Online Appendix of

The Abolition of Immigration Restrictions and the Performance of Firms and Workers: Evidence from Switzerland

By Andreas Beerli, Giovanni Peri, Jan Ruffner, and Michael Siegenthaler

A The Swiss labor market around the time of the reform

During the first half of the 1990s, Switzerland experienced a prolonged phase of economic stagnation. Employment fell by 3% between 1991 and 1996 and registered unemployment increased to 5% in the mid-1990s. This unemployment rate was high in a historical perspective. Switzerland had official unemployment rates of almost 0% during many years of the post-war era. Consequences of the restructuring process associated with the economic stagnation in the early 1990s were an increasingly human capital-intensive economy and changes in the occupational and industrial structure, leading to an increase in the relative demand for skills (Puhani, 2005).

The macroeconomic situation improved in the late 1990s, with GDP picking up and the official unemployment rate falling below 2% in 1998. In this recovery, Swiss firms increasingly reported that they struggle to find suitable skilled workers. At the same time, the skill mix of new immigrants improved substantially relative to earlier periods (Beerli et al., 2017). The macroeconomic situation worsened when the dot-com bubble burst. Switzerland entered a phase of economic stagnation between 2001 and mid-2003. Unemployment increased to 3.5%.

The stagnation phase ended towards the end of 2003. Switzerland entered a relatively extended boom phase with high GDP growth rates, falling unemployment, and very high employment growth relative to previous years. Even the Great Recession of 2007/2008 left only small marks in Switzerland. After a drop in 2009, the Swiss economy recovered fast and strongly. GDP grew at 3% in 2010, more than offsetting the fall in the year before. Employment growth also picked up substantially in 2010 after a stagnation in 2009.

Overall, the number of employees increased by 15.2% between 2003 and 2013, from 4.2 to 4.8 million persons. A large part of this increase in employment was attributable to increased employment of EU workers. Switzerland's growth in hours worked in this period was remarkable

even in international perspective. For instance, Germany, for which the recent surge in employment has been the subject of several studies, had lower employment growth than Switzerland from 2002 to 2013. Remarkably, Switzerland had high employment growth despite solid real wage increases. Siegenthaler et al. (2016) dubbed this phenomenon the Swiss "job miracle".

B Data construction

Table A.1 provides an overview of the data sets, their samples, variables, and unit of analysis, as used in the labor market and the firm-level analysis, respectively.

B.1 Sample construction and variables used for labor market analysis

Swiss Earnings Structure Survey The analysis of the reform effects on immigration and on wages and employment of native workers is based on data from the Swiss Earnings Structure Survey (SESS). The SESS is a stratified random sample of private and public firms with at least 3 full-time equivalents from the manufacturing and service sectors. It is available in even years between 1994 and 2010 and covers between 16.6% (1996) and 50% (2010) of total employment in Switzerland. We restrict the sample and define the key variables as follows:

- *Sample restriction in the SESS*: The sample includes individuals with age between 18 and 65 years working in the private sector with non-missing information on nationality, place of work, education, wages, full-time equivalents, and other basic demographics. We only keep workers employed in private-sector firms, as the coverage of the public sector is not complete throughout our analysis period.

- *Definition of immigrants and natives*: The group we call resident immigrants hold either an L permit (4 to 12 months) or a B permit (1 to 6 years). *Cross-border workers* hold a G permit. *Natives* are individuals with Swiss nationality, either born in Switzerland or naturalized. The foreign-born individuals with a permanent residence permit (C permit) can be considered as *long-time immigrants*. This group excluded in our analysis, although they could reasonably be considered as native residents. We exclude them because some immigrants are likely to switch from an L or B permit to a C permit within our sample period. As we do not observe these changes in our data, we would have individuals that switch between immigrants and natives within the sample if we included long-time immigrants. Reassuringly, however, our labor market results are very similar if we count long-time immigrants as natives.

- *Construction of real hourly wages and full-time equivalent employment*: The dataset contains the gross monthly wage for each individual worker (in the month of October) in Swiss Francs. This measure includes social transfers, bonuses, and one-twelfth of additional yearly payments. We divide this measure by the number of hours worked in October, and use the consumer price index to deflate it into the *real hourly wage* of an individual worker at 2010 constant prices. When analyzing wage outcomes we trim our sample by excluding individuals with wages above the 99th percentile of real hourly wages in each year. We express *full-time equivalent (FTE) employment* as a fraction of the number of hours worked by a full-time worker, so that one unit is FTE.

- *Assignment to border region and driving time to border*: We use an official crosswalk from the Federal Statistical Office (FSO) to link zip codes of work places of workers in the SESS to municipalities. As the number of municipalities (and zip codes) changed over time due to mergers, we use the municipality definition in year 2000 as a time-invariant unit. Observations with outdated zip codes that could not be linked (less than 0.3%) were dropped. We allocate municipalities to the *border region* and the *non-border region* as defined below for the firm-level analysis. Similarly, we use driving time to the nearest border crossing calculated for establishments d_i in the business census (BC) averaged at the municipality level as d_m using establishment employment in 1998 as weights.

- *Firm tenure*: Firms were asked to indicate each employee's affiliation with the firm in number of years. In the raw data, workers with less than one year of firm tenure are coded with a missing value between 1994 and 2002. Hence, we cannot distinguish workers with zero and missing values of firm tenure in these years.[45] To adopt a consistent, albeit imperfect, definition of firm tenure, we recoded all missing and zero values to one in all years.

Swiss Labor Force Survey Since we cannot track individuals across years in the SESS, we use the Swiss Labor Force Survey (SLFS) as a complementary data set to investigate to which degree the effects on local employment can be decomposed into effects on in- and outflows of regional employment and their net effect (see Table A.9 discussed in Appendix C). The SLFS is the equivalent of the US Current Population Survey and was conducted in the second

[45] From year 2002 onward, the survey instructed employers to indicate "zero years" in case a worker was employed less than one full year. No such instruction was given in the years 2000 and 1998. In 1994 and 1996, they were instructed to round to full years.

quarter of the year in our period of interest. It covers roughly 17'000 individuals (or 0.5% of households) prior to 2002 and about 50'000 (1.5%) from 2002 onward. As information on their municipality of work is available from 1996, we use yearly data between 1996 and 2009. In this period, most individuals were interviewed up to five consecutive years. We consider, however, only individuals' information in two consecutive years as only this sample is of meaningful size. Using information on the labor force status, place of work and other individual characteristics in two consecutive years, we can decompose the change in total private sector employment of natives in education group e in municipality i into its net-flows (in- minus outflow):

$$L^e_{i,t+1} - L^e_{i,t} = Netflow^e_{i,t+1,t} = In^e_{i,t+1,t} - Out^e_{i,t+1,t} \tag{BA.1}$$

Individuals are considered as inflows to local employment in municipality m in year $t+1$, (1) if they were employed in another municipality in the same distance bin in t, (2) if they were employed in a municipality located in another distance bin in the border region (0-15, 15-30, $>$ 30 minutes) or in the non-border region in t, (3) if they were not employed (either unemployed or out of the labor force) in t, or (4) if they were not in the sample. The latter group includes all individuals who were not covered in the SLFS or who were in the SLFS but did not belong to group e, e.g. they had another nationality status than native, they were not employed in the private sector, they were not in the relevant age range (18-64), they had a different education level, or they had a missing value in any of these variables. Outflows of local employment between year t and $t+1$ are coded analogously. Using individuals' average survey weight in the SLFS, we compute total group specific employment $L^e_{i,t}$ as well as total in- and outflow and their components (1)–(4), i.e. $IN^e_{i,t+1,t} \equiv \sum_{c=1}^{4} IN^{e,c}_{i,t+1,t}$ and $OUT^e_{i,t+1,t} \equiv \sum_{c=1}^{4} OUT^{e,c}_{i,t+1,t}$. The change in a municipality i's local employment between 1998 (the base year) and T is then just the cumulative of the total yearly net-flows to this municipality which can be disaggregated into net-flows from components (1) to (4) i.e. $L^e_{i,T} - L^e_{i,1998} = \sum_{t=1998}^{T-1} Netflow^e_{i,t+1,t} = \sum_{c=1}^{4} \sum_{t=1998}^{T-1} Netflow^{e,c}_{i,t+1,t}$.

In the difference-in-difference regression framework with outcomes in levels, we can approximate the change in the log employment of a municipality by with its employment growth, i.e. the change in employment in between 1998 and year T standardized with its employment in 1998, i.e. $\ln L^e_{i,T} - \ln L^e_{i,1998} \approx \frac{L^e_{m,T}}{L^e_{i,1998}} - \frac{L^e_{i,1998}}{L^e_{i,1998}}$. The latter can be decomposed into net-flows

from (1)-(4) as follows:

$$\frac{L^e_{i,T}}{L^e_{i,1998}} - \frac{L^e_{i,1998}}{L^e_{i,1998}} = \frac{[\sum_{c=1}^{4}\sum_{t=1998}^{T-1} Netflow^{e,c}_{i,t+1,t}] + L^e_{i,1998}}{L^e_{i,1998}} - \frac{L^e_{i,1998}}{L^e_{i,1998}} \tag{BA.2}$$

Table A.9 shows the effect of the reform on total local native employment by education group in column 1, i.e. the dependent variable is a municipalities current employment standardized with its employment in 1998, i.e. $L^e_{i,T}/L^e_{i,1998}$. In the following columns the dependent variable is the standardized cumulative net-flows (1) from employment in other municipalities in same distance bin (column 2), $[\sum_{t=1998}^{T-1} Netflow^{e,1}_{i,t+1,t} + \mathrm{L}^e_{i,1998}]/L^e_{i,1998}$, (2) from employment in municipalities in other distance bins (column 3), $[\sum_{t=1998}^{T-1} Netflow^{e,2}_{i,t+1,t} + \mathrm{L}^e_{i,1998}]/L^e_{i,1998}$, (3) from non-employment (column 4), $[\sum_{t=1998}^{T-1} Netflow^{e,3}_{i,t+1,t} + \mathrm{L}^e_{i,1998}]/L^e_{i,1998}$, and (4) from out of the sample (column 5), $[\sum_{t=1998}^{T-1} Netflow^{e,4}_{i,t+1,t} + \mathrm{L}^e_{i,1998}]/L^e_{i,1998}$.

In subsection IV.B, we exploit the rich information in the SLFS to construct the share of workers by education group e working in top executive boards ("Direktion/Geschäftsleitung") of a firm. Similarly as for the analysis of in- and outflows, we only use the years 1996-2009 in which we have information on the municipality of work of individuals.

B.2 Sample construction and variables used for firm-level analysis

Our firm-level estimation are based on the innovation surveys (IS) and the Swiss business censuses (BC). In the IS, the raw data contains answers for 1989, 2172, 2586, 2555, 2141, 2363, and 2034 firms for the seven years of the survey, representing an average response rate of 35%.[46] Moreover, the following comments on the construction of our analyses samples should be mentioned. Ruffner and Siegenthaler (2017) provide extensive sensitivity checks that show that our main results are not sensitive to imposing these sample restrictions:

- *Sample restrictions in the BC*: Our analyses with the BC are based on all firms that participated in the censuses 1991–2011. We exclude establishments from the agricultural sector as well as public sector firms, as these sectors are not covered in the other datasets used in the analysis. Since the censuses do no provide information on the split between foreign and Swiss workers in 1991 and 2011, the results on the foreign employment share are restricted to the 1995–2008 period. Moreover, the BC in 2011 is based on register data. Many variables available for the earlier waves are no longer available because of this change. Consequently, we update certain firm characteristics in 2011 using data from

[46] The questionnaires can be downloaded from www.kof.ethz.ch/en/surveys.

the same establishments in 2008.

- *Deletion of microfirms in the BC*: In the BC, we discard firms with less than 3 FTE in 1998 in order to conform with the sample restrictions in the SESS. The population of firms sampled in the IS is firms with 5 or more FTE workers.

- *Outliers*: In both datasets, we discard a very small number of extreme outliers that have a strong leverage on the precision (not the point estimate) of the estimates. In the IS, we delete a small number of observations that report to have relocated from one year to another and at the same time report large changes in sales. Closer inspection of these cases revealed that most of them have implausibly large changes in sales and employment in one year. It is likely that some of these cases are due to changes in the reporting unit (e.g. from firm to establishment or vice versa). In the BC, we compute deviations from within-firm means in log FTE employment and discard all firms with observations that lie above the 99.9% quantile or below the 0.1% quantile of the distribution of this variable.

- *Definition of border and non-border region*: The border region is classified based on official documents of the Swiss Federal Statistical Office. In cases where no official documents were available, the classification is based on direct information gathered at cantonal statistical offices. The border region is slightly differently classified compared to previous studies (Losa et al., 2014) in the canton of Valais, based on information provided by the statistical office of the canton of Valais. All municipalities in the region Upper Valais and Lower Valais until Saint-Maurice (St-Gingolph, Port-Valais, Vouvry, Vionnaz, Collombey-Muraz, Monthey, Troistorrents, Val-d'Illiez, Champéry, Massongex, St-Maurice, Mex, Evionnaz, Salvan, Finhaut, Martigny-Combe, Orsières) are classified as border region. The other municipalities in the canton are classified as non-border region. The results are, however, not sensitive to the differential treatment of these municipalities.

