The Equilibrium Effects of Workers' Outside Employment Options: Evidence from a Labour Market Integration *

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Abstract

We study a reform that eased cross-border commuting from France to the high-wage Swiss labour market. Using a difference-in-differences strategy comparing the French border region with the unaffected French inland, we find that wages increase among mid- and low-skill workers employed in the French border region. Employment in the French border region does not decline overall and increases particularly for low-skill workers. Both local labour supply and demand adjust substantially. Labour supply increases through the local population and the labour force participation rate. Firms increase sales and productivity more than wages, implying that the labour share did not rise. The results thus show that if labour supply is elastic enough, the local labour market can expand and absorb additional competition for workers.

JEL classification: J08, J21, J31, J60, J64, R23.

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1 Introduction

In most theories of the labour market, better outside employment options increase workers' wages. The effect of additional outside options on aggregate employment, however, is ambiguous. Access to jobs with higher wages can raise labour supply, but increased competition for workers can also lower labour demand. In turn, local demand can be stimulated by additional earnings and increased labour supply. Empirically disentangling these adjustment channels is crucial for understanding how local labour markets react to shocks and policy changes.

In the present paper, we study the effects of a labour market integration between France and Switzerland's border regions. The reform, announced in 1998, removed several restrictions on cross-border commuting between the two countries. For French workers, this meant better access to nearby Swiss jobs, allowing them to boost their wages by 20 per cent when switching from a French to a Swiss job. As a result, between 1999 and 2007, the number of French residents with Swiss jobs increased by around 40,000—almost four per cent of the workforce in the French areas whose residents were eligible to work in Switzerland.

Using a difference-in-differences research design, we study the effects of the reform by comparing treated French labour markets in the border region to a matched set of control labour markets in the unaffected French inland.

Our matching strategy assumes the reform was exogenous conditional on pre-reform wage trends in the treated region. The assumption is plausible because the reform was decided between Switzerland and the European Union—there was no room for local interests to shape the policy outcome. While we cannot directly support the parallel trends assumption by inspecting pre-event trends, an alternative matching approach that only uses cross-sectional variables allays these concerns: it produces similar results and importantly, shows no evidence of pre-event trends in the outcomes. Moreover, the robustness of our findings is further demonstrated when choosing an alternative control group based solely on the distance to the Swiss border, and a placebo analysis of the border area with Spain reveals no effects.

We now summarise our main results on the effects of the labour market integration on i) cross-border commuting, ii) the equilibrium change in wages and

employment in France, iii) the adjustment of labour supply in France, and iv) the adjustment of French firms.

Even though residents with different education levels had substantial wage gains from getting a Swiss job, it is mainly the highly educated ones who start commuting more: their commuting propensity increases by 2.8 percentage points in eligible labour markets—a 30 per cent increase relative to the pre-period. This however understates the increase in the total number of commuters for all education groups because the local population also increases, as we will show.

We estimate the effects of the integration on wages paid in the treated French labour markets by focusing on within-worker wage growth—first by measuring local wage growth for all workers who remain employed at the same firm for two consecutive years and second by using worker-level panel data. Our results on wages are thus not affected by the selective uptake of commuting to Switzerland with respect to baseline wages in the treated region. Both approaches show that the integration raised wages for workers employed in the treated region: wages grew between 1 and 2.2 per cent in the first eight years of the policy. Since many new commuters were highly educated, we estimate the effects separately for three different skill groups. The wage effects are concentrated among low- and mid-skill workers, while for high-skill workers, we do not find evidence of higher wages.

We find no evidence of a decline in employment during the sample period, despite the increase in cross-border commuting and higher wages in the treated region. If anything, there is an imprecise increase in employment of around 1.5 per cent, particularly in the first years of the integration. This stems from an increase in low-skill employment of four to six per cent, while there is no evidence of a decline among the other groups.

To understand the underlying adjustment mechanisms, we first show that labour supply responds substantially: The labour force increases by almost four per cent—amounting to almost 100,000 workers, which vastly overcompensates for the outflow of commuters to Switzerland. The increase stems from a higher population and higher labour force participation. The population effect is stronger for workers with a tertiary education; the population and participation effects are similar for low-educated workers; and the participation effect is driven by women.

