy for being located in the border region with a dummy for all years from 2011. Column (1) reports the baseline coefficients. Column (2) reports coefficients when using the wider border region (i.e. municipalities located 40-80 airline distance from the nearest road border crossing to Czech Republic) as control group. Column (3) reports coefficients for a matching specification with West German municipalities, only. Column (4) reports coefficients for a sample of municipalities matched via propensity score matching (within regional type and East/West Germany). The following variables enter the probit regressino to compute propensity scores: Skill shares, age shares, share of foreign workers, growth in migrant workers' employment in 2004-2010, share of women, share of firms in the manufacturing sector, and share of firms in the service sector (all in 2010). Column (5) reports coefficients when restricting the variables for mahalanobis distance matching to variables measured in 2008, only. Column (6) reports coefficients when, in addition to the baseline matching algorithm, matching exactly on regional type (5 types: i) large city, ii) medium-sized city, iii) larger town, iv) smaller town, v) rural municipality). Column (7) reports results from a sample where the control units are restricted to always lie outside the commuting zones of treated units. The baseline mahalanobis distance matching algorithm is based on the following variables: Age shares (2010), skill shares (2010), share of female workers (2010), share of foreign workers (2010), share of firms in service sector (2010), share of firms in manufacturing sector (2010), log employment (2009, 2010), growth in EU8 employment 2004-2010, log wages (2009). I match within West/East Germany, and I drop control municipalities located less than 80km from the German-Polish border. *, ** and *** correspond to 10, 5 and 1 percent signficance levels, respectively.

Table A10: Robustness Checks - Czech Republic

	(1) Baseline	(2) BR to Bavaria Only	(3) BR to Germany Only	(4) Propensity Score Matching	(5) Matching on Industry Compos.	(6) Matching on 2008 Var.	(7) Placebo Treatment Test
Panel A: Unemployment Rate							
Diff-in-Diff	-0.68	-0.74	-0.85	-0.57	-0.47	-0.51	-0.33
	(0.22)***	(0.40)*	(0.27)***	(0.24)**	(0.23)**	(0.23)**	(0.38)
Observations	560	140	392	560	560	560	240
Dep. Var Mean in BR in 2010	8.94	7.78	9.11	8.94	8.94	8.94	7.24
Scaled Effect (% of Mean)	-7.60	-9.52	-9.28	-6.33	-5.29	-5.68	-4.56
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Log Vacancies							
Diff-in-Diff	0.17	0.37	0.15	0.27	0.17	0.15	0.068
	(0.087)*	(0.17)*	(0.11)	(0.087)***	(0.091)*	(0.090)*	(0.084)
Observations	560	140	392	560	560	560	240
Dep. Var Mean in BR in 2010	5.51	5.44	5.61	5.51	5.51	5.51	6.58
Scaled Effect (% of Mean)	3.16	6.84	2.76	4.95	3.04	2.81	1.03
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Log Applicants per Job							
Diff-in-Diff	-0.30	-0.57	-0.30	-0.39	-0.25	-0.26	-0.10
	(0.099)***	(0.11)***	(0.12)**	(0.11)***	(0.10)**	(0.10)**	(0.11)
Observations	531	122	371	526	526	530	239
Dep. Var Mean in BR in 2010	3.24	2.74	3.13	3.24	3.24	3.24	1.86
Scaled Effect (% of Mean)	-9.18	-20.8	-9.69	-11.9	-7.62	-8.09	-5.46
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each column in this table represents a different robustness check for different samples of Czech counties. Each column presents coefficients from a difference-in-differences regression with year and county fixed effects and standard errors clustered at the county level. Diff-in-Diff reports the coefficient on the interaction of a dummy for being located in the border region with a dummy for all years from 2011. Column (1) reports the baseline coefficients. Column (2) reports coefficients for a matching specification with treatment counties bordering West Germany (i.e. Bavaria), only. Column (3) reports coefficients for a matching specification with treatment counties bordering Germany, only. Column (4) reports coefficients for a sample of regions that is matched via propensity score matching, where the following variables enter the probit regression to compute propensity scores: The share of the working age population, the share of firms in manufacturing, the share of firms in agriculture, unemployment rate, number of vacancies, population size, number of applicants per job, average age, and the number of individuals receiving benefits (all measured in 2010). Column (5) reports coefficients when adding the share of firms in a given 1-digit industry (all measured in 2010) to the set of mahalanobis matching variables. Column (6) reports results with baseline mahalanobis matching variables measured in 2008 instead of 2010. Column (7) reports results from a placebo regression for 2005-2010 where the placebo treatment is assigned to the year 2007. For the baseline sample, regions are matched using mahalanobis distance matching, based on the population's working age share, the share of firms in manufacturing, the share of firms in agriculture, the unemployment rate, vacancies in levels, and population size (all measured in 2010). *, ** and *** correspond to 10, 5 and 1 percent signficance levels, respectively.

Table A11: Establishment-Level Results Where Treated Establishments are Restricted to FDI Firms

Panel A:	Share Low-Skilled	Share Medium-Skilled	Share High-Skilled
Diff-in-Diff	0.0078	0.074	0.0077
	(0.012)	(0.053)	(0.0071)
Observations	384189	384189	384189
Dep. Var Mean in BR in 2010	0.092	0.75	0.15
Scaled Effect (% of Mean)	8.42	9.90	5.13
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel B:	Share Aged 15-29	Share Aged 30-49	Share Aged 50+
Diff-in-Diff	0.057	0.042	-0.0073
	(0.013)***	(0.028)	(0.030)
Observations	384189	384189	384189
Dep. Var Mean in BR in 2010	0.16	0.49	0.33
Scaled Effect (% of Mean)	36.2	8.56	-2.23
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel C:	Share Germans	Share EU Migrants	Log Wage Natives
Diff-in-Diff	-0.021	0.011	-0.019
	(0.059)	(0.0068)*	(0.0060)***
Observations	812007	812007	312638
Dep. Var Mean in BR in 2010	0.98	0.012	4.51
Scaled Effect (% of Mean)	-2.12	93.1	-0.42
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel D:	Log Wage Low-Skilled	Log Wage Medium-Skilled	Log Wage High-Skilled
Diff-in-Diff	-0.040	-0.024	-0.012
	(0.021)*	(0.0065)***	(0.011)
Observations	48308	302963	96811
Dep. Var Mean in BR in 2010	4.21	4.45	4.86
Scaled Effect (% of Mean)	-0.95	-0.53	-0.24
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: This table shows how characteristics of treated establishments in the 8 most affected 1-digit industries (restaurants, traffic/telecommunication, investment goods, retail, production goods, construction, commercial services, health) changed post 2010 relative to establishments in the matched control municipalities. The sample of establishments in the border region is restricted to establishments with FDI in the Czech Republic in 2010. Coefficients from a difference-in-differences regression with year and establishment fixed effects and standard errors clustered at the establishment level. Diff-in-Diff reports the coefficient on the interaction of a dummy for an establishment being located in the border region with a dummy for all years from 2011. All employment shares are computed as employment in a given group of workers (e.g., low-skilled) by the establishments' total workforce in 2010. Panel A reports results for within-establishment employment shares of different skill groups, where low-skilled workers have no vocational training, medium-skilled workers have vocational training, and high-skilled workers have a university degree. Panel B reports results for within-establishment employment shares of different age groups. Panel C reports results for establishment entries (Column (1)), establishment exits (Column (2)), and mean establishment log full-time wages for native workers. Panel D reports results for mean establishment log wages by skill group. Except for Panel C, Column (3), all outcomes pool native and migrant workers. Balanced panel of establishments (except for estab. entries/exits). In Columns (1) and (2) of Panel C, the regressions have municipality fixed effects instead of establishment fixed effects. *, ** and *** correspond to 10, 5 and 1 percent signficance levels, respectively.