- *Computation of distance to nearest border crossing*

  For each unit (establishment or firm), we construct the distance (travel duration) to the nearest border crossing (d_i) in minutes. In the BC, these computations are based on the exact geographic coordinates of each establishment. In the IS, we use the zip code the questionnaire was sent to. We assign each establishment/firm to the location observed in 1998. The data on the location of border crossings in Switzerland necessary to construct d_i come from Henneberger and Ziegler (2011) and refer to the year 2010. We also use the

BC 1995 and 1998 to compute an employment-weighted distance to the border for each municipality.

- *Assignment of units to border and non-border region*: In the BC, we assign establishments to the border and non-border region based on the municipality code of each establishment. In the KOF innovation data, we assign firms to the BR and CR depending upon the address the survey was sent to. Because the unit of observation is a firm and not an establishment in the IS, multi-establishment firms are assigned to a treatment or control group based on the location of their headquarters. In both datasets, we exclude a very small number of firms located in municipalities where we could not establish whether they belonged to the BR or CR.

- *Measurement of establishment entry and exit:* In every wave of the BC, an establishment is considered a new entrant if its establishment identifier is new. Exiting establishments are those whose identifiers disappears in the next BC wave. There are two reasons why we observe establishments with new establishment identifiers in the BC. The first is the actual creation of a new firm. The second is that a firm is created by a merger of incumbent firms. The former represents the large majority of cases. We count the number of entering and exiting establishments per municipality and BC wave to construct their share relative to the total number of establishments in a municipality in 1998. We analyze the effect on entrants using the years 1991–2008. For exiting establishments we use the years 1991–2011. We cannot use the census in 2011 in the firm entry analysis because this census uses a more encompassing definition of what counts as an establishment compared to the previous censuses. Therefore, many establishment entries between 2008 and 2011 result from the change in the definition, and we cannot identify those.

Table A.1: Overview of data sets used in labor market and firm analysis

Data source	Coverage and sample	Unit of analysis	Outcome variables	Dimension of heterogeneity	Distance to border
I. Labor market analysis					
Swiss Earnings Structure Survey (SESS)	• 1994–2010 (even years) • employees in private sector establishments • repeated cross-section	municipality	hourly wage, full-time equivalents, number of workers	permit-type, age, education, occupation, industry, management rank	employment weighted mean travel time to next border crossing
Swiss Labor Force Survey (SLFS)	• 1996–2009 (yearly) • employees in private sector establishments • rotating panel	municipality	executive board members, number of workers moving (i) in/out of regions, (ii) in/out of labor force (iii) in/out of sample	permit-type, age, education labor force status	employment weighted mean travel time to next border crossing
II. Establishment- and firm-level analysis					
Business Census (BC)	• 1991, 1995, 1998, 2001, 2005, 2008, 2011 • private sector establishments • panel of universe of establishments	establishment	number of establishments, size of establishments, share of foreign-born and Swiss workforce, entry, exit	industry, establishment size	travel time to next border crossing based on establishment geocode
Innovation Surveys (IS)	• 1996, 1999, 2002, 2005, 2008, 2011, 2013 • private sector establishments • panel of firms	firm	size, sales, export sales, labor productivity, innovation input, innovation output	industry, firm size, export share, pre-reform answers to questions on obstacles to their innovation efforts	travel time to next border crossing based on firm address

Notes: The table gives an overview of the main data sets used in for the labor market and the establishment/firm level analysis.

B.3 Construction of Bartik control

The Bartik control is a proxy for industry-driven local demand shocks. It absorbs local variation in employment or wages (by education group) resulting from national level changes of sectors which are strongly represented in a particular region. In other words, if, for instance, employment in a given industry increased (decreased) nationally, areas in which that industry represented a significant share of employment must have experienced a positive (negative) relative change in the demand for workers relative to those where that industry is not present. The Bartik control is defined at the level of the "commuting zone", which is an aggregation of municipalities often used to represent local labor markets. There are 106 commuting zones in the whole of Switzerland. We define the sector-driven employment growth for group e in a commuting zone cz in year t as:

$$\widetilde{EMP}^{e}_{cz,t} = \sum_{i \in \{1,50\}} \left(EMP^{e}_{i,cz,1994} \times \frac{EMP^{e}_{-cz,i,t}}{EMP^{e}_{-cz,i,1994}} \right) \tag{BA.3}$$

where $EMP^{e}_{i,cz,1994}$ is the employment level of group e (which could be, alternately, all workers or a specific education group of workers) in commuting zone cz and (2-digit) industry i in the earliest available year, 1994. $\frac{EMP^{e}_{-cz,i,t}}{EMP^{e}_{-cz,i,1994}}$ is the group employment growth factor between 1994 and year t for the industry nationally, excluding the commuting zone cz.[47]

When we consider the wage as outcome, we use a Bartik measure also based on national wage growth:

$$\widetilde{w^{e}_{cz,t}} = \sum_{i \in \{1,50\}} s_{i,cz,1990} \left(w^{e}_{i,cz,1994} \times \frac{w^{e}_{-cz,i,t}}{w^{e}_{-cz,i,1994}} \right) \tag{BA.4}$$

where $w^{e}_{i,cz,1994}$ is the initial log hourly wage payed in (2-digit) industry i for education group e in commuting zone cz in the first available wave in 1994 and $\frac{w^{e}_{-cz,i,t}}{w^{e}_{-cz,i,1994}}$ measures industry wage growth for that group on the national level (excluding commuting zone cz). Wage growth is aggregated using each industry's employment share in 1990 $s_{cz,i,1990}$ taken from the national Census.

C Analysis of worker flows

To interpret the estimates of the reform effects on wages and employment by natives as causal, workers in the control group must not be affected by the inflow of CBW due to the reform. This condition would be violated if native workers responded to the inflow of CBW by moving from treated to the control municipalities or vice versa, hence questioning our assumption that

[47] From the list of industries, we dropped the industry 'Recycling' which was not available in all years.

the latter constitute a valid control group.[48]

To investigate the importance of such worker flows, we use the Swiss Labor Force Survey, a complementary data set available yearly between 1996 and 2009. Most individuals in the SLFS were interviewed for two consecutive years. We exploit information on each worker's place of work and employment status in the previous year (next year) to total calculate the number of workers flowing in or out of local employment. This allows decomposing a municipality's change in local employment between 1998 and any other year T into the sum of yearly net-flows (1) from employment in other municipalities in the same distance bin, (2) or from other distance bins (including the control group, the BR 30+ or the NBR), (3) from non-employment or (4) from out of the sample between 1998 and T.[49]

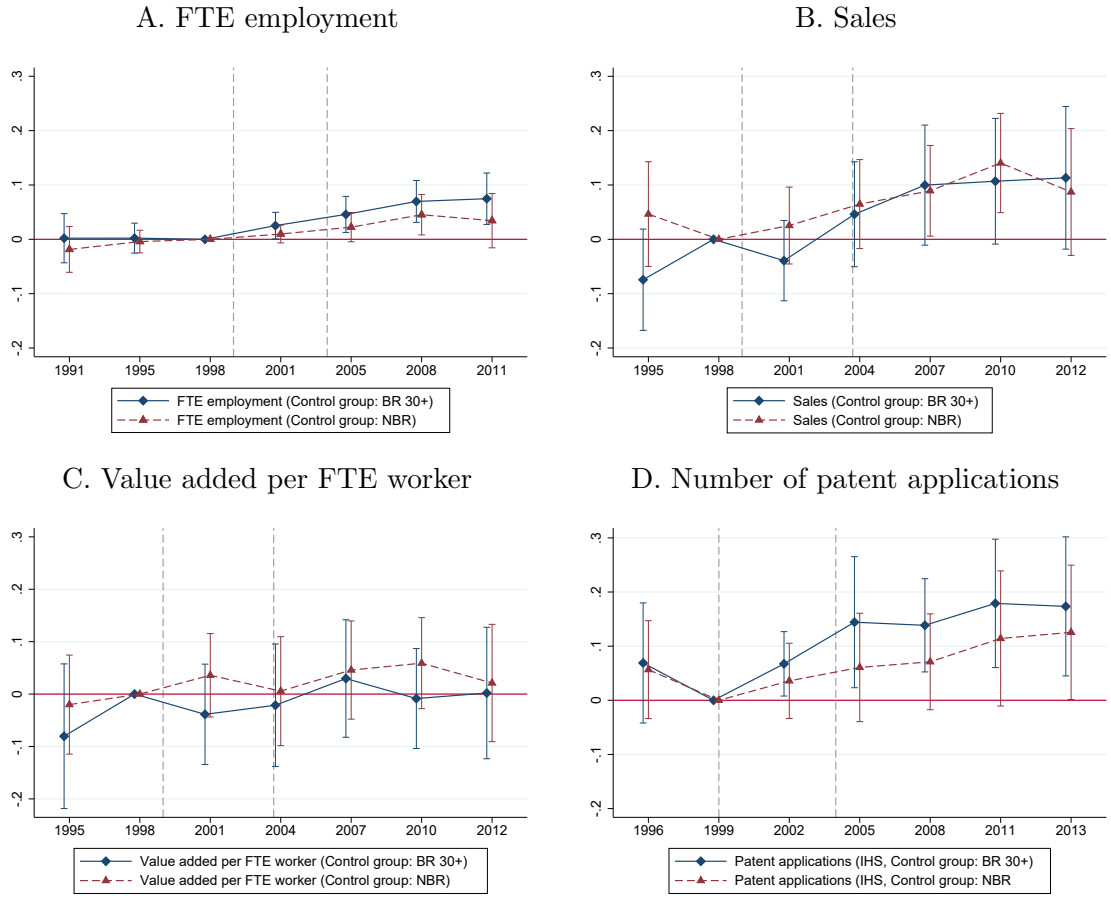
The estimates presented in Appendix Table A.9 show no differential changes in total net-flows in both treatment regions compared to both control groups (BR 30+ in panel I.A and NBR in panel II.D). For highly educated natives, the increase we observe in their employment when the BR 30+ constitutes the control group is consistent with an increased net-inflow from non-employment. When municipalities in the NBR constitute the control group, however, estimates do not allow a clear conclusion. For lower-educated workers changes in employment are generally lower and the estimates effects on their net-flows are not very robust across different control groups. These results are consistent estimates in column 6, which shows that the reform did not lead to significant changes in population size of municipalities in the treated regions.

[48] In the case of flows from the treatment to the control region, employment would increase in the control region and wages would fall, attenuating (overstating) the effects on wage (employment) that the regional comparison in the DiD may detect (see discussion in Dustmann et al. (2017)). The absence of strong negative employment effects on any group of native workers in our case make this particular concern less plausible. However, flows of highly skilled natives in the reverse direction, from the control region to the treatment region as a response to the inflow of CBW, could be consistent with the positive wage and employment effects we find, if effects from human capital externalities outweigh competition effects among highly skilled (see e.g. Moretti, 2004).

[49] The last category, for instance, includes workers that move to public sector employment, drop out of our age range 18-64, etc. See Appendix B.1 for details on construction of these variables.

D Appendix figures

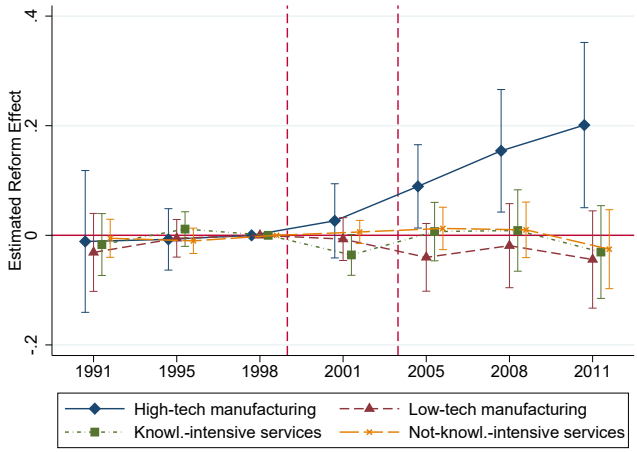
Figure A.1: Effect of free movement policy on various outcomes of incumbent firms, by control group



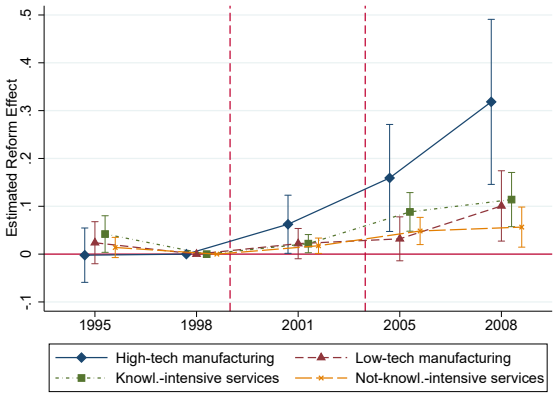
Notes: The panel plot the sequence of effects, and associated 95% confidence intervals, of the free movement policy on highly treated private-sector firms. The event studies are based on separate regressions of equation (2) using either of the two control groups (municipalities in the BR located more than 30 travel minutes to the border and municipalities in the NBR), as indicated in the legend. The regressions in panel A are based on establishment-level data from the BC 1991–2011. The dependent variable is log total FTE employment. The dependent variable in panel B is log total sales earned in year before the innovation surveys (IS) 1996–2013. The dependent variable in panel C is log value added per FTE worker in the year before the IS 1996–2013. The dependent variable in panel D is the IHS of the number of patent applications that a firm filed in the year of the survey and the two years before the surveys 1996–2013. The regressions in panel A are weighted using average establishment size (in FTE) as weight. All regressions control for firm fixed effects, year fixed effects, and NUTS-II trends. Standard errors are clustered by commuting zone.