We then document that the labour market integration increased labour demand by expanding production. Specifically, the reform increased sales and material costs among employers by a similar magnitude—suggesting an increase in output and not solely prices. These effects are stronger in the construction and non-tradable sectors compared to tradables. The effects in the tradable sectors are still positive, but smaller.

We also show that labour costs grow less than material costs and sales, which implies that the extra labour input and higher wages do not increase the labour share. Then, we show that labour productivity, measured by value added per worker, rises in all sectors in the free mobility period. Since material costs per worker rise as well, we again interpret this as reflecting higher physical productivity. The rise in labour productivity is generally larger than the rise in wages, again implying the labour share did not increase. Further, we find no evidence that a trade reform—enacted concurrently in pre-specified industries—is driving these productivity gains. While the reform's impact on sales, productivity, and material costs is heterogeneous across sectors, the impact on wages is much more homogeneous: wages in tradable sectors grew similarly to those in the remaining sectors.

Overall, our results show a local boom in both output and the labour market in response to the labour market integration. The results imply that additional competition for workers does not necessarily lead to a decline in employment or an increase in the labour share. Instead, if labour supply is elastic enough, the local labour market can expand and absorb additional competition for workers.

Our paper thus contributes to the understanding of how labour markets respond to policy and local shocks. First, since labour supply depends on aggregate conditions in the local labour market, the cross-location variation we exploit identifies local general equilibrium effects of outside options—in contrast to studies that assess the impact of outside employment options at the worker level (Caldwell and Danieli, 2024; Caldwell and Harmon, 2018).

Studies on the aggregate effects either exploit within-location, cross-industry variation to identify partial equilibrium effects (Schubert et al., 2021; Beaudry et al., 2012), or exploit labour demand shocks across local labour markets to identify local general equilibrium effects, as in Green et al. (2019) and Dodini et al. (2022).

The latter paper shares many similarities with ours—such as that the employment opportunities increase in nearby jobs and affect a broad set of workers. Despite this, we document substantially different results, which we argue stem from a strong labour supply response in our case. Documenting this response is possible from our combined use of employer-employee records and survey data, which is a novelty in this literature. Employment counts from registry data alone would not necessarily reflect the participation response, as unemployment would remain unmeasured. However, a shortcoming of our setting is the lack of full-count registry data with a longitudinal link, which limits our ability to track individuals.

Our paper further contributes to recent work on commuting policies. Beerli et al. (2021) previously studied the effects of the same policy in Switzerland, and Dumeignil (2021) studies the effects of removing the last commuting restrictions in France. Dicarlo (2022) studies the effects of the same policy on incumbent Italian firms; our paper studies aggregate effects and highlights the importance of the labour supply adjustment, similar to Dustmann et al. (2017). Closest to our paper is Bütikofer et al. (2022), who study the impact of the opening of the Oresund bridge between Malmo and Copenhagen—but there are two differences. First, in our case, new jobs became accessible much closer to the affected workers than in their case. We will show that this led to a gender gap in commuting in their case but not in ours. Second, we provide new evidence on how labour demand responded to the increased outside options.

2 The labour market integration

In late 1998, Switzerland and the European Union (EU) announced seven bilateral agreements that were signed in June 1999. After passing the European and Swiss parliament as well as a referendum in Switzerland, the agreements took effect in June 2002—but as we discuss below, there were anticipation effects starting from 1999. Among the agreements, the one on the free movement of persons allows EU and Swiss citizens to move freely for work. Because of the higher cost of living in Switzerland, it was more attractive for French residents to become a cross-border

commuter instead of migrating to Switzerland.[1]

Even though the labour market integration was negotiated, it was unlikely to be driven by particular interests in the French-Swiss border region. Because the EU's negotiating position was based on two principles—that all agreements became active at the same time and that they were in line with existing rules within the EU (Bundesrat, 1999, p. 6139)—the integration was a consequence of the free movement of people that had already existed within the EU and that allows cross-border commuting.