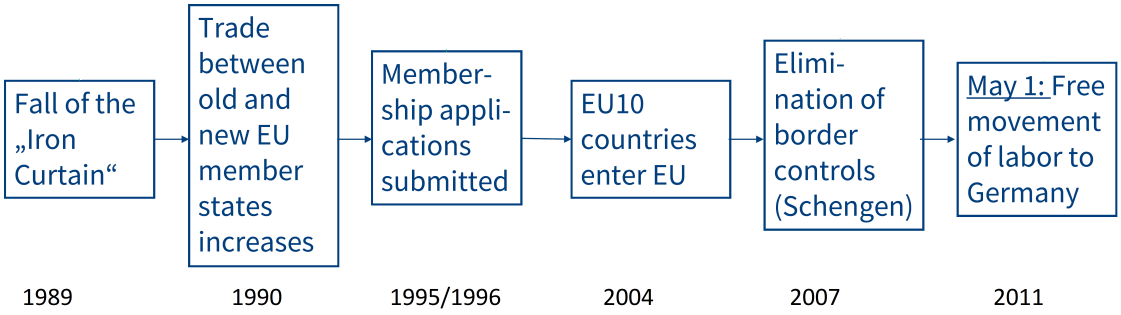
Table A12: Establishment-Level Results Where Treated Establishments are Restricted to Non-FDI Firms

Panel A:	Share Low-Skilled	Share Medium-Skilled	Share High-Skilled
Diff-in-Diff	-0.0016	0.00053	-0.00032
	(0.0013)	(0.0052)	(0.0013)
Observations	762593	762593	762593
Dep. Var Mean in BR in 2010	0.081	0.80	0.10
Scaled Effect (% of Mean)	-1.91	0.067	-0.31
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel B:	Share Aged 15-29	Share Aged 30-49	Share Aged 50+
Diff-in-Diff	-0.0076	0.013	-0.0053
	(0.0019)***	(0.0038)***	(0.0028)*
Observations	762593	762593	762593
Dep. Var Mean in BR in 2010	0.16	0.48	0.32
Scaled Effect (% of Mean)	-4.69	2.64	-1.65
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel C:	Share Germans	Share EU Migrants	Log Wage Natives
Diff-in-Diff	0.018	-0.0000066	-0.0017
	(0.018)	(0.0021)	(0.0016)
Observations	1574337	1574337	617069
Dep. Var Mean in BR in 2010	0.97	0.011	4.00
Scaled Effect (% of Mean)	1.82	-0.059	-0.043
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Panel D:	Log Wage Low-Skilled	Log Wage Medium-Skilled	Log Wage High-Skilled
Diff-in-Diff	0.0054	-0.0020	-0.00036
	(0.0077)	(0.0015)	(0.0039)
Observations	89080	598249	185018
Dep. Var Mean in BR in 2010	3.81	3.98	4.37
Scaled Effect (% of Mean)	0.14	-0.049	-0.0083
County FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: This table shows how characteristics of treated establishments in the 8 most affected 1-digit industries (restaurants, traffic/telecommunication, investment goods, retail, production goods, construction, commercial services, health) changed post 2010 relative to establishments in the matched control municipalities. The sample of establishments in the border region is restricted to establishments without FDI in the Czech Republic in 2010. Coefficients from a difference-in-differences regression with year and establishment fixed effects and standard errors clustered at the establishment level. Diff-in-Diff reports the coefficient on the interaction of a dummy for an establishment being located in the border region with a dummy for all years from 2011. All employment shares are computed as employment in a given group of workers (e.g., low-skilled) by the establishments' total workforce in 2010. Panel A reports results for within-establishment employment shares of different skill groups, where low-skilled workers have no vocational training, medium-skilled workers have vocational training, and high-skilled workers have a university degree. Panel B reports results for within-establishment employment shares of different age groups. Panel C reports results for establishment entries (Column (1)), establishment exits (Column (2)), and mean establishment log full-time wages for native workers. Panel D reports results for mean establishment log wages by skill group. Except for Panel C, Column (3), all outcomes pool native and migrant workers. Balanced panel of establishments (except for estab. entries/exits). In Columns (1) and (2) of Panel C, the regressions have municipality fixed effects instead of establishment fixed effects. *, ** and *** correspond to 10, 5 and 1 percent signficance levels, respectively.

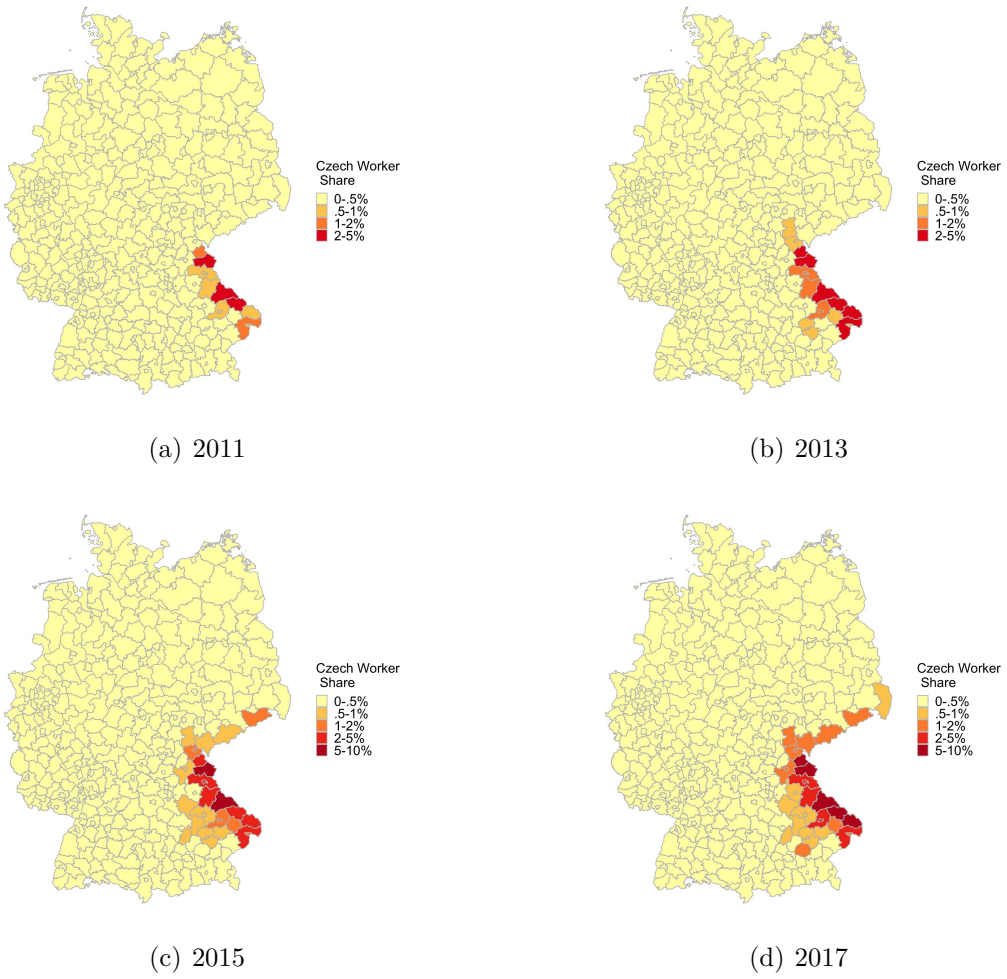
A2 Appendix Figures

Figure A1: The Eastern Enlargement of the EU: The Process



Notes: This figure gives an overview of the process of the Eastern enlargement of the EU in 2004. The process started with the fall of the iron curtain in 1989, which followed an increase in trade between Western and Eastern EU member states through the 1990s. Eastern European countries submitted their membership applications after a relatively short period of time, in 1995-1996. In 2004, 10 new countries accessed the EU, 8 of them from Eastern Europe. The 8 Eastern European countries which accessed the EU along with Cyprus and Malta are Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia. The process of EU enlargement came along with open borders in the course of the Schengen agreement (2007) and free movement of labor (May 1, 2011, Germany). Note that while Germany and Austria delayed the opening of their labor markets until 2011, while the UK, Ireland, and Sweden opened them immediately in 2004. They were followed by Spain, Portugal, Finland, Italy and Greece (2006), Luxembourg and the Netherlands (2007), France (2008), and Belgium and Denmark (2009).