Figure A.2: Effect of free movement policy on FTE employment of incumbent establishments by broad sector (control group: NBR)

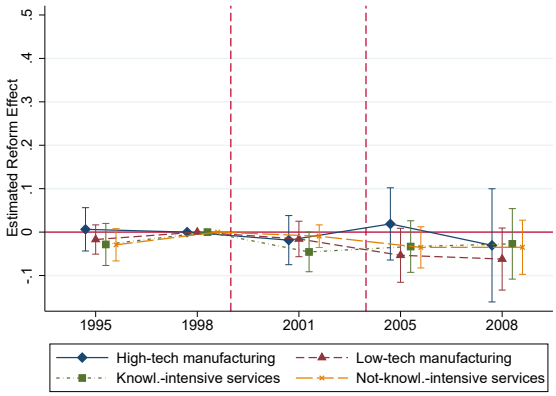
A. Total FTE employment



B. FTE employment of foreigners relative to FTE employment in 1998

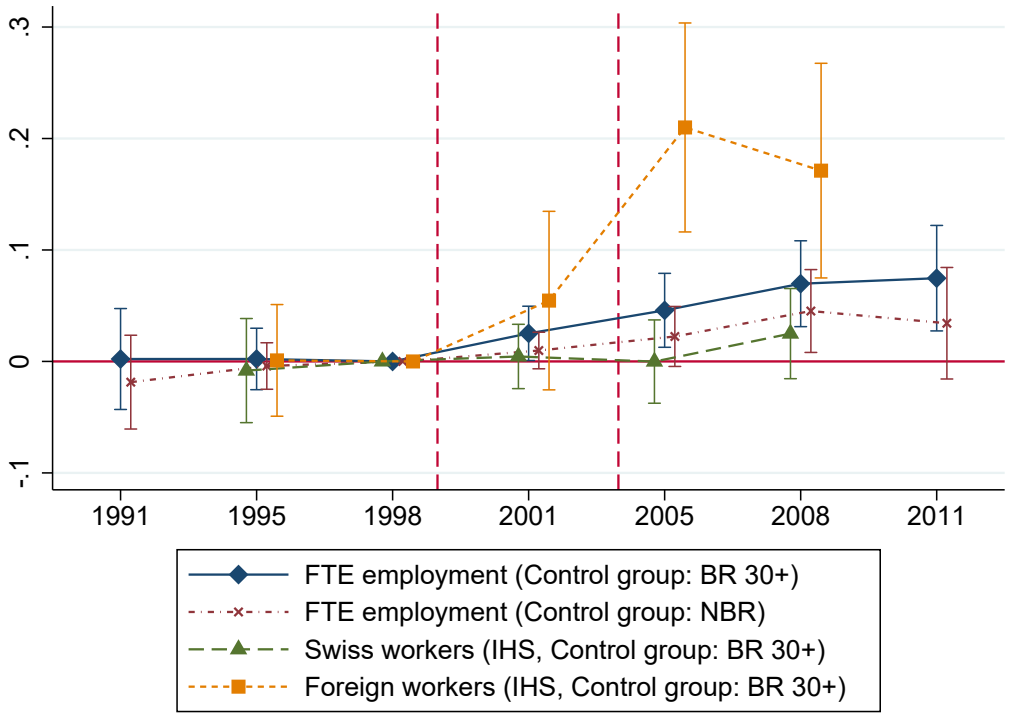


C. FTE employment of natives relative to FTE employment in 1998



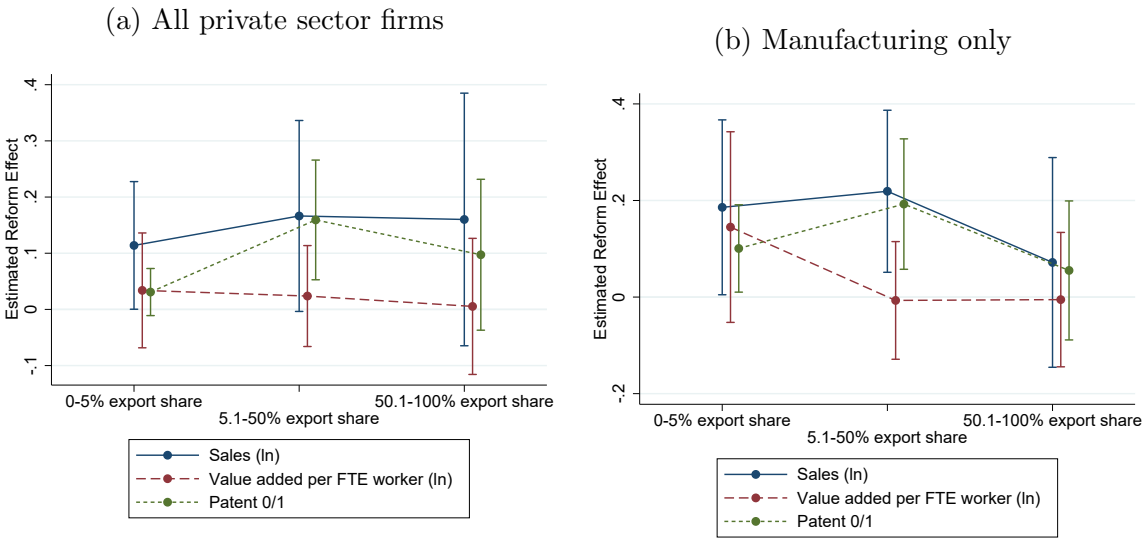
Notes: The figure estimates the effect of the free movement policy on FTE employment of incumbent establishments using private-sector establishment-level data from the BC. It plots event study coefficients and associated 95% confidence intervals for highly treated establishments based on equation (2), estimated separately by establishments' broad sector of economic activity. The regressions control for establishment fixed effects, year fixed effects, and linear NUTS-II trends. The control group is establishments in the NBR. In panel A, the dependent variable is log FTE employment. In panel B, it is FTE employment of foreigners as a share of total employment in 1998. In panel C, it is FTE employment of Swiss nationals as a share of total employment in 1998. The samples cover the 1995–2008 period because the BC in 1991 and 2011 do not contain information on workers' nationality. All regressions are weighted using average establishment size (in FTE). Standard errors are clustered by commuting zone. Figure A.3 provides the same regressions for an approximate log outcome.

Figure A.3: Effect of free movement policy on FTE employment by nationality (inverse hyperbolic sine)



Notes: The figure plots the sequence of effects, and associated 95% confidence intervals, of the free movement policy on FTE employment of highly treated private-sector firms. The event studies are based on separate regressions of our main regression model using one of the two control groups (municipalities in the BR located more than 30 travel minutes to the border and municipalities in the NBR). The regressions are based on establishment-level data from the BC 1991–2011. The dependent variables are log total FTE employment and the inverse hyperbolic sine (IHS) of establishments' FTE employment of Swiss and foreign nationals. The IHS of outcome y is $IHS(y) = ln(y + \sqrt{1 + y^2})$. The IHS approximates the log of an outcome but has the advantage that it is defined at 0. All regressions control for establishment fixed effects, year fixed effects, and NUTS-II trends. The regressions are weighted using average establishment size (in FTE) as weight. Standard errors are clustered by commuting zone.

Figure A.4: Effect of free movement policy by firms' pre-reform export share



Notes: The figure studies whether the effects of the free movement policy depend on firms' export status. The coefficients are estimated using a version of our baseline regression model (equation (1)) augmented with interactions between our main treatment indicators (i.e. $Free_t \times I(d_i < 15)$) and indicator variables for the respective export shares. The regressions are based on firm-level data from the IS 1996–2013. We control for firm fixed effects, year fixed effects, and NUTS-II trends. The sample is restricted to the BR. The dependent variables are firms' log total sales, log value added per FTE worker, and the probability to file a patent application in the three years before the survey. Panel A uses our baseline firm sample in the IS. Panel B is restricted to manufacturing. Standard errors are clustered by commuting zone. The two subfigures show that the estimated reform effects are similar between firms with different initial export share. The exception is the patenting effect that is driven by firms with intermediate export share. This, however, results from the fact that the patenting effect is concentrated in manufacturing firms, which in Switzerland are more likely to export than the rest of the firms. If we focus on the manufacturing sector only, the patenting effect has no obvious relationship to firms' export status (panel B).

E Appendix tables

Table A.2: Cross-border workers residing in Switzerland and abroad

	3-Years Average, in Thousands					Average
	1999-2001	**2002-2004**	**2005-2007**	**2008-2010**	**2011-2013**	**Annual Change**
Swiss border workers working in Switzerland and living abroad	NA	NA	10	8	15	0.63
Foreign border workers working in Switzerland and living abroad	144	167	188	221	261	7.81
Swiss border workers working abroad and living in Switzerland	NA	6	9	9	10	0.4
Foreign border workers working abroad and living in Switzerland	NA	5	7	10	13	0.7

Notes: This table provides data on the number of CBW on both sides of the Swiss border. In the three-year period from 2002 to 2004, 11,000 CBW living in Switzerland worked in neighboring countries. In the three-year period 2011–2013, the number had increased to 23,000 (+12,000). There were approximately 100,000 additional CBW working in Switzerland but living in neighboring countries in the same period. *Source*: Swiss Federal Statistical Office.

Table A.3: Characteristics of natives and cross-border workers in the border region, 1998 and 2010

	Native workers		Cross-border workers		Resident immigrants	
Panel A. Worker characteristics	1998	Δ 2010 - 1998	1998	Δ 2010 -1998	1998	Δ 2010 -1998
Demographic characteristics						
Share highly educated	0.201	0.062	0.153	0.125	0.188	0.158
Share lower educated	0.799	-0.062	0.847	-0.125	0.812	-0.158
Mean age	39.750	1.430	39.658	0.802	33.701	1.749
Share male	0.599	-0.056	0.693	-0.033	0.667	-0.070
Mean tenure	9.338	-1.104	9.471	-2.249	4.155	-1.225
Mean log hourly real wage	3.570	0.031	3.455	0.079	3.309	0.186
Management positions						
Share top management	0.066	0.009	0.019	0.009	0.034	0.003
Share middle management	0.089	-0.005	0.052	0.011	0.051	0.024
Share lower management	0.239	-0.034	0.189	0.026	0.142	0.036
Share no management	0.606	0.030	0.739	-0.045	0.773	-0.064
Occupation groups						
Share high-paying occupations	0.245	0.024	0.159	0.073	0.139	0.116
Share middle-paying occupations	0.396	-0.030	0.244	0.015	0.169	0.048
Share low-paying occupations	0.359	0.006	0.597	-0.088	0.692	-0.165
Industries						
Agriculture/Fishing/Mining	0.004	0.002	0.005	0.001	0.005	0.001
Manufacturing	0.265	-0.060	0.461	-0.081	0.227	-0.053
Utilities	0.007	0.000	0.001	0.001	0.001	0.002
Construction	0.068	-0.001	0.127	-0.019	0.161	-0.058
Wholesale/Retail/Repair	0.201	0.009	0.144	0.009	0.099	0.034
Hotel/Restaurants	0.036	0.007	0.055	-0.004	0.243	-0.083
Transport/Communication/Storage	0.062	-0.015	0.064	-0.010	0.039	-0.007
Financial Intermediation	0.108	-0.019	0.021	0.003	0.038	0.012
Real Estate/R&D/IT/Business	0.115	0.029	0.056	0.066	0.078	0.135
Education	0.022	0.001	0.007	0.007	0.015	0.010
Health	0.083	0.035	0.042	0.019	0.063	0.003
Personal Services	0.029	0.012	0.016	0.008	0.032	0.006
Number of Workers	1,000,206	220,832	103,784	71,236	79,254	82,957

Panel B. Relative wage gap natives vs. cross-border workers (2004-2010)	Coeff.	S.E.
(i) Municipality and year fixed effects	-0.055	(0.001)
(ii) Year × establishment × occupation fixed effects	-0.031	(0.001)
(iii) Year × establishment × occupation × tenure fixed effects	-0.016	(0.001)

Notes: This table shows descriptive statistics of native workers, cross-border workers and resident immigrants in 1998 and their change between 1998 and 2010. In Panel A, occupations are categorized into high-, middle- and low-paying occupations according the mean wage in 1998 (see Table A.4). Panel B reports the main coefficient of individual-level (Mincer) regressions of the log hourly wage on a dummy for cross-border workers. The sample includes natives and CBW only and is based on the years 2004–2010. All regressions control for age, age squared, marital status, sex and three education groups (tertiary, secondary, primary or less). Row (i) additionally includes municipality and year fixed effects. Row (ii) further adds year-specific establishment fixed effects interacted with fixed effects for 24 occupations in the SESS. Row (iii) also adds interactions with tenure. The table is based on sample restrictions outlined in II.A. This is the reason why the number of CBW reported in this table deviates from the numbers on CBW reported in section I.