A set of other agreements simultaneously increased mutual market access in specific sectors:[2] Air and land traffic were liberalized; Swiss public entities were required to tender internationally; and in some manufacturing sectors, product approval processes were eased, reducing the fixed cost of trade. The trade reform covered sectors that already had similar agreements within the EU. This allows us to estimate differential effects by exposure to the reform and test directly whether the trade agreement had a confounding effect on border labour markets.

Cross-border commuting was possible before the reform, but there were restrictions. The first restriction was geographic: a border region, primarily consisting of municipalities within a 10km buffer of the border,[3] was established in 1946. Since then, residents from the border regions could freely cross the border. They were also the only French residents eligible to work in Switzerland. The second restriction required Swiss firms to first seek a worker within Switzerland before hiring a cross-border commuter.[4][5]

The restrictions were removed in three steps.[6] First, the transition phase from

[1]This difference in cost of living led to a higher number of French commuters than migrants in Switzerland even before the labour market integration, and that gap widened afterwards.

[2]See table A1 for details.

[3]The exception was the department of Haute Savoie, which also belonged to the border region.

[4]Firms had to submit an application to the cantonal authorities, and the whole process could take several months; see Beerli et al. (2021, p. 983) for more details.

[5]Although it was theoretically possible to commute from Switzerland to France, few Swiss did so: In 2000, approximately 0.03 per cent of the Swiss labour force in the border region worked in France. From 2002 to 2008, the number of Swiss border workers living in Switzerland and working abroad increased from 6000 to 9000 (Beerli et al., 2021, table A.2). This includes commuters to all countries neighbouring Switzerland and is an order of magnitude smaller than the increase in the number of commuters from France to Switzerland.

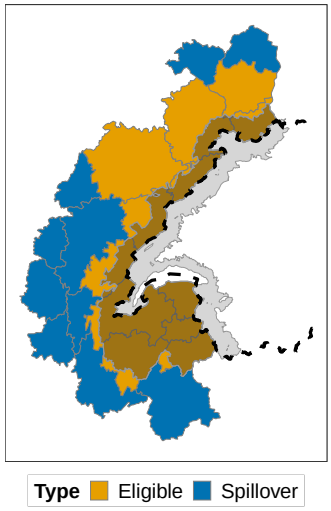
[6]Other regulations did not change. In particular, regulations for unemployment insurance and

1999 to 2003 facilitated labour mobility in the border region: Weekly instead of daily commuting became possible; the duration of a work permit was extended from one to five years; and it became possible to change workplaces in Switzerland. Internal migrants moving to the border region from other parts of France no longer had to wait six months before they could get a Swiss job. During this transition phase, anticipation effects were likely: Swiss authorities handled permit applications more leniently following the integration announcement (Beerli et al., 2021), and French residents were aware of the integration by late 1999 (Merckling, 1999).

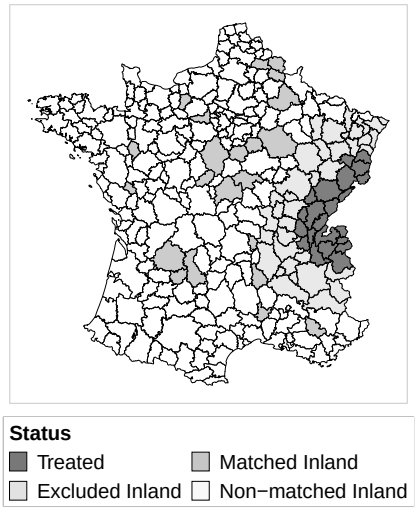
Second, in June 2004, mobility within the border region became fully free as Swiss firms were no longer required to search for a suitable worker in the Swiss labour market before hiring a cross-border commuter. Third, in June 2007, the border region was abolished, allowing workers to commute from anywhere in France to anywhere in Switzerland.

Figure 1a illustrates the labour markets along the French-Swiss border. The black dotted line represents the border of Switzerland. The grey area on both sides of the border denotes the border region. The yellow areas are French labour markets that include at least one municipality in the border region, referred to as eligible labour markets. The blue areas represent French labour markets that could be affected by spatial spillover effects.

pension contributions remained the same, but cross-border commuters were required to register with Swiss health insurance after the reform. The taxation of commuters also remained unchanged, as it is based on older treaties between Switzerland and France: French commuters pay taxes in France unless they work in Geneva. See appendix A.2.2 for details.