Figure A2: The Geographic Distribution of Czech Workers in Germany



(a) 2011

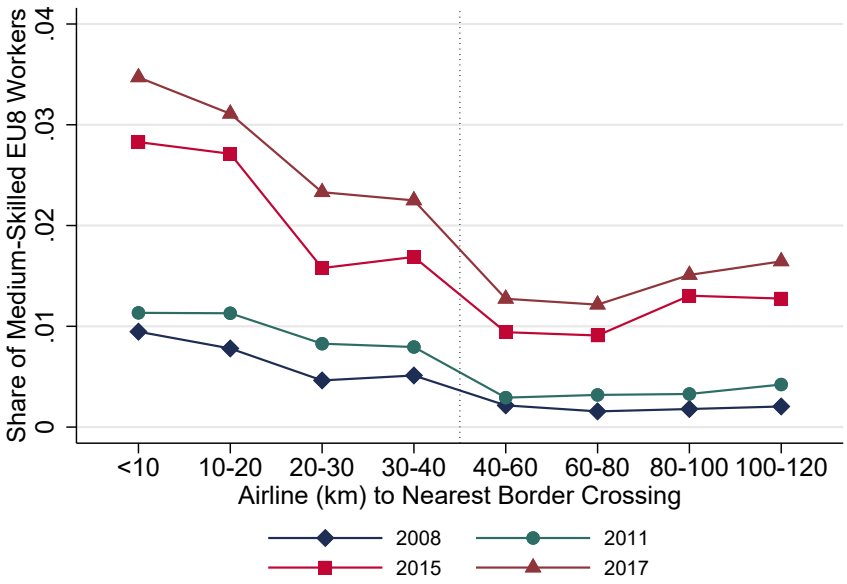
(b) 2013

(c) 2015

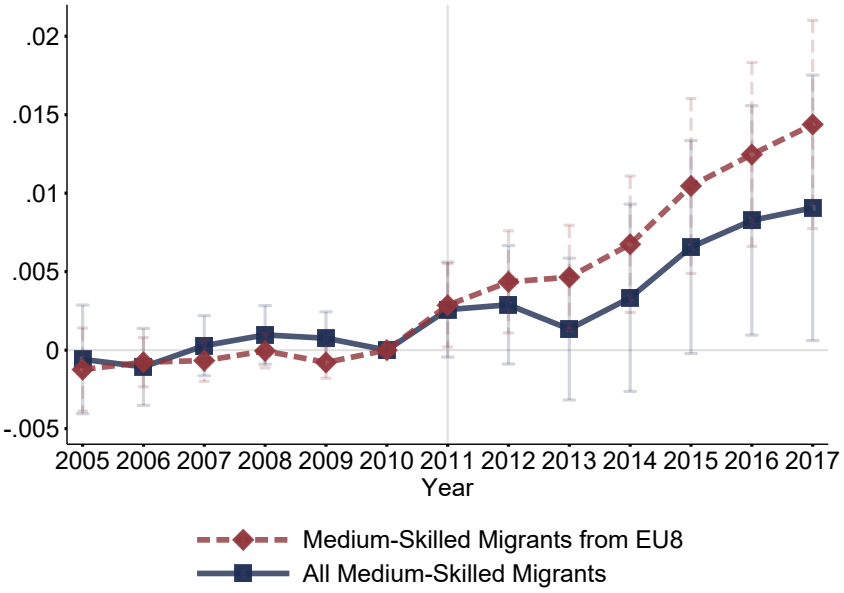
(d) 2017

Notes: This figure shows the geographic distribution of Czech workers across Germany. Each map plots different categories for the share of Czech workers by 2010 employment. The geographic unit is counties (NUTS-3).

Figure A3: The Inflow of Migrant Workers to Germany



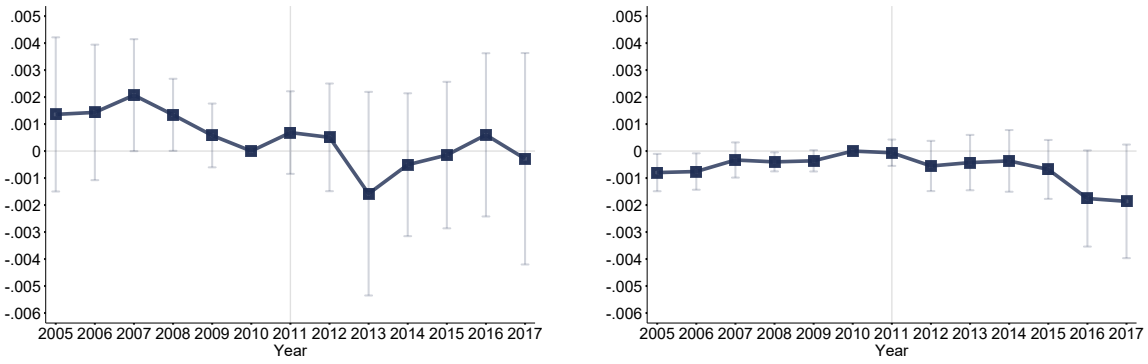
(a) Share of Medium-Skilled EU8 Workers by Airline Distance from the Border



(b) Share of Migrant Workers - Matched Municipalities

Notes: This figure shows the inflow of medium-skilled EU8 and migrant workers to the German border region. Panel (a) presents the share of medium-skilled EU8 workers by airline distance (in km) from the nearest Czech-German road border crossing for 4 points in time: 2008 (blue diamonds), 2011 (green circles), 2015 (red squares), and 2017 (darkred triangles). Panel (b) reports event study coefficients on the differential inflow of all migrant/EU8 workers to treated municipalities (up to 40km from nearest road border crossing into the Czech Republic) vs. matched control municipalities. I compute all shares relative to employment in 2010. Event study regressions include year and municipality fixed effects. In Panel (b), 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011. Medium-skilled workers have completed vocational training (approx. 12 years of education).

Figure A4: The Inflow of Low- and High-skilled Migrant Workers to Germany

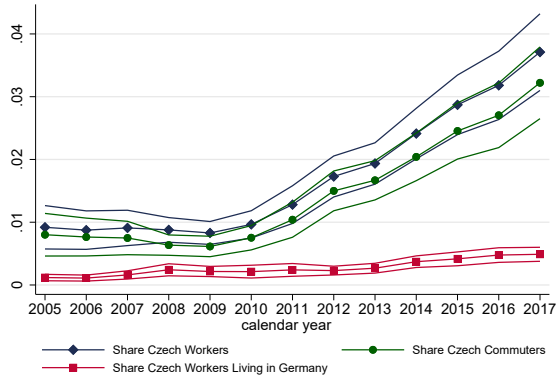


(a) Share of Low-Skilled Migrant Workers

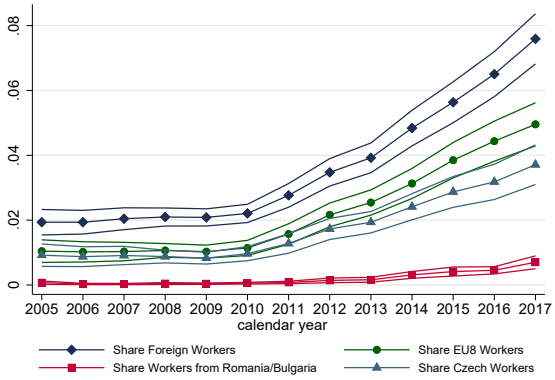
(b) Share of High-Skilled Migrant Workers

Notes: This figure shows the inflow of low-skilled and high-skilled migrant workers to the German border region compared to matched controls. Panel (a) reports event study coefficients on the differential inflow of low-skilled migrant workers to treated municipalities (up to 40km from nearest road border crossing into Czech Republic) vs. matched control municipalities, and Panel (b) plots the same for high-skilled migrant workers. I compute all shares relative to employment in 2010. Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the municipality level. Low-skilled workers have no vocational training, high-skilled workers have a university degree. The German labor market opened for EU8 workers in 2011.