Table A.4: Effect on share of total immigrants in occupation groups relative to total employment in 1998

Dependent variable: number of total immigrants in occupation relative to total employment in 1998

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A. High-paying occupations							
	Define goal & strategy in companies	Logistics, strategy department	Review, consult, certify	Invest	R&D	Analyse, program, operating	Plan, Design	Education
$Free_t \cdot I(d_m \leq 15)$	0.004	0.002	0.009	0.002	0.006	0.004	0.001	0.003
	(0.001)	(0.000)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
$Free_t \cdot I(15 < d_m \leq 30)$	0.000	0.000	0.002	-0.000	0.000	0.001	0.001	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Change within occ. (BR≤15min)	0.135	0.102	0.204	0.119	0.345	0.169	0.037	0.121
	Panel B. Middle-paying occupations							
	Machine Operators	Accounting, HR	Clerks	Other clerical occupations	Security	Medical, nursing, social tasks	Cultural, Entertainment Information Sport	Other
$Free_t \cdot I(d_m \leq 15)$	0.005	0.004	0.002	0.005	0.001	0.004	0.001	-0.008
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.003)
$Free_t \cdot I(15 < d_m \leq 30)$	0.002	0.001	0.001	0.001	0.000	0.001	-0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Change within occ. (BR≤15min)	0.079	0.078	0.038	0.074	0.141	0.081	0.077	-0.204
	Panel C. Low-paying occupations							
	Manufac-turing	Construction	Craft	Retail	Transport	Manicure, laundry	Cleaning	Restauration
$Free_t \cdot I(d_m \leq 15)$	0.002	0.000	0.000	0.003	0.001	0.001	0.002	0.002
	(0.005)	(0.003)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.004)
$Free_t \cdot I(15 < d_m \leq 30)$	0.003	0.000	-0.000	0.003	0.001	0.000	0.001	-0.000
	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.004)
Change within occ. (BR≤15min)	0.014	0.003	0.296	0.042	0.021	0.139	0.101	0.027
Observations	9585	9585	9585	9585	9585	9585	9585	9585
Year and area fixed effects	√	√	√	√	√	√	√	√
Nuts II trend	√	√	√	√	√	√	√	√

Notes: This table shows the effect of the free movement policy on the number of immigrants in an occupation standardized by total local employment in 1998 based on regression specification (1). Municipalities in the BR 30+ constitute the control group. The total number of immigrants is split into 24 mutually exclusive and exhaustive occupations categories available in the SESS. Workers with missing occupation information are allocated to the category "other occupations". Occupations are categorized into the high-, middle- and low-paying according the mean wage in 1998. The last row in each panel indicates the change in the number of immigrants in an occupation relative to the total number of workers in that occupation in 1998, $\widetilde{\delta^o}$. To this end, the coefficient $\delta^o \equiv Free_t \cdot (d_i \leq 15)$ is scaled with $\widetilde{\delta^o} = \delta^o \times (\overline{Emp_{i,1998}}/\overline{Emp^o_{i,1998}})$ where $\overline{Emp_{i,1998}}$ is the average total employment and $\overline{Emp^o_{i,1998}}$ is the average occupation group specific employment, both in municipalities in the border region in 1998. $Free_t$ is one from year 2004 onward. The coefficients for the transition phase are included but not shown for brevity. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. The regressions are weighted using the total number of workers in 1998. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.5: Effect of free movement policy on wages and employment of natives by education group

Dependent variable	Mean log hourly wages by education group			Log full-time equivalents by education group		
	all	high	lower	all	high	lower
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Baseline: Control group BR 30+						
$Transition_t \cdot I(d_m \leq 15)$	0.014	0.028	-0.000	0.008	0.132	-0.028
	(0.010)	(0.014)	(0.010)	(0.057)	(0.075)	(0.056)
$Transition_t \cdot I(15 < d_m \leq 30)$	0.019	0.020	0.008	0.032	0.122	0.008
	(0.009)	(0.014)	(0.009)	(0.046)	(0.067)	(0.048)
$Free_t \cdot I(d_m \leq 15)$	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.021)	(0.015)	(0.022)	(0.045)	(0.064)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.006)	(0.012)	(0.007)	(0.039)	(0.072)	(0.044)
Observations	11181	8383	11045	11188	8415	11049
Panel B. Control group: NBR						
$Transition_t \cdot I(d_m \leq 15)$	0.002	0.023	-0.007	-0.050	0.027	-0.073
	(0.009)	(0.010)	(0.008)	(0.056)	(0.073)	(0.058)
$Transition_t \cdot I(15 < d_m \leq 30)$	0.007	0.017	0.002	-0.018	0.016	-0.026
	(0.009)	(0.011)	(0.007)	(0.041)	(0.049)	(0.047)
$Free_t \cdot I(d_m \leq 15)$	-0.005	0.043	-0.021	-0.054	0.040	-0.088
	(0.020)	(0.013)	(0.021)	(0.043)	(0.059)	(0.047)
$Free_t \cdot I(15 < d_m \leq 30)$	0.007	0.018	-0.003	-0.017	0.066	-0.048
	(0.008)	(0.010)	(0.009)	(0.034)	(0.050)	(0.034)
Observations	14281	10703	14104	14289	10737	14107
Year and area fixed effects	√	√	√	√	√	√
Nuts II trend	√	√	√	√	√	√

Notes: This table shows the baseline effect of the free movement policy on wages and employment of natives by education group based on regression specification (1). In column 1–3, the dependent variable is the mean log hourly real wage by education group. The dependent variable in column 4-6 is the log number of native full-time equivalents worked by natives by education group. In panel A (panel B), municipalities in the BR 30+ (the NBR) constitute the control group. $Transition_t$ is one for the period between 2000 and 2003, whereas $Free_t$ is one from year 2004 onward. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. The regressions are weighted using the total number of natives in a cell. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.6: Main robustness checks for labor market analysis

Dependent variable	Immi-grants /	Mean log hourly wages by education group			Log full-time equivalents by education group		
	Emp '98'	all	high	lower	all	high	lower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Baseline with Nuts II trends							
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.014)	(0.021)	(0.015)	(0.022)	(0.045)	(0.064)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.008)	(0.006)	(0.012)	(0.007)	(0.039)	(0.072)	(0.044)
Observations	9585	11181	8383	11045	11188	8415	11049
Panel B. Including Bartik							
$Free_t \cdot I(d_m \leq 15)$	0.056	0.006	0.045	-0.017	0.041	0.163	-0.006
	(0.014)	(0.017)	(0.015)	(0.019)	(0.046)	(0.063)	(0.053)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.014	0.016	-0.001	0.059	0.193	0.011
	(0.008)	(0.008)	(0.012)	(0.007)	(0.038)	(0.073)	(0.043)
Observations	9585	11181	8383	11045	11188	8415	11049
Panel C. Nuts II regions X year fixed effects							
$Free_t \cdot I(d_m \leq 15)$	0.060	0.001	0.048	-0.020	0.037	0.172	-0.008
	(0.014)	(0.020)	(0.014)	(0.021)	(0.047)	(0.066)	(0.053)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.008	0.015	-0.006	0.059	0.186	0.015
	(0.008)	(0.007)	(0.013)	(0.007)	(0.039)	(0.075)	(0.044)
Observations	9585	11181	8383	11045	11188	8415	11049
Panel D. Baseline omitting nuts II trends							
$Free_t \cdot I(d_m \leq 15)$	0.064	-0.017	0.027	-0.033	0.051	0.143	0.023
	(0.023)	(0.036)	(0.023)	(0.035)	(0.051)	(0.070)	(0.067)
$Free_t \cdot I(15 < d_m \leq 30)$	0.021	-0.000	0.012	-0.016	0.080	0.217	0.033
	(0.011)	(0.006)	(0.013)	(0.008)	(0.042)	(0.076)	(0.050)
Panel E. Baseline excluding industries exposed to bilateral agreements on trade							
$Free_t \cdot I(d_m \leq 15)$	0.044	-0.001	0.051	-0.021	0.144	0.272	0.107
	(0.015)	(0.020)	(0.013)	(0.019)	(0.084)	(0.089)	(0.100)
$Free_t \cdot I(15 < d_m \leq 30)$	0.020	0.017	0.020	-0.003	0.105	0.315	0.048
	(0.013)	(0.009)	(0.013)	(0.010)	(0.047)	(0.084)	(0.051)
Observations	8802	10308	6896	10138	10315	6928	10140
Year and area fixed effects	✓	✓	✓	✓	✓	✓	✓

Notes: This table documents the robustness the reform effect on wages and employment of natives by education group based on regression specification (1). In column 1, the dependent variable is the total number of immigrants standardized by total employment in 1998. In column 2–4, the dependent variable is the mean log hourly real wage by education group. The dependent variable in column 5–7 is the log number of native full-time equivalents worked by natives by education group. Panel A repeats estimates from the baseline specification as in Table A.5 including Nuts-II regional trends. Panel B adds the Bartik measure, computed separately for wages (Column 2–4) and full-time equivalents (Column 1, 5–7) by education group, as control for sector-driven trends as specified in Appendix B.3. Panel C instead includes full interactions of fixed effects at the level of Nuts-II regions and years instead of regional trends. In Panel D NUTS-II trends are omitted. Panel E uses the baseline specification and the sample includes only two-digit industries that are unaffected by the bilateral agreements according to a classification by Bühler et al. (2011). $Free_t$ is one for municipalities in the border region after 2004. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives in a cell. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.7: Robustness of labor market outcomes to dropping cities

Dependent variable	Immi-grants /	Mean log hourly wages by education group			Log full-time equivalents by education group		
	Emp '98	all	high	lower	all	high	lower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Panel A. Baseline				
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.014)	(0.021)	(0.015)	(0.022)	(0.045)	(0.064)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.008)	(0.006)	(0.012)	(0.007)	(0.039)	(0.072)	(0.044)
Observations	9585	11181	8383	11045	11188	8415	11049
			Panel B. Dropping Geneva				
$Free_t \cdot I(d_m \leq 15)$	0.058	-0.009	0.033	-0.024	0.036	0.139	0.005
	(0.018)	(0.023)	(0.015)	(0.024)	(0.049)	(0.067)	(0.055)
$Free_t \cdot I(15 < d_m \leq 30)$	0.023	0.008	0.013	-0.006	0.059	0.193	0.017
	(0.008)	(0.006)	(0.012)	(0.007)	(0.039)	(0.071)	(0.044)
Observations	9576	11172	8374	11036	11179	8406	11040
			Panel C. Dropping Basel				
$Free_t \cdot I(d_m \leq 15)$	0.054	0.024	0.046	0.006	0.003	0.157	-0.053
	(0.016)	(0.009)	(0.016)	(0.008)	(0.042)	(0.063)	(0.042)
$Free_t \cdot I(15 < d_m \leq 30)$	0.023	0.006	0.015	-0.009	0.064	0.197	0.020
	(0.008)	(0.005)	(0.012)	(0.006)	(0.039)	(0.072)	(0.044)
Observations	9576	11172	8374	11036	11179	8406	11040
			Panel D. Dropping Lugano				
$Free_t \cdot I(d_m \leq 15)$	0.057	-0.001	0.047	-0.021	0.038	0.155	-0.003
	(0.014)	(0.022)	(0.015)	(0.022)	(0.045)	(0.064)	(0.052)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.196	0.014
	(0.008)	(0.006)	(0.012)	(0.007)	(0.039)	(0.071)	(0.044)
Observations	9576	11172	8374	11036	11179	8406	11040
			Panel E. Dropping Zurich				
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.003	0.040	-0.020	0.045	0.149	0.010
	(0.015)	(0.021)	(0.016)	(0.022)	(0.046)	(0.066)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.021	0.007	0.006	-0.002	0.078	0.187	0.046
	(0.010)	(0.007)	(0.013)	(0.007)	(0.041)	(0.084)	(0.039)
Observations	9576	11172	8374	11036	11179	8406	11040
Year and area fixed effects	√	√	√	√	√	√	√
Nuts II trend	√	√	√	√	√	√	√