(a) Border municipalities and treated labour markets



(b) The treated and matched labour markets

Figure 1
The Swiss and French labour markets

Notes: Panel 1a shows the municipalities and labour markets along the Swiss-French border. The black dashed line represents the border between France and Switzerland. The grey area includes the French and Swiss border municipalities. Labour market types are color-coded based on exposure to the integration: yellow indicates markets directly exposed to integration by having at least one municipality in the border region, and blue indicates markets potentially affected by spillovers.
Panel 1b shows the local labour markets in France by treatment status. *Treated* markets, shown also in panel 1a, are directly affected by the integration. *Excluded inland* refers to labour markets excluded from the pool of potential controls. *Non-matched Inland* are labour markets from the pool of potential controls that were not matched, and *Matched Inland* represents the control labour markets selected through the matching strategy.

We focus the analysis on the years up to 2007 for two reasons: Workers aim to minimize commuting time, so the last liberalization step likely had minor effects; additionally, since the Swiss Franc appreciated after 2007, results from post-2007 are confounded by this change in exchange rates. While studying the further amplification of wage differences is interesting, our focus here is on the effects of labour market integration itself, as it represents a permanent change to the structure of the local labour market.

3 Data & Empirical design

3.1 The data sources

Large parts of the analysis rely on microdata aggregated at the labour market cell level. A cell is defined as a combination of the local labour market,[7] year, and demographics (e.g., skill, education, and/or gender). Furthermore, some results are disaggregated by four broad sectors: tradable, construction, non-tradable, and other.[8]

We use a range of data sets; here, we give an overview of the most important ones. More details are in appendix B.

Matched employer-employee data The main data come from social security declarations by employers (*DADS*) from 1995 to 2007. For each year, the data report employment spells between workers and establishments. For each spell, the data report salary, hours worked, gender, age, occupational category, municipality of work and residence, and each spell's start and end date. Employment is measured at the cell level from the full-count *DADS Postes* data.

In the *DADS* data, we define skill groups based on workers' two-digit occupational classification. High-skill occupations include managers, executives, scientists, engineers, lawyers. Mid-skill occupations include technicians, foremen, skilled blue collar workers and administrative employees. Low-skill occupations include unskilled blue and white collar workers (craft, manufacturing, sales clerks).

Measuring within-worker wage growth Because the reform impacts who works in France, our empirical strategy needs to be robust to composition changes in the French workforce. Thus, we estimate the impact on wages paid in France from within-worker comparisons in two different ways. In the first approach, using data from *DADS Postes*, we construct an index of within-worker, within-firm wage growth at the cell level. To compute this index, we first residualize wages with respect to gender, age, and calendar year. Then, we measure the average change in

[7] There are 297 local labour markets in France.

[8] The *Other* sector consists of all industries not covered by the main three sectors.

residual wages of workers employed at the same establishment in two consecutive years. Then, we aggregate at the cell level and accumulate across years relative to 1998. In the second approach, using data from *DADS Panel*, we estimate wage changes at the worker level for workers who are employed before and after the reform. This approach, in contrast to the wage index, captures wage growth within and across firms. It also allows us to estimate wage effects on workers that were present in the sampled labour markets before 1999.

Census and labour force survey data While the administrative data only include workers who are employed in France, the census and the labour force survey report information for the entire resident population, including cross-border commuters and persons out of the labour force. We group workers into three education groups based on their highest degree: mandatory education, secondary education, and tertiary education.

Census We use data from the French *census* from 1982, 1990, 1999, 2006, and 2007, where 1999 is the base year.[9] We calculate cell-level outcomes such as population, commuting propensity, and labour force participation rate.

Labour force survey We use the years from 1993 to 2002 for We use the years from 1993 to 2002 to analyse the wage premium of Swiss jobs for French residents and to document cross-border commuting at a higher temporal resolution. A substantial redesign of the survey introduces substantial breaks in measurements. Thus, we only use the labour force survey to analyse the first years after the announcement of the reform.