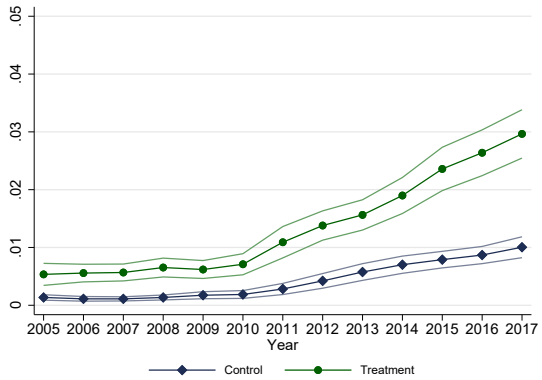
Figure A5: The Czech Worker Inflow: Descriptives



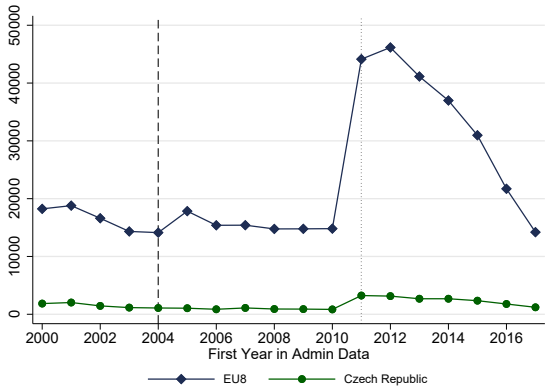
(a) Share of Czech Workers by Place of Living



(b) Inflow of Migrant Workers by Selected Origin Group



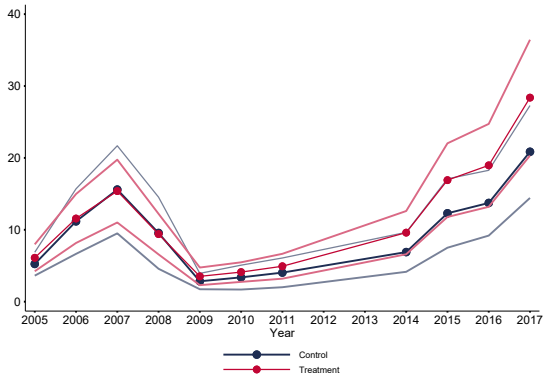
(c) Raw Share of Medium-Skilled EU8 Workers: Border Region vs. Matched Controls



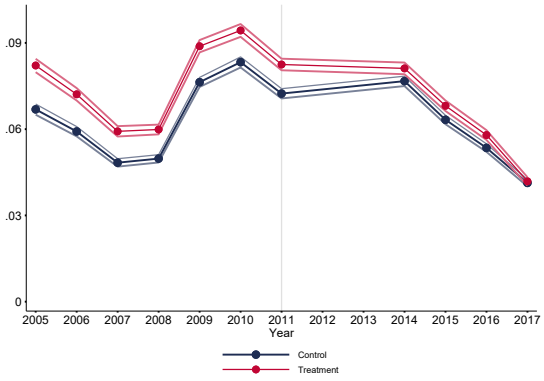
(d) Inflow of EU8 and Czech Workers to Germany by Year of First Entry

Notes: This figure presents descriptive evidence on the migrant worker inflow following the 2011 EU enlargement. Panel (a) plots the share of Czech workers by 2010 employment in the border region for i) all Czech workers (blue diamonds), ii) all Czechs which are reported to "live abroad" (green circles), and iii) all Czechs with a residence in Germany (red squares). Panel (b) plots i) the share of all migrant workers (blue diamonds), ii) the share of EU8 workers (green circles), iii) the share of Czech workers (cyan triangles), and iv) the share of workers from Romania/Bulgaria (red squares) in the border region. Note that the free movement policy for Romanians/Bulgarians started in 2014. In Panel (c), I present raw means of the share of medium-skilled EU8 workers to the border region (green circles) vs. matched control municipalities (blue diamonds). Panel (d) plots the numbers of EU8/Czech workers entering Germany by the first year they were recorded in the German social-security data. This is based on June 30 information in my full 10-% sample of the social-security records.

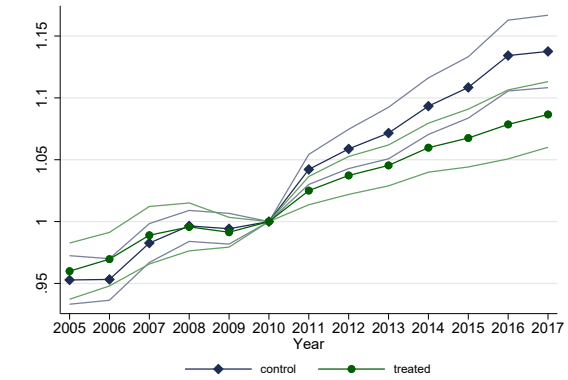
Figure A6: Raw Averages for Main Outcome Variables



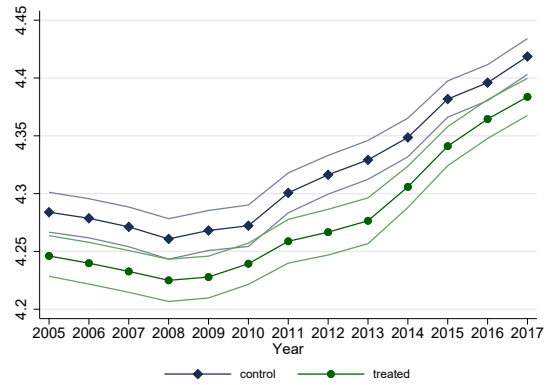
(a) Vacancies (levels)



(b) Unemployment Rates



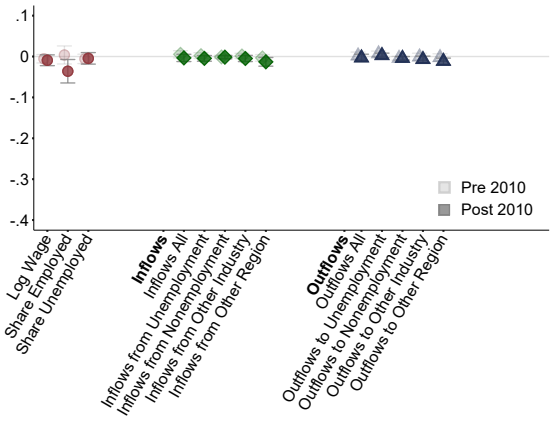
(c) Share of Native Employment by 2010 Employment



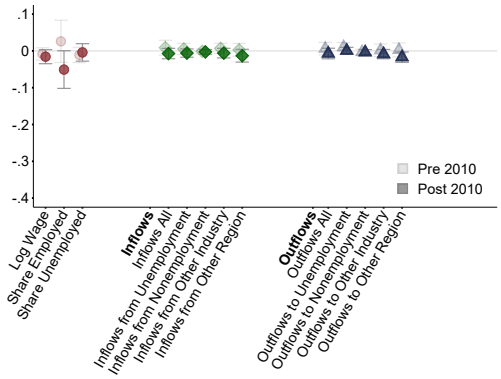
(d) Native Full-time Log Wages

Notes: This figure shows the raw averages of i) vacancies as of Dec 31 in a given year in Czech municipalities (Panel a), unemployment rates in Czech municipalities (Panel b), the share of native employment relative to employment in 2010 in Germany (Panel c), and native full-time log wages in Germany (Panel d). The red line refers to treatment units, the blue line refers to control units. The thin lines depict the 95% confidence intervals around the mean. The German labor market opened for EU8 workers in 2011.

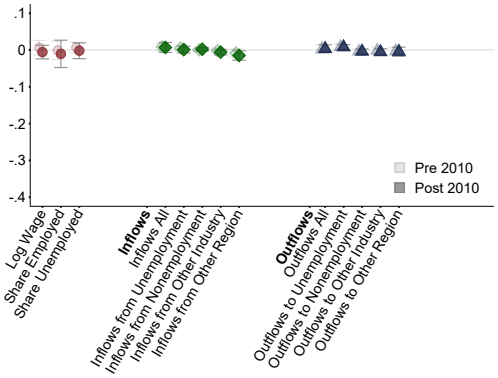
Figure A7: Inflows and Outflows for Matched Regions in Germany