Notes: This table shows the robustness of the reform effect on wages and employment of natives by education group based on regression specification (1). In column 1, the dependent variable is the total number of immigrants standardized by total employment in 1998. In column 2–4, the dependent variable is the mean log hourly real wage by education group. The dependent variable in column 5–7 is the log number of native full-time equivalents worked by natives by education group. Panel A repeats estimates from the baseline specification as in Table A.5 with the BR 30+ as control group. In Panel B-E, Geneva, Basel, Lugano, and Zurich, respectively, are omitted from the sample (using the BR 30+ as control group). $Free_t$ is one for municipalities in the border region after 2004. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives in a cell. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.8: Labor market results with alternative computation of standard errors

Dependent variable	Immi-grants	Mean log hourly wages by education group			Log full-time equivalents by education group		
	Emp '98'	all	high	lower	all	high	lower
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			A. Baseline				
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.014)	(0.021)	(0.015)	(0.022)	(0.045)	(0.064)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.008)	(0.006)	(0.012)	(0.007)	(0.039)	(0.072)	(0.044)
Observations	9585	11181	8383	11045	11188	8415	11049
Number of clusters	72						
			Panel B. SE clustered at municipality level				
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.012)	(0.019)	(0.013)	(0.020)	(0.039)	(0.066)	(0.047)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.009)	(0.007)	(0.011)	(0.007)	(0.034)	(0.060)	(0.037)
Observations	9585	11181	8383	11045	11188	8415	11049
Number of clusters	1065	1464	1271	1459	1464	1273	1459
			Panel C. SE clustered at canton level				
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.016)	(0.023)	(0.016)	(0.024)	(0.047)	(0.059)	(0.058)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.007)	(0.006)	(0.006)	(0.009)	(0.036)	(0.070)	(0.044)
Observations	9585	11181	8383	11045	11188	8415	11049
Number of clusters	18	18	18	18	18	18	18
			Panel D. SHAC variance				
$Free_t \cdot I(d_m \leq 15)$	0.056	-0.002	0.045	-0.022	0.040	0.163	-0.003
	(0.016)	(0.016)	(0.014)	(0.016)	(0.027)	(0.053)	(0.031)
$Free_t \cdot I(15 < d_m \leq 30)$	0.022	0.009	0.015	-0.006	0.059	0.193	0.014
	(0.007)	(0.007)	(0.007)	(0.007)	(0.026)	(0.055)	(0.027)
Observations	9585	11207	8496	11071	11214	8527	11075
Year and area fixed effects	√	√	√	√	√	√	√
Nuts II trend	√	√	√	√	√	√	√

Notes: This table shows the robustness of the reform effect on wages and employment of natives by education group based on regression specification (1). In column 1, the dependent variable is the total number of immigrants standardized by total employment in 1998. In column 2–4, the dependent variable is the mean log hourly real wage by education group. The dependent variable in column 5–7 is the log number of native full-time equivalents worked by natives by education group. Panel A repeats estimates from the baseline specification as in Table A.5 with standard errors, clustered by commuting zone. In panel B and C standard errors are clustered at the level of municipalities and Cantons, respectively. In panel D, we report standard errors based on the Spatial Heteroscedasticity and Autocorrelation Consistent (SHAC) variance estimator initially proposed by Conley (1999) and recently advanced by Colella et al. (2018). This estimator allows for correlation between areas that are geographically close but belong to different regional units. Following Dustmann et al. (2017), we use a uniform kernel and a bandwidth of 100 kilometers. $Free_t$ is one for municipalities in the border region after 2004. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives in a cell.

Table A.9: Effect of free movement policy on native employment and cumulative net-flows of natives into local employment

Dependent variable	Employment/ Employment 1998	Cumulative net-flows from/to (In-Out) Employment in same bin	Employment in other bins	Non-Employment	Other	Population / Population 1998
	(1)	(2)	(3)	(4)	(5)	(6)
I. Control group: BR 30+						
Panel A. All education groups						
$Free_t \cdot I(d_m \leq 15)$	0.052	-0.011	0.013	-0.038	0.088	0.067
	(0.077)	(0.026)	(0.040)	(0.042)	(0.106)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.086	-0.009	0.005	-0.026	0.115	0.049
	(0.074)	(0.024)	(0.049)	(0.026)	(0.102)	(0.034)
Observations	5189	5189	5189	5189	5189	15334
Panel B. Highly educated						
$Free_t \cdot I(d_m \leq 15)$	0.203	-0.063	0.055	0.164	0.047	0.080
	(0.158)	(0.059)	(0.074)	(0.060)	(0.221)	(0.098)
$Free_t \cdot I(15 < d_m \leq 30)$	0.228	-0.074	0.004	0.069	0.229	0.017
	(0.174)	(0.046)	(0.073)	(0.043)	(0.265)	(0.087)
Observations	1654	1654	1654	1654	1654	6301
Panel C. Lower educated						
$Free_t \cdot I(d_m \leq 15)$	0.008	-0.010	-0.010	-0.093	0.122	0.040
	(0.067)	(0.030)	(0.043)	(0.043)	(0.105)	(0.051)
$Free_t \cdot I(15 < d_m \leq 30)$	0.049	-0.002	-0.004	-0.048	0.104	0.043
	(0.072)	(0.027)	(0.050)	(0.035)	(0.095)	(0.035)
Observations	4529	4529	4529	4529	4529	13937
II. Control group: NBR						
Panel D. All education groups						
$Free_t \cdot I(d_m \leq 15)$	0.078	0.007	0.017	-0.020	0.074	0.043
	(0.078)	(0.025)	(0.026)	(0.032)	(0.088)	(0.046)
$Free_t \cdot I(15 < d_m \leq 30)$	0.121	0.008	0.030	0.001	0.082	0.032
	(0.062)	(0.023)	(0.019)	(0.026)	(0.063)	(0.033)
Observations	6417	6417	6417	6417	6417	19662
Panel E. Highly educated						
$Free_t \cdot I(d_m \leq 15)$	0.293	-0.007	0.069	0.021	0.210	0.074
	(0.173)	(0.083)	(0.064)	(0.083)	(0.262)	(0.102)
$Free_t \cdot I(15 < d_m \leq 30)$	0.301	-0.033	0.056	-0.072	0.350	-0.014
	(0.173)	(0.086)	(0.059)	(0.089)	(0.286)	(0.084)
Observations	2068	2068	2068	2068	2068	7778
Panel F. Lower educated						
$Free_t \cdot I(d_m \leq 15)$	0.039	-0.003	-0.001	-0.055	0.098	0.032
	(0.069)	(0.031)	(0.029)	(0.039)	(0.081)	(0.042)
$Free_t \cdot I(15 < d_m \leq 30)$	0.087	0.007	0.020	0.006	0.053	0.044
	(0.057)	(0.027)	(0.021)	(0.033)	(0.056)	(0.031)
Observations	5681	5681	5681	5681	5681	17882
Year and area fixed effects	√	√	√	√	√	√
Nuts II trend	√	√	√	√	√	√

Notes: This table shows the effect of the free movement policy on native employment, their cumulative net-flows into from local employment and on native population based on regression specification (1). In column 1, the dependent variable is native employment in municipality m in year t divided by native employment in 1998 in the same municipality. Changes in total employment can be decomposed into four cumulative net-flows components (column 2–5). See Appendix B.1 for details on the construction of these variables. In column 2, the dependent variable is the cumulative net-flow (inflow minus outflow) from other municipalities in the same distance bin (0-15, 15-30, 30+ or NBR) standardized by total employment in 1998. In column 3, the dependent variable is the cumulative net-flow from municipalities in other bins. Column 4 shows cumulative net-flows from non-employment (unemployment or out of the labor force). Column 5 shows cumulative net-flows from a residual category other (out of the sample, age range, missing values, etc.). In column 6, the dependent variable is the population in municipality m in year t standardized by its population in 1998. In Panel I.A to I.C municipalities in the border region farther away than 30 minutes constitute the control group. In Panel II.D to II.F municipalities in the non-border region are the control group. $Free_t$ is one from year 2004 onward. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives 1998. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.10: Effect of the free movement policy on share and number of natives in top tier management

Dependent variable	Share board members		Log (board members)	
	(1)	(2)	(3)	(4)
Panel A. All education groups				
$Free_t \cdot I(d_m \leq 15)$	0.020	0.030	0.130	0.199
	(0.014)	(0.016)	(0.091)	(0.076)
$Free_t \cdot I(15 < d_m \leq 30)$	-0.005	0.006	0.066	0.139
	(0.012)	(0.012)	(0.101)	(0.059)
Mean Dep. Var. pre-period	0.218	0.213		
Panel B. Highly educated				
$Free_t \cdot I(d_m \leq 15)$	0.072	0.078	0.230	0.249
	(0.039)	(0.041)	(0.121)	(0.123)
$Free_t \cdot I(15 < d_m \leq 30)$	-0.003	0.011	0.109	0.123
	(0.032)	(0.036)	(0.130)	(0.120)
Mean Dep. Var. pre-period	0.386	0.382		
Panel C. Low educated				
$Free_t \cdot I(d_m \leq 15)$	-0.006	0.012	-0.038	0.065
	(0.014)	(0.016)	(0.094)	(0.083)
$Free_t \cdot I(15 < d_m \leq 30)$	-0.015	0.001	-0.014	0.082
	(0.013)	(0.013)	(0.104)	(0.084)
Mean Dep. Var. pre-period	0.169	0.168		
Control group: BR 30+	√		√	
Control group: NBR		√		√
Year and area fixed effects	√	√	√	√
Nuts II trend	√	√	√	√

Notes: This table shows the effect of the free movement policy on the share and the number of natives who are board members of firms based on regression specification (1). The dependent variable in column 1–2 is the share of native workers who are board members within an education group. In column 3 and 4, the dependent variable is log number of native board members or their full-time equivalents, respectively, by education group. $Free_t$ is one for municipalities in the border region after 2004. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives in a cell. The share of board members in each panel is computed using the pre-1999 average in each panel. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.11: Effect of the free movement policy on wages of highly educated natives in different management ranks (control group: NBR)

Dependent variable: Average log hourly wages of highly educated natives in management ranks

	All highly	Wage by management rank		Constant management
	educated	High and middle	Low and no	rank shares
	(1)	(2)	(3)	(4)
$Free_t \cdot I(d_m \leq 15)$	0.043	0.051	0.032	0.029
	(0.013)	(0.018)	(0.011)	(0.010)
$Free_t \cdot I(15 < d_m \leq 30)$	0.018	0.024	0.013	0.008
	(0.010)	(0.015)	(0.012)	(0.010)
Year and area fixed effects	√	√	√	√
Nuts II trend	√	√	√	√

Notes: This table shows the effect of the free movement policy on mean log hourly real wages of highly educated natives in different management levels based on equation (1). Municipalities in the NBR constitute the control group. Column 1 reports the baseline effect on all highly educated natives. In column 2 and 3, highly educated natives are split into those with a high or middle positions and low or no management rank, respectively. Column 4 reports the effect on all highly educated when the share of high/middle managers is hold at its 1998 level. This variable is the weighted average of the wages in high/middle positions p, $w_{m,t}^{p=h}$ and wages in low/no management positions, $w_{m,t}^{p=l}$ using the share of these groups' employment in 1998, $\gamma_{m,'98} = L^{p=h}/L$ and $(1 - \gamma_{m,'98})$, as weights i.e. $\tilde{w}_{m,t} = w_{m,t}^{p=h}\gamma_{m,'98} + w_{m,t}^{p=l}(1 - \gamma_{m,'98})$. $Free_t$ is one from year 2004 onward. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives in a cell. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.12: Effect of free movement policy on wage levels of natives by sector of employment (control group: NBR)

Category of employment	Manufacturing		Services	
	High-tech	Low-tech	Knowledge-intensive	Not-knowledge-intensive
	(1)	(2)	(3)	(4)
Panel A. All education groups				
$Free_t \cdot I(d_m \leq 15)$	0.029	0.016	0.015	-0.011
	(0.017)	(0.016)	(0.018)	(0.020)
$Free_t \cdot I(15 < d_m \leq 30)$	-0.011	0.019	-0.002	0.005
	(0.015)	(0.013)	(0.012)	(0.013)
Panel E. Highly educated				
$Free_t \cdot I(d_m \leq 15)$	0.006	0.003	0.058	0.071
	(0.018)	(0.029)	(0.015)	(0.022)
$Free_t \cdot I(15 < d_m \leq 30)$	0.032	0.028	0.009	0.037
	(0.015)	(0.020)	(0.013)	(0.025)
Panel F. Low educated				
$Free_t \cdot I(d_m \leq 15)$	0.033	0.010	-0.008	-0.021
	(0.018)	(0.015)	(0.017)	(0.019)
$Free_t \cdot I(15 < d_m \leq 30)$	-0.008	0.010	-0.008	-0.006
	(0.016)	(0.013)	(0.012)	(0.013)
Year and area fixed effects	√	√	√	√
Nuts II trend	√	√	√	√