Other data In addition, we aggregate firm-level outcomes from balance sheets also at the cell level. The balance sheet information comes from the *FICUS* database. We also use Swiss administrative data on cross-border commuters in Switzerland to show annual trends in cross-border commuting.

[9]The data for 1999 were collected already in March 1999, shortly after the labour market integration was announced in December 1998. To the extent that the reform has already had effects in this short time period, the estimates would understate the true effects.

3.2 Empirical design: Swiss side

We study how commuting in the border region of Switzerland with France evolves using a difference-in-difference strategy similar to Beerli et al. (2021). The Swiss border municipalities—the grey area, on the Swiss side in Figure 1—constitute the treated group. We exclude Swiss municipalities in the Basel cantons located in the far north, as they are proximate to both Germany and France. The control municipalities are located within the Swiss interior and are not part of any border region with neighbouring countries.

We estimate the annual impact of the integration on the number of cross-border commuters in Swiss municipalities at the border with France. Since we expect commuters to concentrate close to the border, we let the treatment effects vary by distance from the nearest border crossing:

$$\begin{aligned} y_{mt} = \alpha_m + \alpha_t + \sum_{\tau \neq 1998} \beta_{1,\tau} \text{treat}_{\text{dist}_m < 10} \times 1[t = \tau] \\ + \sum_{\tau \neq 1998} \beta_{2,\tau} \text{treat}_{\text{dist}_m \geq 10} \times 1[t = \tau] + v_{mt} \end{aligned} \tag{1}$$

where m indicates municipality, t indicates the year. y_{mt} is the number of cross-border commuters in the municipality relative to employment in 1998. $\text{treat}_{\text{dist}_m < 10}$ indicates municipalities in the border region that are less than 10km away from the next border crossing. $\text{treat}_{\text{dist}_m \geq 10}$ indicates municipalities in the border region that are at least 10km away from the next border crossing. We are interested in the coefficients $\beta_{1,\tau}$ and $\beta_{2,\tau}$

3.3 Empirical design: French side

3.3.1 Estimating the effect of the labour market integration

To estimate the effect of the labour market integration on the French side, we define the set of treated labour markets as markets that are at most a distance of $\bar{d}$ away from the French-Swiss border. This includes both eligible labour markets and neighbouring markets likely affected by spatial spillovers arising from commuting

linkages (Manning and Petrongolo, 2017; Monte et al., 2018; Nimczik, 2020). To consider such spillovers in the estimation, we set $\bar{d} = 84$ kilometres as the width of a belt drawn around the French-Swiss border. $\bar{d}$ is defined by the municipality in the eligible labour markets furthest away from Switzerland. Figure 1a shows the 22 treated labour markets. The eligible labour markets are marked in yellow, and the spillover labour markets in blue.[10]

We estimate models that compare the outcomes over time between the treated group and a suitable control group. The matching is described in the next section 3.3.2; here, we present the regression models.

Aggregate data To estimate the aggregate impact of the integration, we use a range of difference-in-difference regression models at the level of the local labour market m. The first model estimates annual treatment effects for each year $\tau \neq 1998$ for a group of workers g:

$$y_{mt}^g = \alpha_m^g + \alpha_t^g + \sum_{\tau \neq 1998} \beta_\tau^g treat_m \times 1[t = \tau] + \gamma^g X_{mt}^g + v_{mt}^g. \tag{2}$$

The models are estimated separately for each worker group g. α_m^g are fixed effects for labour market m of worker group g, which account for time-constant heterogeneity at the level of the labour market $\times$ worker group level. α_t^g are fixed effects for year $t \times$ worker group g and account for time-varying shocks that impact worker group g in the same way in the treated and in the control labour markets. The coefficients of interest are β_τ^g: They estimate the effect of the labour market integration on workers in group g for different years. X_{mt}^g is a set of additional controls. First, it includes a linear time trend that, for each skill group, is specific to the matched treated-control pair of labour markets. Including the trends improves the precision of the estimates; point estimates without the trends are very similar in magnitude. Second, in robustness checks, we add further labour-market-specific

[10]The treated labour markets lie within a 96-minute car drive from the next French-Swiss border crossing. The median commute in France in 2004 was 12 minutes. The treated labour markets, therefore, lie within ten times the median commute, which is the distance over which Manning and Petrongolo (2017) estimate ripple effects to extend. Data on the location of border crossings have been kindly provided by Henneberger and Ziegler (2011).

observables from 1998. The observables are interacted with a linear time trend. v^g_{mt} is an error term orthogonal to the treatment assignment.