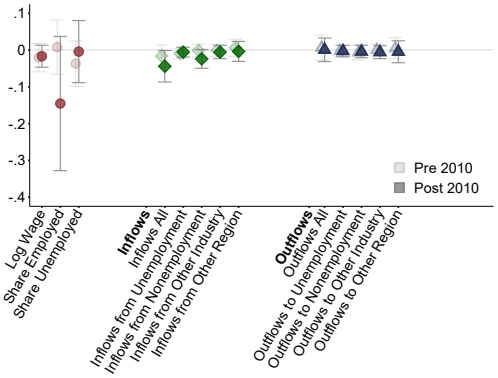
(a) All Workers



(b) Low-skilled Workers



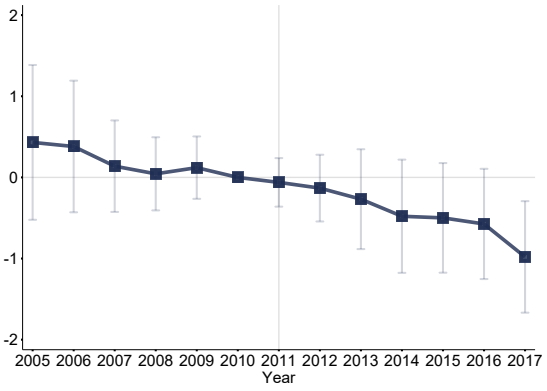
(c) Medium-skilled Workers



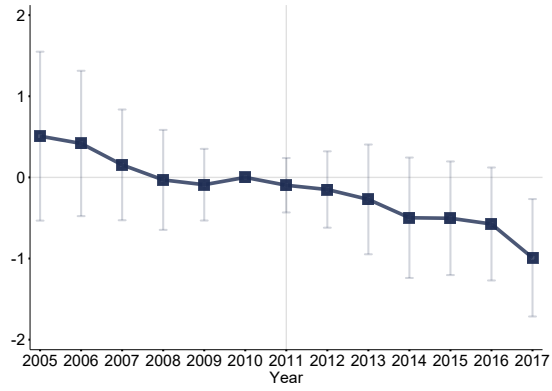
(d) High-skilled Workers

Notes: This figure plots the coefficients for pre-treatment (2005-2009) and post-treatment (2011-2017) dummies in difference-in-differences regressions on the municipality level, which control for municipality and year fixed effects. The y-axis indicates the respective dependant variable. In Panel (a), outcomes are computed for the full sample. Panels (b), (c), and (d) are based on outcomes computed for low-skilled, medium-skilled, and high-skilled workers, respectively. All regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the county level.

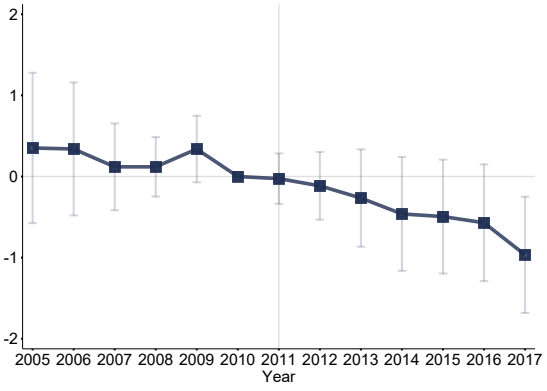
Figure A8: Event Study Regression Coefficients for Czech Counties



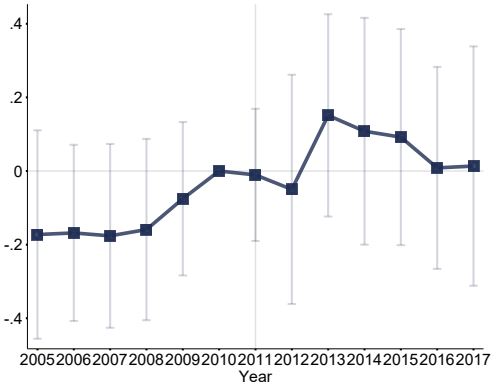
(a) Unemployment Rate



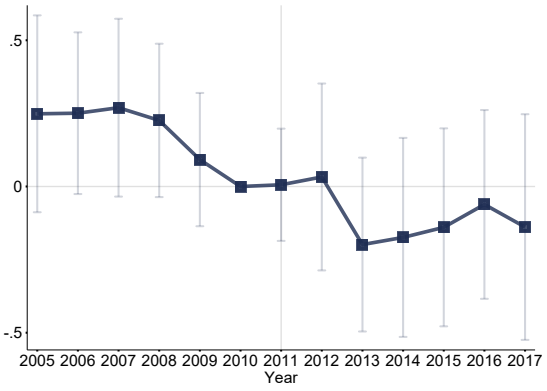
(b) Unemployment Rate - Men



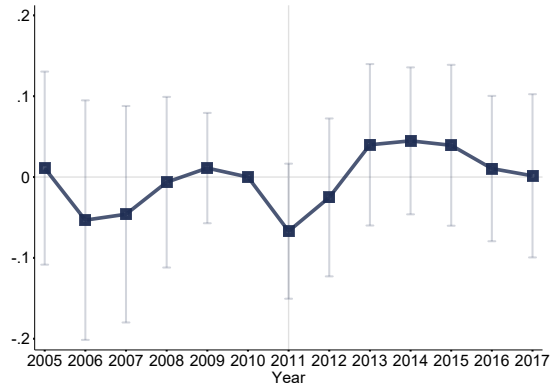
(c) Unemployment Rate - Women



(d) Log Vacancies



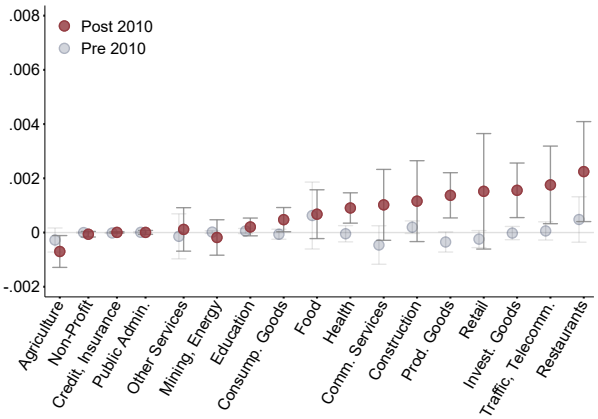
(e) Log Applicants per Job



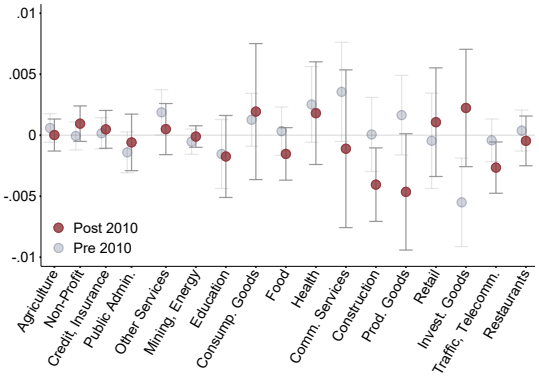
(f) Log Inflows

Notes: This figure shows labor market outcomes for Czech border counties (with a direct border with either Germany or Austria) compared to matched controls. Panels (a), (b), and (c) present the differential evolution of unemployment rates, Panel (d) presents log vacancies, Panel (e) presents log applicants per job, and Panel (f) presents log inflows. Vacancies are recorded on December 31 in a given year. Inflows refer to all individuals who moved to a given county in a given year, regardless of age. Event study regressions include year and county fixed effects. 95% confidence intervals are derived from standard errors clustered at the county level. The German labor market opened for EU8 workers in 2011.

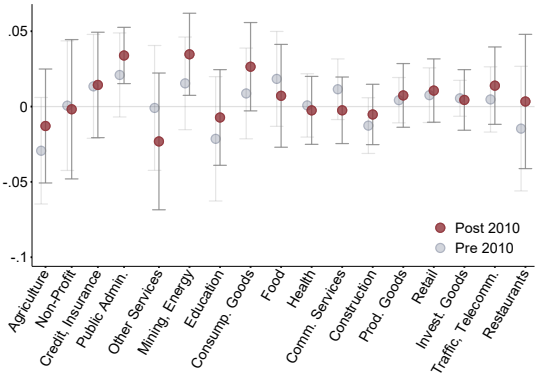
Figure A9: Labor Market Effects by 1-Digit Industries in Germany