Notes: This table shows the effect on wages of natives by sector of employment and education based on regression specification (1). Municipalities in the NBR constitute the control group. High-tech manufacturing is NACE Rev 1.1 industries 24, 29, 30, 31, 32, 33, 34 and 35 excluding 35.1. Low-tech manufacturers are the remainder manufacturing categories. Knowledge-intensive services are NACE Rev 1.1 industries 61, 62, 64, 65-67, 70-74, 80, 85, 92. Not knowledge-intensive services are the remainder service sector categories. $Free_t$ is one from year 2004 onward. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total number of natives in a cell. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.13: Effect of free movement policy on immigrants by education group relative to total employment 1998, by sector of employment

Dependent variable: number of immigrants by sector of employment and education standardized by total sectoral employment in 1998

Category of employment	Manufacturing		Services	
	High-tech	Low-tech	Knowledge-intensive	Not-knowledge-intensive
	(1)	(2)	(3)	(4)
I. Control group: BR 30+				
Panel A. All education groups				
$Free_t \cdot I(d_m \leq 15)$	0.069	-0.033	0.084	0.046
	(0.038)	(0.021)	(0.015)	(0.021)
$Free_t \cdot I(15 < d_m \leq 30)$	0.033	-0.004	0.033	0.006
	(0.024)	(0.011)	(0.014)	(0.016)
Panel B. Highly educated				
$Free_t \cdot I(d_m \leq 15)$	0.037	0.008	0.058	0.025
	(0.017)	(0.005)	(0.007)	(0.008)
$Free_t \cdot I(15 < d_m \leq 30)$	0.009	-0.000	0.021	0.003
	(0.011)	(0.003)	(0.008)	(0.004)
Panel C. Lower educated				
$Free_t \cdot I(d_m \leq 15)$	0.031	-0.041	0.026	0.021
	(0.029)	(0.020)	(0.011)	(0.016)
$Free_t \cdot I(15 < d_m \leq 30)$	0.024	-0.003	0.012	0.003
	(0.017)	(0.010)	(0.008)	(0.014)
II. Control group: NBR				
Panel D. All education groups				
$Free_t \cdot I(d_m \leq 15)$	0.076	-0.047	0.042	0.027
	(0.041)	(0.023)	(0.024)	(0.020)
$Free_t \cdot I(15 < d_m \leq 30)$	0.043	-0.016	-0.002	-0.012
	(0.028)	(0.014)	(0.014)	(0.016)
Panel E. Highly educated				
$Free_t \cdot I(d_m \leq 15)$	0.033	0.007	0.028	0.025
	(0.014)	(0.005)	(0.012)	(0.009)
$Free_t \cdot I(15 < d_m \leq 30)$	0.007	-0.002	-0.005	0.003
	(0.012)	(0.004)	(0.008)	(0.006)
Panel F. Low educated				
$Free_t \cdot I(d_m \leq 15)$	0.043	-0.054	0.014	0.002
	(0.034)	(0.022)	(0.015)	(0.015)
$Free_t \cdot I(15 < d_m \leq 30)$	0.036	-0.015	0.003	-0.015
	(0.021)	(0.012)	(0.010)	(0.014)
Year and area fixed effects	√	√	√	√
Nuts II trend	√	√	√	√

Notes: This table shows the effect of the free movement policy on the number of immigrants by sector of employment and education group standardized by total sectoral employment in 1998 based on regression specification (1). In panel A and D the sample includes immigrants from all education groups. In panel B and E (panel C and F), the sample includes highly (lower) educated immigrants. In panel I.A–C municipalities in the BR 30+ are in the control group. In panel II.D–F municipalities in the NBR are the control group. High-tech manufacturing is NACE Rev 1.1 industries 24, 29, 30, 31, 32, 33, 34 and 35 excluding 35.1. Low-tech manufacturers are the remainder manufacturing categories. Knowledge-intensive services are NACE Rev 1.1 industries 61, 62, 64, 65-67, 70-74, 80, 85, 92. Not knowledge-intensive services are the remainder service sector categories. $Free_t$ is one from year 2004 onward. $(d_i \leq x)$ and $(y < d_i \leq z)$ indicate whether a municipality is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Distance interactions with the transition phase are omitted for brevity. The regressions are weighted using the total employment in 1998 in a cell. Robust standard errors, clustered by commuting zone, are shown in parentheses.

Table A.14: Characteristics of firms depending on pre-reform skill shortage

	(1)		(2)		(3)	
	No shortage		**Moderate**		**High shortage**	
	mean	sd	mean	sd	mean	sd
FTE employment (ln)	3.77	(1.57)	4.22	(1.53)	3.91	(1.46)
Firm age (years)	47.39	(46.99)	48.17	(38.22)	45.20	(37.53)
High-tech manufacturing	0.18	(0.38)	0.25	(0.43)	0.22	(0.41)
Low-tech manufacturing	0.25	(0.43)	0.33	(0.47)	0.34	(0.47)
Knowl.-intensive services	0.18	(0.39)	0.13	(0.34)	0.12	(0.32)
Not-knowl.-intensive services	0.27	(0.44)	0.19	(0.39)	0.23	(0.42)
Firms with R&D expenditures	0.42	(0.49)	0.58	(0.49)	0.52	(0.50)
Export share in sales (in %)	18.74	(31.23)	23.61	(33.40)	20.99	(31.92)
Firms with foreign owner	0.12	(0.32)	0.11	(0.31)	0.12	(0.32)
Share academics in workforce (in %)	17.38	(21.05)	17.75	(19.10)	16.97	(19.74)
Value added per FTE worker (ln)	11.77	(0.59)	11.76	(0.55)	11.72	(0.64)
Number of competitors	28.55	(29.60)	26.28	(27.82)	29.03	(29.12)
Highly hampered by LMRF	0.05	(0.22)	0.12	(0.32)	0.27	(0.44)
Travel minutes to border	31.76	(20.53)	30.80	(19.19)	31.25	(19.13)
Observations	1117		1773		616	

Notes: The table shows average firm characteristics using data from the KOF innovation surveys 1996 and 1999. Entries represent averages per region of all firm-year observations in the surveys. We differentiate firms that differed in the extent to which they reported that their innovation efforts were negatively affected by a "shortage of specialized personnel". The original variable has a 5-point Likert scale. Firms that have "no shortage" are firms with a less than 2, "moderate shortage" firms have a value between 2 and 4, and "high shortage" firms have a value greater than or equal to 4. High-tech manufacturing is NACE rev. 1.1 industries 24 and 29–35 excluding 35.1. "Highly hampered by LMRF" are firms that reported that their innovation efforts were strongly negatively affected by labor market regulation for foreigners in 1996 and/or 1999.

Table A.15: Further heterogeneity of firm-level effects of free movement policy

VARIABLES	(1) FE Sales	(2) FE Productivity	(3) FE Patent count
A: **Firm size**			
$Free_t * I(d_i \leq 15)$	0.136	-0.001	0.128
	(0.060)	(0.041)	(0.043)
$Free_t * I(d_i \leq 15) * I(FTE \geq 100)$	-0.045	0.098	-0.007
	(0.061)	(0.034)	(0.060)
B: **High vs. low CBW share**			
$Free_t * I(d_i \leq 15)$	0.119	0.005	0.144
	(0.053)	(0.035)	(0.046)
$Free_t * I(d_i \leq 15) *$ Ind. CBW share $\geq 10\%$	0.010	0.082	-0.051
	(0.053)	(0.061)	(0.063)
C: **Export status**			
$Free_t * I(d_i \leq 15)$	0.134	-0.019	0.102
	(0.054)	(0.044)	(0.039)
$Free_t * I(d_i \leq 15) *$ Exporter	0.001	0.064	0.062
	(0.047)	(0.041)	(0.060)

Notes: Each panel contains separate regressions of our baseline firm-level DiD model (specification 1) using the IS 1996–2013, augmented with one or several interactions between indicators for subgroups of firms and $Transition_t * I(d_i \leq 15)$, $Transition_t * I(15 < d_i \leq 30)$, $Free_t * I(d_i \leq 15)$, and $Free_t * I(15 < d_i \leq 30)$. In the table, we focus on the effects on highly treated firms in the free movement phase. The indicators refer to firm size (in terms of FTE employment, panel A), whether the firm operates in an industry with a cross-border worker share exceeding 10 % in 1998 in the BR (panel B), and firms' export share in sales (panel C). All regressions account for firm fixed effects, period fixed effects, and linear trends per Nuts-II region. The dependent variable in column 1 is firms' log total sales. The dependent variable in column 2 is firms' log value added per FTE worker. The dependent variable in column 3 is the inverse hyperbolic sine of the number of patent application filed by the firm in the three years preceding the survey. $Free_t$ is a dummy equal to one from year 2004 onward. $I(d_i \leq x)$ indicate whether a firm is located less than x travel minutes from the next border crossing. Standard errors are clustered by commuting zone.

Table A.16: Main robustness checks for firm-level results

VARIABLES	(1) FE Foreign employ.	(2) FE Establ. size BC	(3) FE Firm size IS	(4) FE Sales	(5) FE Productivity	(6) FE Patents 0/1
			A. Baseline			
$Free_t * I(d_i \leq 15)$	0.085	0.062	0.098	0.120	0.037	0.064
	(0.020)	(0.022)	(0.046)	(0.050)	(0.035)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.034	0.055	0.091	0.049	-0.042	0.018
	(0.012)	(0.023)	(0.046)	(0.044)	(0.039)	(0.024)
			B. Control group: NBR			
$Free_t * I(d_i \leq 15)$	0.088	0.036	0.040	0.072	0.040	0.048
	(0.022)	(0.020)	(0.037)	(0.042)	(0.036)	(0.025)
$Free_t * I(15 < d_i \leq 30)$	0.037	0.036	0.033	0.001	-0.040	0.002
	(0.012)	(0.017)	(0.035)	(0.035)	(0.038)	(0.017)
			C. Omitting linear time trends			
$Free_t * I(d_i \leq 15)$	0.096	0.059	0.097	0.119	0.037	0.064
	(0.021)	(0.027)	(0.046)	(0.050)	(0.035)	(0.026)
$Free_t * I(15 < d_i \leq 30)$	0.031	0.055	0.091	0.049	-0.042	0.020
	(0.013)	(0.025)	(0.046)	(0.044)	(0.039)	(0.024)
			D. Industry-period effects			
$Free_t * I(d_i \leq 15)$	0.079	0.060	0.088	0.114	0.042	0.066
	(0.020)	(0.022)	(0.042)	(0.047)	(0.036)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.030	0.055	0.087	0.047	-0.028	0.017
	(0.012)	(0.021)	(0.043)	(0.042)	(0.040)	(0.024)
			E. Nuts-II period effects			
$Free_t * I(d_i \leq 15)$	0.084	0.060	0.111	0.122	0.040	0.064
	(0.021)	(0.022)	(0.046)	(0.047)	(0.038)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.034	0.055	0.101	0.059	-0.047	0.020
	(0.012)	(0.022)	(0.045)	(0.047)	(0.039)	(0.023)
			F. Canton-period effects			
$Free_t * I(d_i \leq 15)$	0.077	0.035	0.168	0.134	0.005	0.086
	(0.045)	(0.031)	(0.060)	(0.067)	(0.055)	(0.032)
$Free_t * I(15 < d_i \leq 30)$	0.024	0.035	0.146	0.096	-0.064	0.031
	(0.011)	(0.022)	(0.054)	(0.061)	(0.049)	(0.025)
			G. Allowing for firm exit and entry			
$Free_t * I(d_i \leq 15)$	0.108	0.058	0.097	0.120	0.037	0.064
	(0.018)	(0.020)	(0.047)	(0.050)	(0.035)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.040	0.051	0.087	0.046	-0.043	0.017
	(0.011)	(0.016)	(0.046)	(0.044)	(0.039)	(0.024)
			H. Cross-section of firms in 1998			
$Free_t * I(d_i \leq 15)$	0.101	0.054	0.116	0.136	0.027	0.068
	(0.019)	(0.021)	(0.050)	(0.053)	(0.035)	(0.029)
$Free_t * I(15 < d_i \leq 30)$	0.036	0.050	0.098	0.053	-0.052	0.023
	(0.012)	(0.016)	(0.048)	(0.045)	(0.039)	(0.024)
			I. Including outliers			
$Free_t * I(d_i \leq 15)$	0.116	0.092	0.088	0.109	0.026	0.063
	(0.036)	(0.035)	(0.049)	(0.054)	(0.041)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.049	0.037	0.080	0.036	-0.042	0.018
	(0.035)	(0.040)	(0.047)	(0.045)	(0.038)	(0.024)
			J. Unexposed to Bilaterals			
$Free_t * I(d_i \leq 15)$	0.067	0.076	0.101	0.139	0.054	0.036
	(0.014)	(0.027)	(0.057)	(0.060)	(0.038)	(0.024)
$Free_t * I(15 < d_i \leq 30)$	0.026	0.063	0.095	0.083	-0.006	-0.016
	(0.012)	(0.025)	(0.055)	(0.054)	(0.045)	(0.026)

Notes: This table shows the robustness of the effect of the free movement policy with separate regressions, based on the baseline firm/establishment-level specification 1 using the BC (columns 1 and 2) and the IS (columns 3–6). All regressions account for establishment (BC) or firm (IS) fixed effects and period fixed effects, and all include linear trends per NUTS-II region (except panel C). The dependent variables are equivalent to those in Table 5 of the paper. The estimations in columns 1 and 2 are weighted using establishments' average size (in FTE). Panel A repeats our baseline results. In panel B, highly and slightly treated firms are compared to establishments/firms in the non-border region (NBR). Panel C excludes the linear trends by region that are part of our baseline specification. In panels D, E, and F, we control for industry-period fixed effects (FE), NUTS-II-period FE, and canton-period FE, respectively. The regressions in panel G is not restricted to private-sector firms present throughout 1991–2011. Instead, we include firms that enter and exit in the sample period. Panel H focuses on the cross-section of firms/establishments existing in 1998. Panel I includes the few outliers dropped from the main samples. The regressions in panel J are restricted to two-digit industries that are unaffected by the bilateral agreements according to the classification by Bühler et al. (2011). $Free_t$ is a dummy variable equal to one from year 2004 onward. $I(d_i \leq x)$ and $I(y < d_i \leq z)$ indicate whether a firm is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. The variables capturing the transition effects are included in the regression but omitted for brevity. Standard errors are clustered by commuting zone.