Some outcomes in the census data have pre-existing trends between 1990 and 1999, stemming from differences in demographic composition and migration rates that have existed since at least 1982. We account for these trends, which are exogenous to the reform, by controlling for the internal migration rates from 1990 to 1999 and the exits and entries into the labour force based on the age distribution. We allow for a different impact of the controls on the outcome in each census year. Appendix B.3 provides further details.

We modify model (2) to estimate treatment effects for the two periods of the labour market integration. Similar to Beerli et al. (2021) we estimate a treatment effect for the transition period ($1999-2003$) and for the free mobility period ($2004-2007$):

$$\begin{aligned} y^g_{mt} =& \alpha^g_m + \alpha^g_t + \beta^g_{\text{transition}} treat_m \times 1[1999 \leq t < 2004] \\ &+ \beta^g_{\text{free}} treat_m \times 1[2004 \leq t \leq 2007] + \gamma^g X^g_{mt} + v^g_{mt}. \end{aligned} \tag{3}$$

where the coefficients of interest are now $\beta^g_{\text{transition}}$ and β^g_{free}. When using the census data, this model will only estimate a coefficient for the free mobility period.

All regressions on employment and wages at the labour market level are weighted by cell-level employment in 1998. For outcomes based on Census data, we weight by the cell-level resident population in 1999.

Worker-level panel data Modifying the regression models from the aggregate data to the worker panel, we estimate annual treatment effects as follows:

$$\begin{aligned} y_{it} =& \alpha_i + \alpha^{G(i)}_t + \phi_{j(i)} + \sum_g \sum_{\tau \neq 1998} \beta^g_\tau treat_i \times 1[G(i) = g] \times 1[t = \tau] + \\ &+ \sum_g \gamma^g X^{G(i)}_{m(i)t} \times 1[G(i) = g] + v_{it}. \end{aligned} \tag{4}$$

$G(i)$ denotes the skill group g of worker i, defined by the skill in the last observed spell before 1999. Their labour market $m(i)$ is assigned in the same manner. That is, we estimate effects on workers initially employed in the treatment labour markets

and do not include labour market entrants in the estimation with the panel data. Treatment effects are specific to the worker group g. Unlike equations (2) and (3), the parameters for different worker types are estimated in a single equation, and both the year fixed effects and the linear time trends in $X_{m(i)t}^{G(i)}$ are specific to the worker group $\times$ matched labour market pair. The reason for the joint estimation is that we include an establishment fixed effect $\phi_{j(i)}$ in some specifications.

The fourth model is adopted from (3) for the worker-level data:

$$\begin{aligned} y_{it} =& \alpha_i + \alpha_t^{G(i)} + \phi_{j(i)} \\ &+ \sum_g \beta^g_{\text{transition}} treat_m \times 1[1999 \leq t < 2004] \times 1[G(i) = g] \\ &+ \sum_g \beta^g_{\text{free}} treat_m \times 1[2004 \leq t \leq 2007] \times 1[G(i) = g] \\ &+ \sum_g \gamma^g X_{m(i)t}^{G(i)} \times 1[G(i) = g] + v_{it}. \end{aligned} \tag{5}$$

Inference We cluster the standard errors at the labour market level. In both France and Switzerland, these are defined as commuting zones by the respective statistical agencies..[11] On the French side, there are 44 clusters in the main specification. As a robustness check, we also report standard errors clustered at the next higher sub-national unit—the department. This approach results in 27 clusters, and we apply the Imbens and Kolesar (2016) correction for small numbers of clusters. In practice, the standard errors from the two approaches are very similar.

3.3.2 Matching to find a suitable control group

Equations (2) to (5) compare the evolution of outcomes with those in affected areas with non-affected ones. Because the labour market integration was not randomly assigned across labour markets, differences between the treatment and control groups may bias the estimated effect. To find control units[12] that are as similar as possible to the treated labour markets we use Mahalanobis matching. We match on a limited

[11] *Zone emploi* in France and *ms-region* in Switzerland.