(a) Share of EU8 Workers



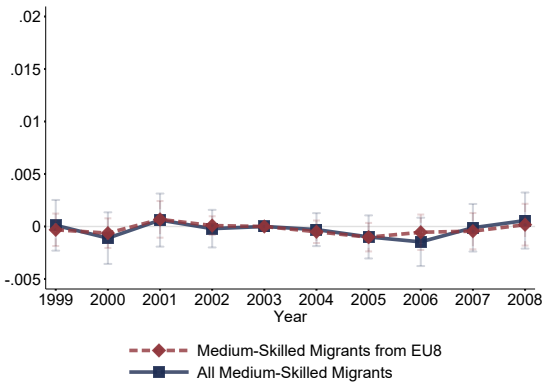
(b) Native Employment



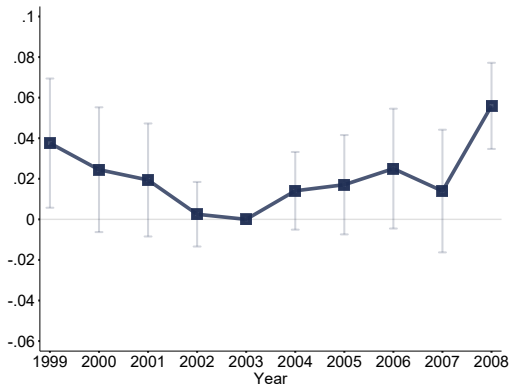
(c) Native Full-time Log Wages

Notes: This figure plots the coefficients for pre-treatment (2005-2009) and post-treatment (2011-2017) dummies in difference-in-differences regressions on the municipality level which control for municipality and year fixed effects. Panel (a) reports the coefficients for the share of EU8 workers by 2010 employment in each 1-digit industry. Panel (b) reports the coefficients for the share of native employment by 2010 native employment in each 1-digit industry. Panel (c) reports the coefficients for native full-time log wages in each 1-digit industry. 95% confidence intervals are derived from standard errors clustered at the county level. See Figure 4 for corresponding graphs on 1-digit occupations.

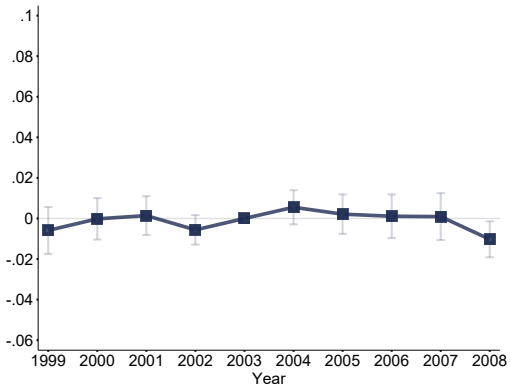
Figure A10: Placebo Treatment Check for Germany: Reform in 2004



(a) Share of Migrant Workers



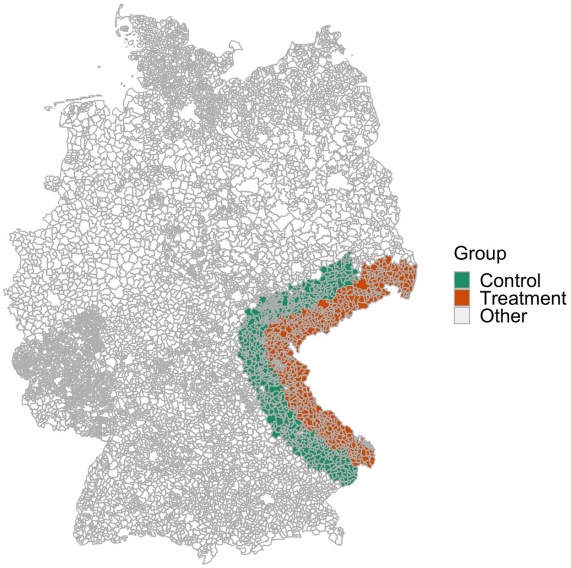
(b) Native Employment



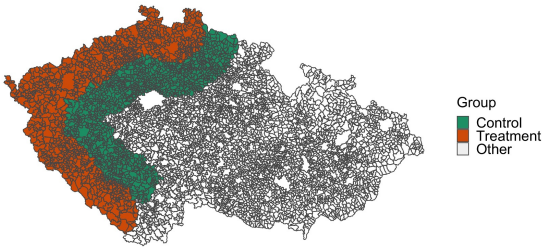
(c) Native Full-time Log Wages

Notes: This figure presents a placebo treatment test on the labor market effects in Germany, where I pretend that treatment occured in 2004 instead of 2011. Regressions are based on my baseline sample of matched municipalities. I show event study coefficients for my main regional outcome variables: Migrant worker share by 2010 employment (Panel (a)), native employment by 2010 native employment (Panel (b)), and native full-time log wages (Panel (c)). Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011.

Figure A11: Maps of the Narrow vs. Wider Border Regions



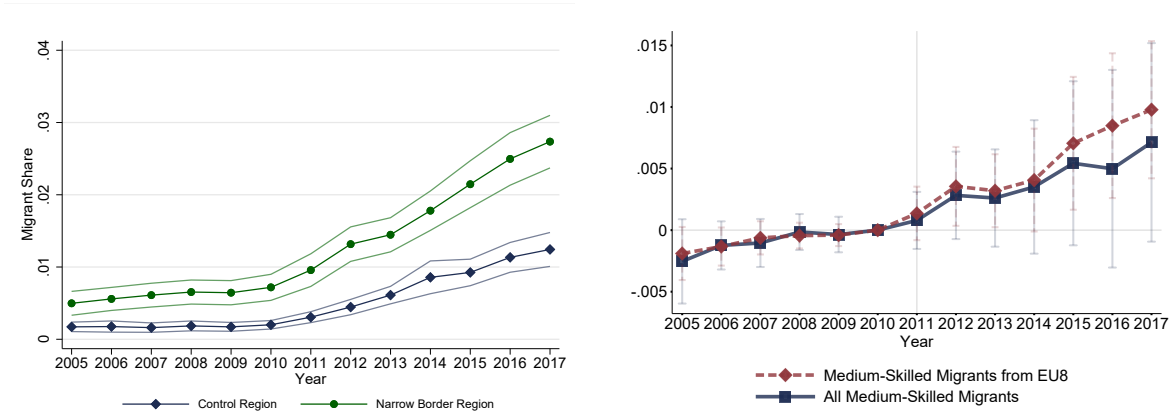
(a) Narrow and Wider Border Region - Municipalities, Germany



(b) Narrow and Wider Border Region - Municipalities, Czech Republic

Notes: This map shows my definition of wider and narrow border region for Germany and the Czech Republic, respectively. For Germany, municipalities (LAU-1) in the narrow border region are all municipalities located up to 40km from the nearest road border crossing into the Czech Republic (airline distance from municipality centroid), corresponding exactly to my definition of treated regions in Figure 1. Municipalities in the wider border region are all municipalities located between 40-80km in airline distance from the nearest road border crossing to the Czech Republic. I deliberately exclude municipalities located up to 80km from the German-Polish border, since they could be affected by increased cross-border commuting from Poland. For Czech Republic, municipalities (LAU-2) in the narrow border region are all municipalities located up to 40km from the nearest road border crossing to Germany (airline distance from municipality centroid). Municipalities in the wider border region are all municipalities located between 40-80km in airline distance from the nearest road border crossing to Germany. I deliberately exclude municipalities located up to 40km from the Czech-Austrian border, since they could be affected by out-migration of Czech workers to Austria.

Figure A12: The Inflow of Foreign Workers to Germany - Narrow vs. Wider Border Region

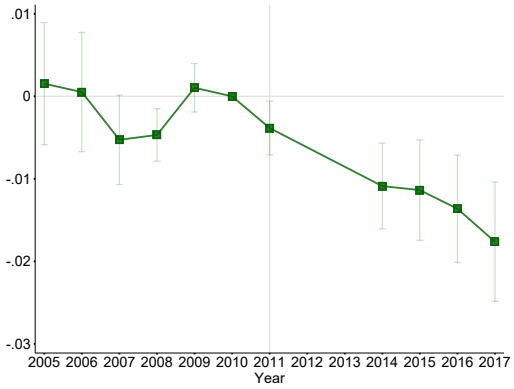


(a) The Inflow of Medium-Skilled EU8 Workers to Germany - Wider and Narrow Border Region

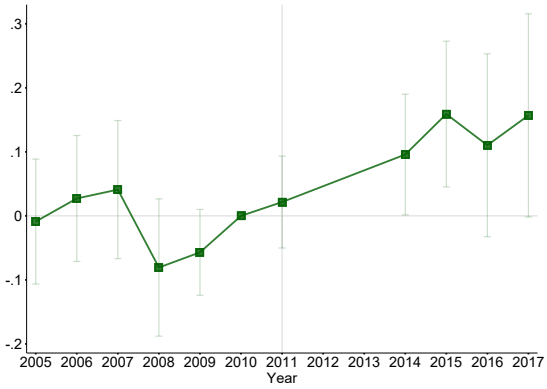
(b) Share of Migrant Workers - Wider and Narrow Border Region

Notes: This figure shows the inflow of medium-skilled EU8 and migrant workers to the narrow vs. wider German border region. Panel (a) presents raw means for the inflow of medium-skilled EU8 workers to German border municipalities ("narrow border region", up to 40km from nearest road border crossing to Czech Republic) compared to the "wider border region" (40-80km from nearest road border crossing into the Czech Republic). Panel (b) reports event study coefficients on the differential inflow of all migrant/EU8 workers to the narrow border region vs. the wider border region. Event study regressions include year and municipality fixed effects. In Panel (b), 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011. Medium-skilled workers have completed vocational training (approx. 12 years of education).