Table A.17: Firm results with alternative standard errors

Dependent variable	FTE (ln, IS) (1)	Sales (ln, IS) (2)	Value added per FTE (3)	Patents 0/1 (4)
A. Commuting zone				
$Free_t * I(d_i \leq 15)$	0.099	0.121	0.037	0.064
	(0.046)	(0.050)	(0.035)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.092	0.050	-0.042	0.018
	(0.046)	(0.044)	(0.039)	(0.024)
Observations	10,863	10,063	8,628	10,640
Number of clusters	73	73	73	73
B. Firm				
$Free_t * I(d_i \leq 15)$	0.099	0.121	0.037	0.064
	(0.041)	(0.046)	(0.038)	(0.023)
$Free_t * I(15 < d_i \leq 30)$	0.092	0.050	-0.042	0.018
	(0.039)	(0.041)	(0.037)	(0.022)
Number of clusters	4417	4193	3767	4368
C. Canton				
$Free_t * I(d_i \leq 15)$	0.099	0.121	0.037	0.064
	(0.042)	(0.028)	(0.044)	(0.026)
$Free_t * I(15 < d_i \leq 30)$	0.092	0.050	-0.042	0.018
	(0.042)	(0.019)	(0.045)	(0.023)
Number of clusters	23	23	22	23
D. Industry				
$Free_t * I(d_i \leq 15)$	0.099	0.121	0.037	0.064
	(0.042)	(0.046)	(0.042)	(0.028)
$Free_t * I(15 < d_i \leq 30)$	0.092	0.050	-0.042	0.018
	(0.034)	(0.041)	(0.038)	(0.028)
Number of clusters	67	67	66	67
E. SHAC variance				
$Free_t * I(d_i \leq 15)$	0.099	0.121	0.037	0.064
	(0.023)	(0.015)	(0.029)	(0.018)
$Free_t * I(15 < d_i \leq 30)$	0.092	0.050	-0.042	0.018
	(0.031)	(0.033)	(0.029)	(0.015)

Notes: This table shows the robustness of effect of the free movement policy on firm outcomes with alternative standard errors. All panels contain separate regressions of our baseline models specification (1) based on the IS data (see Table 5 for information). In panel A, standard errors are clustered on the level of commuting zone (our baseline strategy). In panels B, C, and D standard errors are clustered on the firm, cantonal and two-digit industry (NACE rev. 2) level, respectively. In panel E, we report standard errors based on the Spatial Heteroscedasticity and Autocorrelation Consistent (SHAC) variance estimator proposed by Conley (1999). This estimator allows for correlation between areas that are geographically close but belong to different regional units. Following Dustmann et al. (2017), we use a uniform kernel and a bandwidth of 100 kilometers. Transition interactions are included in the regression but omitted for brevity. All regressions account for establishment/firm fixed effects, period fixed effects, and linear trends per NUTS-II region.

Table A.18: Sensitivity of results based on innovation surveys to weighting

VARIABLES	(1) FE FTE (ln)	(2) FE FTE (ln)	(3) FE Sales	(4) FE Sales	(5) FE Produc-tivity	(6) FE Produc-tivity	(7) FE Patent appl. 0/1	(8) FE Patent appl. 0/1
$Transition_t * I(d_i \leq 15)$	0.015	-0.017	-0.004	0.066	-0.001	-0.033	0.017	0.003
	(0.033)	(0.080)	(0.036)	(0.122)	(0.036)	(0.143)	(0.019)	(0.036)
$Transition_t * I(15 < d_i \leq 30)$	0.035	-0.065	-0.008	-0.099	-0.044	-0.117	0.004	-0.147
	(0.029)	(0.053)	(0.033)	(0.082)	(0.035)	(0.137)	(0.015)	(0.078)
$Free_t * I(d_i \leq 15)$	0.098	0.168	0.120	0.435	0.037	0.100	0.064	0.078
	(0.046)	(0.108)	(0.050)	(0.176)	(0.035)	(0.080)	(0.027)	(0.037)
$Free_t * I(15 < d_i \leq 30)$	0.091	0.132	0.049	-0.139	-0.042	-0.029	0.018	-0.179
	(0.046)	(0.107)	(0.044)	(0.133)	(0.039)	(0.063)	(0.024)	(0.131)
Observations	10,871	10,871	10,071	10,071	8,633	8,633	10,647	10,647
Number of firms	4,422	4,422	4,198	4,198	3,770	3,770	4,372	4,372
Firm effects	√	√	√	√	√	√	√	√
Period effects	√	√	√	√	√	√	√	√
Nuts-II trends	√	√	√	√	√	√	√	√
Weights		√		√		√		√

Notes: The table presents robustness of the results of firm-level regressions specification (1) using the IS 1996–2013 and different weighting schemes. The dependent variables are firms' log FTE employment (columns 1 and 2), log total sales (columns 3 and 4), log value added per FTE worker (columns 5 and 6), and a dummy equal to 1 if a firm filed at least one patent application in the three years preceding the survey (columns 7 and 8). The regressions in odd columns are unweighted, those in even columns are weighted using average firm size (in FTE) as weight. All regressions account for firm fixed effects, period fixed effects, and linear trends per NUTS-II region. $Transition_t$ is a dummy equal to one between 1999 and 2003, whereas $Free_t$ is one from year 2004 onward. $I(d_i \leq x)$ and $I(y < d_i \leq z)$ indicate whether a firm is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Standard errors are clustered by commuting zone.

Table A.19: Robustness of firm results to dropping large cities

VARIABLES	(1) FE Foreign employ.	(2) FE Establ. size BC	(3) FE Firm size IS	(4) FE Sales	(5) FE Productivity	(6) FE Patents 0/1
			A. Baseline			
$Transition_t * I(d_i \leq 15)$	0.025	0.024	0.015	-0.004	-0.001	0.017
	(0.009)	(0.017)	(0.033)	(0.036)	(0.036)	(0.019)
$Transition_t * I(15 < d_i \leq 30)$	0.031	0.049	0.035	-0.008	-0.044	0.004
	(0.007)	(0.016)	(0.029)	(0.033)	(0.035)	(0.015)
$Free_t * I(d_i \leq 15)$	0.085	0.062	0.098	0.120	0.037	0.064
	(0.020)	(0.022)	(0.046)	(0.050)	(0.035)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.034	0.055	0.091	0.049	-0.042	0.018
	(0.012)	(0.023)	(0.046)	(0.044)	(0.039)	(0.024)
			B. Dropping Geneva			
$Transition_t * I(d_i \leq 15)$	0.030	0.028	0.017	-0.012	0.005	0.016
	(0.010)	(0.021)	(0.035)	(0.036)	(0.037)	(0.020)
$Transition_t * I(15 < d_i \leq 30)$	0.031	0.049	0.035	-0.008	-0.044	0.004
	(0.008)	(0.016)	(0.029)	(0.033)	(0.035)	(0.015)
$Free_t * I(d_i \leq 15)$	0.091	0.059	0.101	0.107	0.043	0.069
	(0.025)	(0.024)	(0.048)	(0.049)	(0.036)	(0.026)
$Free_t * I(15 < d_i \leq 30)$	0.034	0.055	0.091	0.049	-0.042	0.018
	(0.013)	(0.023)	(0.046)	(0.044)	(0.039)	(0.024)
			C. Dropping Basel			
$Transition_t * I(d_i \leq 15)$	0.024	0.034	0.019	-0.003	-0.007	0.009
	(0.009)	(0.015)	(0.035)	(0.039)	(0.037)	(0.019)
$Transition_t * I(15 < d_i \leq 30)$	0.031	0.049	0.035	-0.008	-0.044	0.004
	(0.008)	(0.016)	(0.029)	(0.033)	(0.035)	(0.015)
$Free_t * I(d_i \leq 15)$	0.080	0.067	0.093	0.113	0.034	0.057
	(0.021)	(0.022)	(0.048)	(0.053)	(0.037)	(0.028)
$Free_t * I(15 < d_i \leq 30)$	0.034	0.054	0.091	0.049	-0.042	0.018
	(0.012)	(0.022)	(0.046)	(0.044)	(0.039)	(0.024)
			D. Dropping Lugano			
$Transition_t * I(d_i \leq 15)$	0.025	0.023	0.009	-0.011	-0.000	0.018
	(0.008)	(0.017)	(0.032)	(0.034)	(0.036)	(0.019)
$Transition_t * I(15 < d_i \leq 30)$	0.031	0.049	0.035	-0.008	-0.044	0.004
	(0.007)	(0.016)	(0.029)	(0.033)	(0.035)	(0.015)
$Free_t * I(d_i \leq 15)$	0.084	0.061	0.096	0.116	0.034	0.066
	(0.020)	(0.022)	(0.046)	(0.050)	(0.035)	(0.027)
$Free_t * I(15 < d_i \leq 30)$	0.034	0.055	0.091	0.049	-0.042	0.018
	(0.012)	(0.023)	(0.046)	(0.044)	(0.039)	(0.024)
			E. Dropping Zurich			
$Transition_t * I(d_i \leq 15)$	0.025	0.027	0.021	-0.002	-0.001	0.023
	(0.009)	(0.017)	(0.034)	(0.037)	(0.038)	(0.019)
$Transition_t * I(15 < d_i \leq 30)$	0.028	0.047	0.035	-0.023	-0.047	0.007
	(0.009)	(0.018)	(0.032)	(0.034)	(0.039)	(0.017)
$Free_t * I(d_i \leq 15)$	0.084	0.067	0.095	0.113	0.042	0.065
	(0.021)	(0.022)	(0.049)	(0.052)	(0.036)	(0.028)
$Free_t * I(15 < d_i \leq 30)$	0.033	0.068	0.084	0.042	-0.033	0.015
	(0.015)	(0.023)	(0.051)	(0.048)	(0.044)	(0.027)

Notes: This table shows the robustness of effect of the free movement policy on firm/establishment outcomes using alternative sample restrictions. Each panel contains separate regressions of our baseline firm/establishment-level specification 1 using the BC (columns 1 and 2) and the IS (columns 3–6). All regressions account for establishment (BC) or firm (IS) fixed effects, period fixed effects, and linear trends per NUTS-II region. The dependent variable in column 1 is full-time equivalent (FTE) employment of foreigners as a share of total employment in 1998. The dependent variable in column 2 is establishments' log FTE employment. The dependent variable in column 3 is firms' log FTE employment. The dependent variable in column 4 is firms' log total sales. The dependent variable in column 5 is firms' log value added per FTE worker. The dependent variable in column 6 is a dummy equal to 1 if a firm filed at least one patent application in the three years preceding the survey. In each panel, we drop observations from a particular city case by case. Standard errors are clustered by commuting zone.