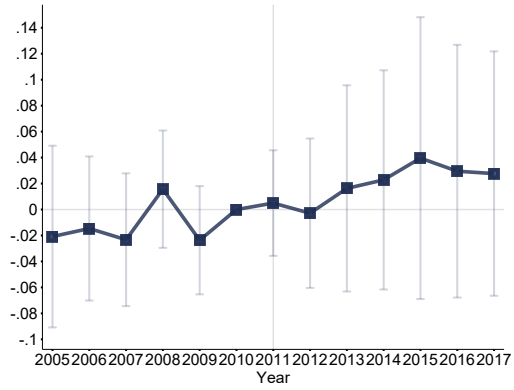
Figure A13: Labor Market Effects in Czech Republic and Germany - Narrow vs. Wider Border Region



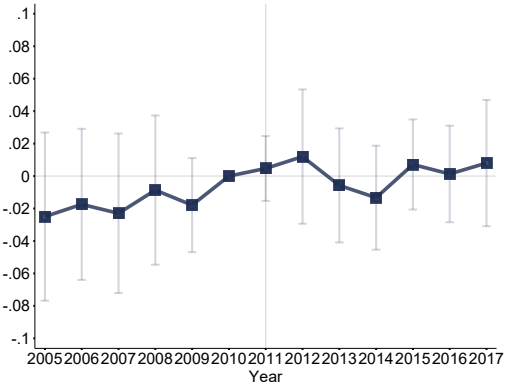
(a) Unemployment Rates in Czech Republic



(b) Log(Vacancies+1) in Czech Republic



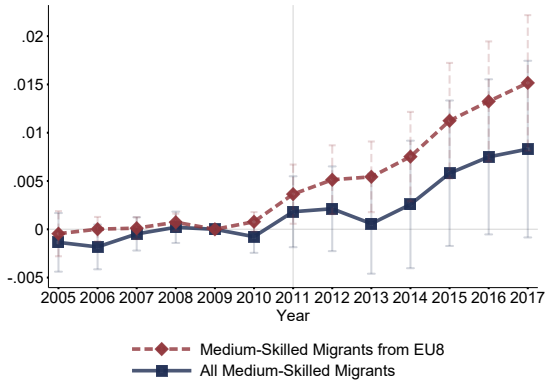
(c) Native Employment in Germany



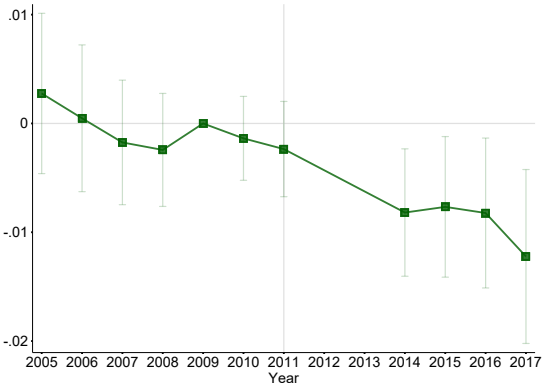
(d) Native Wages (Full-time) in Germany

Notes: This figure shows the impact of out-migration and in-migration on labor markets in the Czech and German narrow border region compared to the wider border region. For both Germany and Czech Republic, I define the narrow border region as all municipalities located up to 40km from the nearest border crossing to the Czech-German border. The wider border region comprises all municipalities located 40-80km from the border. Panels (a) and (b) report event study coefficients on the differential effect on municipality unemployment rates and municipality log vacancies to the narrow vs. wider border region in Czech Republic. Panels (c) and (d) report event study coefficients on the differential effect on municipality-level native employment and native full-time log wages to the narrow vs. wider border region in Germany. For the employment outcome, I compute the share of employed natives relative to native employment in 2010. Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011.

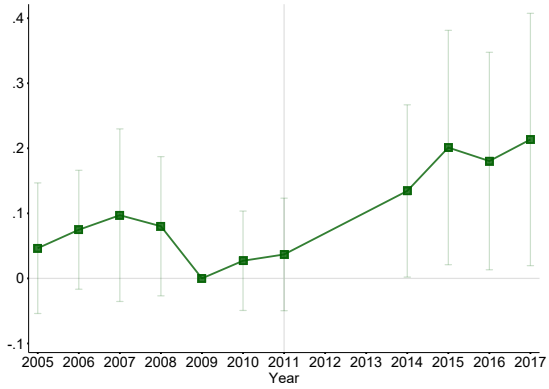
Figure A14: Labor Market Effects in Czech Republic and Germany - Omitting 2009



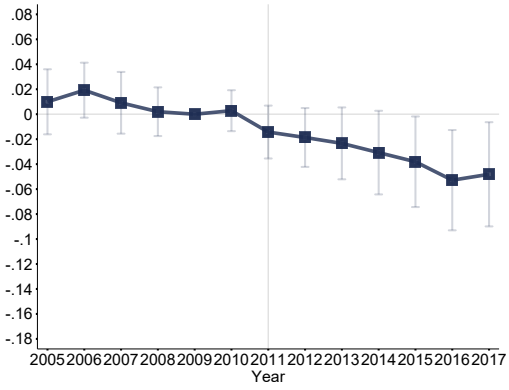
(a) Share of Foreign Workers



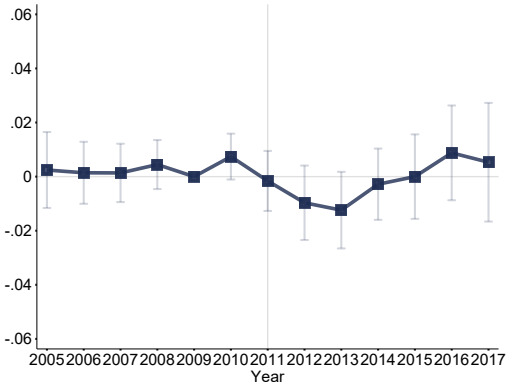
(b) Unemployment Rates in Czech Republic



(c) Log(Vacancies+1) in Czech Republic



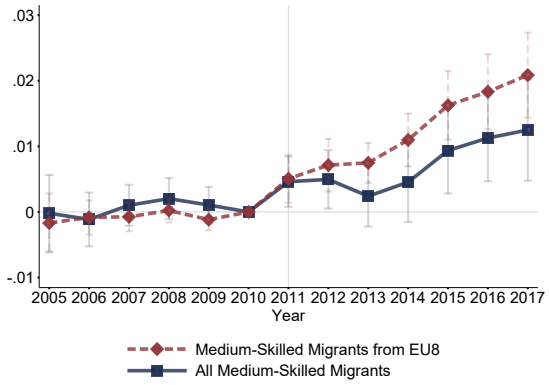
(d) Native Employment in Germany



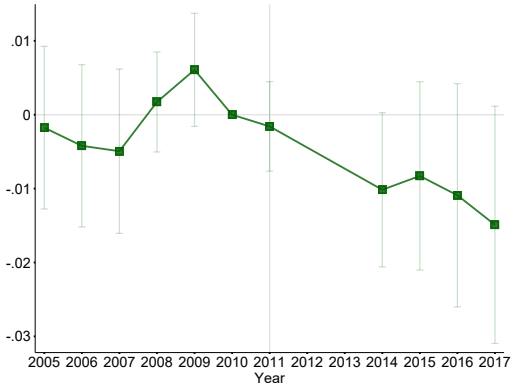
(e) Native Full-time Log Wages in Germany

Notes: This figure shows the impact of out-migration and in-migration on labor markets in the Czech and German border municipalities compared to matched controls, where I omit 2009 instead of 2010 as the reference year. For Czech Republic, I define the border region to include all municipalities located in a county with a direct border to Germany or Austria. For Germany, I define the border region as all municipalities located up to 40km from the nearest road border crossing to Czech Republic. For the employment outcome, I compute the share of employed natives relative to native employment in 2010. Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011.

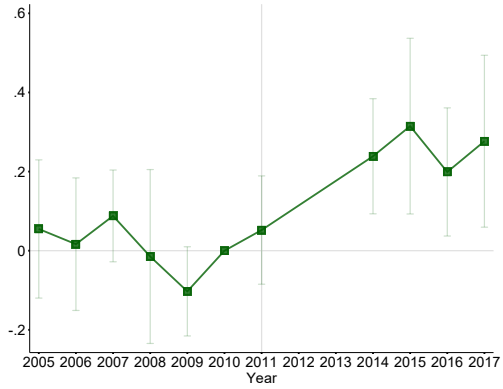
Figure A15: Labor Market Effects in Czech Republic and Germany - West Germany Only



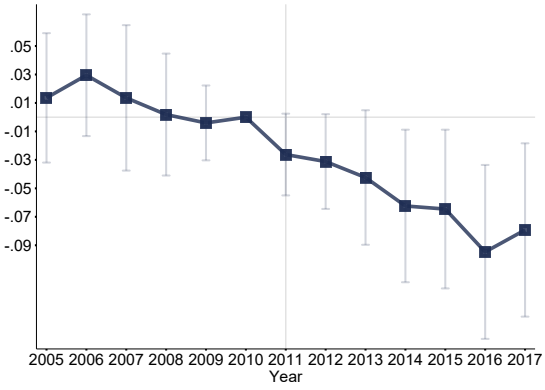
(a) Share of Foreign Workers - West Germany



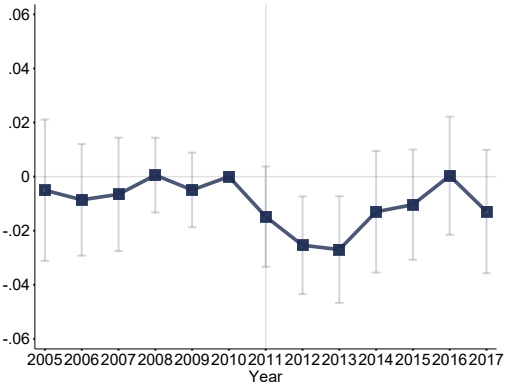
(b) Unemployment Rates in Czech Republic



(c) Log(Vacancies+1) in Czech Republic



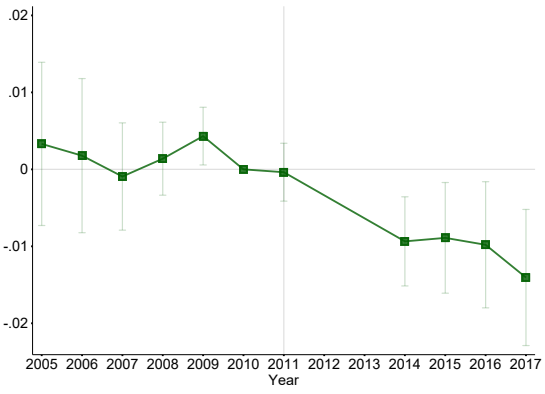
(d) Native Employment in West Germany



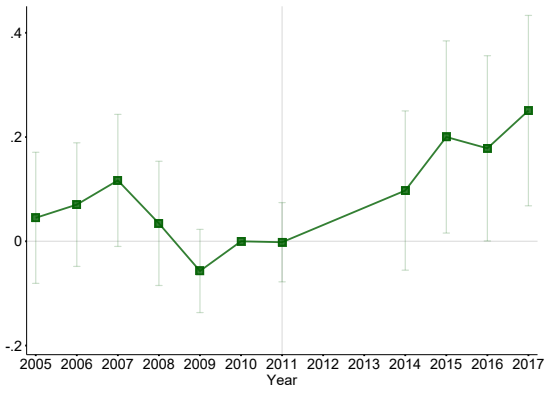
(e) Native Full-time Log Wages in West Germany

Notes: This figure replicates my main results on local labor markets for a sample of regions bordering West Germany (i.e. Bavaria), only. In Panel (a), the outcome variable is the share of medium-skilled migrant workers in Germany. Panels (b) and (c) report event study coefficients on the differential effect on municipality unemployment rates and municipality log vacancies to treated municipalities vs. matched control municipalities in Czech Republic. Panels (d) and (e) report event study coefficients on the differential effect on municipality-level native employment and native full-time log wages to treated municipalities vs. matched control municipalities in Germany. For the employment outcome, I compute the share of employed natives relative to overall employment in 2010. Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011.

Figure A16: Labor Market Effects in Czech Republic - Treatment Regions Bordering Germany Only



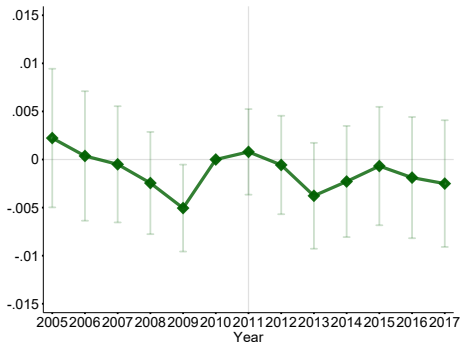
(a) Unemployment Rates in Czech Republic



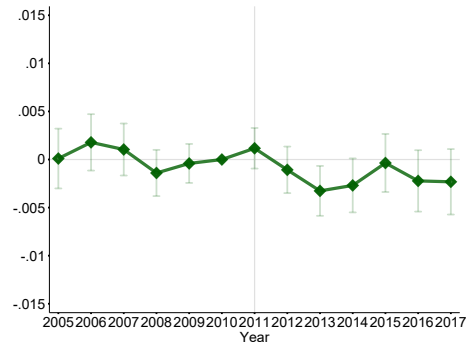
(b) Log(Vacancies+1) in Czech Republic

Notes: This figure replicates my main results on local labor markets in Czech Republic where the treatment regions are restricted to bordering Germany, only. Panels (a) and (b) report event study coefficients on the differential effect on municipality unemployment rates and municipality log vacancies to treated municipalities vs. matched control municipalities in Czech Republic. Event study regressions include year and municipality fixed effects. 95% confidence intervals are derived from standard errors clustered at the municipality level. The German labor market opened for EU8 workers in 2011.

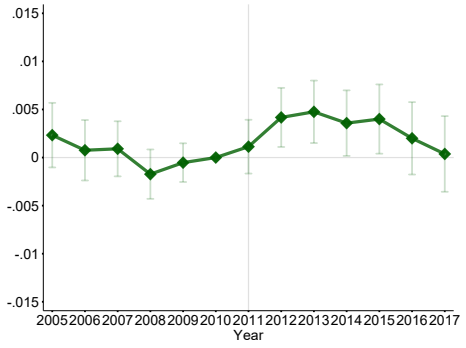
Figure A17: Matched Cohort of Native Workers in Germany - Restrictive Matching Version



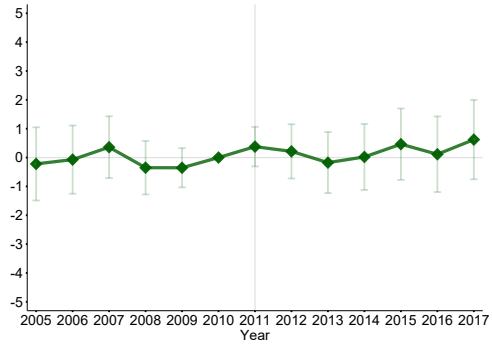
(a) Log Earnings



(b) Log Wage (Full-time)



(c) Full-time Employment



(d) Days Worked per Year

Notes: This figure reports labor market outcomes for a cohort of native workers who were employed in the matched regions in 2010 and which I match using a more restrictive matching algorithm compared to the baseline sample of workers. I use a combination of exact matching and mahalanobis distance matching to find unique matched worker pairs. I match workers exactly within cells of gender, 1-digit industry, 2-digit occupation, and years of education. Within these cells, I use mahalanobis distance matching to find unique matches based on age (2010), experience (2010), and employment status (2010). Days worked refer to social-security employment (excluding minijobs). 95% confidence intervals are derived from standard errors clustered at the worker level.