Table A.20: Effect of free movement policy on different innovation outcomes by pre-reform shortage of R&D workers

VARIABLES	(1) R&D 0/1	(2) R&D workers IHS	(3) R&D expend. IHS	(4) Patent appl. 0/1	(5) Process innov. 0/1	(6) Product innov. 0/1	(7) Sales share new/impr. products
$Free_t * I(d_i \leq 15)$	-0.034	-0.058	-0.599	0.082	0.012	-0.062	-0.033
	(0.039)	(0.099)	(0.575)	(0.035)	(0.047)	(0.048)	(0.029)
$Free_t * I(d_i \leq 15) * R\&D_i^{short}$	0.109	0.364	1.511	0.073	-0.032	0.216	0.107
	(0.066)	(0.143)	(0.689)	(0.042)	(0.067)	(0.063)	(0.053)
$Free_t * I(15 < d_i \leq 30)$	-0.007	0.125	0.225	0.038	-0.087	-0.013	-0.033
	(0.037)	(0.085)	(0.488)	(0.030)	(0.047)	(0.032)	(0.029)
$Free_t * I(15 < d_i \leq 30) * R\&D_i^{short}$	-0.000	-0.131	-0.600	0.051	0.085	0.059	-0.004
	(0.049)	(0.115)	(0.734)	(0.043)	(0.063)	(0.062)	(0.059)
Observations	4,967	4,473	4,358	4,904	4,985	4,985	2,802
R-squared	0.030	0.022	0.016	0.021	0.050	0.026	0.040
Number of firms	1,560	1,513	1,480	1,557	1,560	1,560	1,245
Firm effects	√	√	√	√	√	√	√
Period effects	√	√	√	√	√	√	√
Nuts-II trends	√	√	√	√	√	√	√

Notes: The table presents results of firm-level regressions specification (1) using the IS 1996–2013 and exploiting heterogeneity with respect to pre-reform shortage of R&D workers. The dependent variable in column 1 is a dummy equal to one if a firm reports to have R&D activity. The dependent variables in columns 2 and 3 are the Inverse Hyperbolic Sines (IHS) of the number of R&D workers and R&D expenditures, respectively. The dependent variable in column 4 is a dummy equal to 1 if a firm filed at least one patent application in the three years preceding the survey. The dependent variables in columns 5 and 6 are dummies equal to one if a firm reports to have introduced at least one process or product innovation in the three years preceding the survey. Process innovation refers to the implementation of a new or significantly improved production or delivery method. A product innovation is defined as the introduction of a good or service that is either new or a substantially improved version of a prior good or service. The dependent variable in column 7 is the firms' sales share of new or significantly improved products. All regressions account for firm fixed effects, period fixed effects, and linear trends per NUTS-II region. $Free_t$ is a dummy equal to one from year 2004 onward. The variables capturing the transition effects are included in the regression but omitted for brevity. $I(d_i \leq x)$ and $I(y < d_i \leq z)$ indicate whether a firm is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. $R\&D_i^{shortage}$ is a dummy equal to 1 if a firm reported substantial problems in finding R&D workers in either one or the two IS in 1996 and 1999 (i.e. if the average of the corresponding original Likert scale survey item is at least 4), or 0 otherwise. Standard errors are clustered by commuting zone.

Table A.21: Effect of free movement policy on establishment entry and exit

VARIABLES	(1) Entry all	(2) Entry Low-tech manuf.	(3) Entry High-tech manuf.	(4) Entry Knowl.-intensive services	(5) Entry Not knowl.-intensive services	(6) Exit all
$Transition_t * I(d_i \leq 15)$	0.016	0.012	0.041	0.018	0.009	-0.004
	(0.006)	(0.010)	(0.017)	(0.012)	(0.004)	(0.009)
$Transition_t * I(15 < d_i \leq 30)$	0.016	0.006	0.007	0.040	-0.000	-0.009
	(0.007)	(0.008)	(0.017)	(0.013)	(0.005)	(0.008)
$Free_t * I(d_i \leq 15)$	0.037	0.033	0.056	0.048	0.022	0.002
	(0.010)	(0.010)	(0.019)	(0.014)	(0.007)	(0.007)
$Free_t * I(15 < d_i \leq 30)$	0.026	0.011	0.020	0.041	0.017	-0.003
	(0.004)	(0.009)	(0.012)	(0.009)	(0.004)	(0.005)
Observations	8,157	7,284	5,135	7,602	8,055	9,764
R-squared	0.386	0.136	0.075	0.170	0.342	0.422
Number of municipalities	1,636	1,457	1,027	1,521	1,615	1,636
Municipality effects	√	√	√	√	√	√
Period effects	√	√	√	√	√	√
Nuts-II trends	√	√	√	√	√	√
Number of clusters	73	72	71	73	73	73

Notes: The table studies whether the immigration reform affected establishment entry and exit. All estimations are run at the municipality level using BC data and are restricted to the BR. The dependent variable in columns 1–5 is the number of new establishments in t as a fraction of the number of establishments in 1998 in the sector. The estimation sample is based on the BC 1991–2008. The dependent variable in columns 6 is the number of establishments exiting between $t-1$ and t as a fraction of the number of establishments in 1998 in the sector. The sample is based on the BC 1991–2011 in this case. All regressions account for municipality fixed effects, period fixed effects, and linear trends per NUTS-II region. $Transition_t$ is a dummy equal to one between 1999 and 2003, whereas $Free_t$ is one from year 2004 onward. $I(d_i \leq x)$ and $I(y < d_i \leq z)$ indicate whether a firm is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. The regressions are weighted using the municipality-specific number of establishments in the sector in 1998 as the weight. Standard errors are clustered by commuting zone.

Table A.22: Effects of free movement policy on within-firm staffing decisions

VARIABLES	(1) FE Foreign employ.	(2) FE Foreign employ.	(3) FE Establ. size (FTE)	(4) FE Establ. size (FTE)
$Transition_t * I(d_i \leq 15)$	0.029	0.006	0.009	0.030
	(0.019)	(0.009)	(0.068)	(0.045)
$Transition_t * I(15 < d_i \leq 30)$	0.050	0.028	0.093	0.089
	(0.015)	(0.009)	(0.065)	(0.044)
$Free_t * I(d_i \leq 15)$	0.062	0.070	0.097	0.105
	(0.022)	(0.023)	(0.037)	(0.059)
$Free_t * I(15 < d_i \leq 30)$	0.042	0.050	0.116	0.124
	(0.014)	(0.015)	(0.054)	(0.070)
Observations	54,463	66,188	72,414	88,080
R-squared	0.592	0.581	0.728	0.698
Preferred sample	√	√	√	√
Region effects	√	√	√	√
Firm-period effects	√	√	√	√
Control group: BR 30+	√		√	
Control group: NBR		√		√

Notes: This table studies whether multi-establishment firms grow disproportionately in establishments closer to the border by including a full set of firm-period effects into the otherwise standard DiD model, specification 1. The effects are thus identified only from the comparison of establishments within the same firm. The estimation sample is private-sector establishments in the BC 1995–2008 (columns 1 and 2) and 1991–2011 (columns 3 and 4). The dependent variable in columns 1 and 2 is full-time equivalent (FTE) employment of foreigners as a share of total employment in 1998. Columns 3 and 4 show the corresponding results using log FTE employment as dependent variable. The regressions do not contain establishment fixed effects. Instead, we control for region fixed effects, i. e. a dummy equal to one for each of the four relevant regions (border region 0–15, 15–30, and 30+ minutes from the border, non-border region). We also relax the restriction that an establishment needs to be present 1991–2011 somewhat (since the number of firms with *several* establishments present throughout the 20-year period is very small). Instead, we focus on all establishments existing at least in 1995–2005. We observe larger increase the foreign employment share and FTE employment in highly treated establishments relative to establishments further away from the border even within the same firms. Standard errors are clustered by commuting zone.

Table A.23: Effects of free movement policy on firms' export status

	(1)	(2)	(3)	(4)
	FE	FE	FE	FE
VARIABLES	Export 0/1	Export 0/1	Export share	Export share
$Transition_t * I(d_i \leq 15)$	-0.010	0.016	0.401	0.455
	(0.027)	(0.022)	(0.898)	(0.887)
$Transition_t * I(15 < d_i \leq 30)$	-0.037	-0.012	-0.695	-0.646
	(0.025)	(0.019)	(0.898)	(0.821)
$Free_t * I(d_i \leq 15)$	-0.004	-0.020	0.414	0.791
	(0.020)	(0.022)	(0.951)	(0.792)
$Free_t * I(15 < d_i \leq 30)$	-0.007	-0.022	-0.243	0.137
	(0.017)	(0.021)	(0.909)	(0.797)
Observations	10,757	12,495	10,483	12,193
R-squared	0.003	0.003	0.010	0.008
Number of firms	4,400	5,129	4,341	5,062
Preferred sample	√	√	√	√
Firm effects	√	√	√	√
Period effects	√	√	√	√
Control group: BR 30+	√	√	√	√
Control group: NBR		√		√

Notes: The table studies the effect of the free movement policy an firm's export status based on firm-level specification 1 and the IS 1996–2013 using both control groups. The dependent variable in columns 1 and 2 is a dummy equal to one if a firm exported in the year before the survey. The dependent variable in columns 3 and 4 is firms' export share in sales in the year before the survey. $Transition_t$ is a dummy equal to one between 1999 and 2003, whereas $Free_t$ is one from year 2004 onward. $I(d_i \leq x)$ and $I(y < d_i \leq z)$ indicate whether a firm is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. All regressions account for firm fixed effects, period fixed effects, and linear trends per NUTS-II region. Standard errors are clustered by commuting zone.

Table A.24: The reform and firms' perceptions of policy-related obstacles to innovation

VARIABLES	(1) FE Insufficient external funding	(2) FE Taxes	(3) FE Regulation in domestic market	(4) FE Labor market regulation for foreigners	(5) FE Environm. regulation	(6) FE Construction laws	(7) FE Restricted access to EU	(8) FE Insufficient public support for research	(9) FE Insufficient public support for technology
A. Control: Border region									
$Transition_t * I(d_i \leq 15)$	-0.051	0.016	-0.013	-0.001	-0.008	0.002	0.005	0.020	-0.015
	(0.037)	(0.029)	(0.026)	(0.027)	(0.032)	(0.040)	(0.040)	(0.025)	(0.018)
$Transition_t * I(15 < d_i \leq 30)$	-0.052	0.011	0.013	0.013	-0.012	0.015	-0.036	0.043	0.030
	(0.033)	(0.028)	(0.028)	(0.025)	(0.030)	(0.039)	(0.038)	(0.032)	(0.017)
$Free_t * I(d_i \leq 15)$	-0.012	0.026	-0.027	-0.022	0.005	-0.021	0.003	0.027	-0.006
	(0.035)	(0.027)	(0.028)	(0.023)	(0.035)	(0.036)	(0.039)	(0.028)	(0.023)
$Free_t * I(15 < d_i \leq 30)$	0.001	0.031	0.034	-0.017	0.013	-0.027	-0.033	0.034	0.039
	(0.029)	(0.025)	(0.028)	(0.022)	(0.032)	(0.034)	(0.036)	(0.030)	(0.021)
Observations	8,811	8,810	7,627	7,625	7,625	7,627	7,630	7,072	7,071
B. Control: NBR									
$Transition_t * I(d_i \leq 15)$	-0.004	-0.001	-0.018	-0.050	0.021	-0.003	0.058	-0.027	-0.035
	(0.032)	(0.030)	(0.024)	(0.027)	(0.028)	(0.033)	(0.030)	(0.019)	(0.018)
$Transition_t * I(15 < d_i \leq 30)$	-0.005	-0.007	0.009	-0.034	0.017	0.012	0.014	-0.005	0.009
	(0.027)	(0.027)	(0.028)	(0.023)	(0.025)	(0.029)	(0.025)	(0.021)	(0.015)
$Free_t * I(d_i \leq 15)$	0.027	-0.012	-0.049	-0.071	0.004	0.020	0.058	-0.013	-0.042
	(0.033)	(0.025)	(0.024)	(0.023)	(0.033)	(0.034)	(0.029)	(0.022)	(0.021)
$Free_t * I(15 < d_i \leq 30)$	0.038	-0.009	0.014	-0.063	0.017	0.017	0.017	-0.007	0.002
	(0.026)	(0.023)	(0.025)	(0.021)	(0.028)	(0.030)	(0.023)	(0.021)	(0.018)
Observations	10,204	10,203	8,857	8,856	8,855	8,857	8,859	8,206	8,206

Notes: The studies the effect of the free movement policy on firms' perception of policy related obstacles to innovation based on our baseline specification (1). In the IS 1996–2011, firms were asked whether different policy-related factors had a negative effect on their innovation efforts. We built 9 dummy variables from the original Likert-scale survey items. The dependent variables are dummies equal to 1 if a firm gave a value of 4 or 5 to a specific innovation obstacle. Panel A is based on firms in the BR only. Panel B includes firms in the NBR into the control group. All regressions control for firm fixed effects, year fixed effects, and NUTS-II trends. $Transition_t$ is a dummy equal to one between 1999 and 2003, whereas $Free_t$ is one from year 2004 onward. $I(d_i \leq x)$ and $I(y < d_i \leq z)$ indicate whether a firm is located less than x travel minutes or between y and z travel minutes from the next border crossing, respectively. Standard errors are clustered by commuting zone. Cluster-robust standard errors in parentheses.

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