[12] To minimize the risk that spillovers across areas contaminate the control group, we consider as potential controls only labour markets that are at least 150 kilometres away from the Swiss border.

set of covariates that could influence potential outcomes after 1998.[13]

We match on the index of wage growth for the three skill groups between 1995 and 1998 to account for different labour market dynamics before the labour market integration. We also match on the following covariates in the cross-section in 1998 to account for other unobserved heterogeneity: the employment shares of the four sectors, the employment shares of the three skill groups, and the share of residents who live and work in the same labour market as opposed to other French labour markets. We refer to the latter as the own commuting share. For simplicity, we refer to the full set of variables as covariates, even though some of them are pre-existing trends in outcomes.

The resulting status of local labour markets is shown in Figure 1b. From darkest to lightest grey, the categories are the treated, the matched control, and the excluded inland labour markets.

Table 1 presents summary statistics for the sample before and after matching. Panel A compares the treated units to all potential control units for each covariate,[14] while Panel B compares them to the matched control units. The first four columns show the means and standard deviations of the variables by treatment status. The last four columns show different overlap measures: The normalized differences and the log ratio of standard deviations indicate that the matching strategy yields control units that are more similar to the treated units than the complete set of potential controls. Column 7 in panel A shows that a substantial fraction of potential control units lies outside the tails of the distribution of the treated units. Panel B shows that the matching brings the tails closer together.

[13] Mahalanobis matching is relatively robust in various settings, in particular in small samples. However, the set of included covariates should not be too large (Zhao, 2004; Stuart, 2010). We have also experimented with adding more variables but the overall match quality worsens.

[14] We have not matched on the average log wage in 1998 but include it in the table as additional information.

Table 1. Balance Before and After Matching

	Controls		Treated		Overlap measures			
	Mean (1)	(S.D.) (2)	Mean (3)	(S.D.) (4)	Nor Dif (5)	LRSD (6)	$\pi(c)$ (7)	$\pi(t)$ (8)
Panel A. Controls: All								
Log employment	9.84	(1.05)	10.04	(0.79)	0.22	−0.28	0.13	0.00
Share high-skill	0.14	(0.08)	0.10	(0.01)	−0.83	−1.84	0.30	0.00
Share mid-skill	0.61	(0.04)	0.62	(0.04)	0.28	−0.10	0.07	0.00
Share low-skill	0.24	(0.06)	0.28	(0.04)	0.73	−0.34	0.12	0.00
Share tradable	0.40	(0.08)	0.50	(0.11)	0.94	0.31	0.05	0.18
Share non-tradable	0.13	(0.03)	0.12	(0.03)	−0.43	0.03	0.10	0.14
Share construction	0.11	(0.02)	0.10	(0.02)	−0.05	0.19	0.06	0.14
Share other	0.36	(0.06)	0.28	(0.07)	−1.22	0.11	0.08	0.14
Wage growth high-skill	0.07	(0.02)	0.06	(0.01)	−0.51	−0.51	0.12	0.00
Wage growth mid-skill	0.07	(0.02)	0.07	(0.01)	−0.28	−0.59	0.17	0.00
Wage growth low-skill	0.07	(0.02)	0.06	(0.01)	−0.45	−0.75	0.23	0.00
Own commuting share	0.74	(0.15)	0.85	(0.06)	0.90	−1.00	0.15	0.05
Mean log wage	2.36	(0.14)	2.30	(0.04)	−0.58	−1.21	0.14	0.00
Multivariate distance					1.18			
N	238.00		22.00					
Panel B. Controls: Matched								
Log employment	9.87	(0.75)	10.04	(0.79)	0.18	0.05	0.05	0.05
Share high-skill	0.09	(0.02)	0.10	(0.01)	0.15	−0.38	0.18	0.09
Share mid-skill	0.62	(0.03)	0.62	(0.04)	0.01	0.36	0.00	0.14
Share low-skill	0.29	(0.04)	0.28	(0.04)	−0.19	0.03	0.00	0.14
Share tradable	0.47	(0.09)	0.50	(0.11)	0.32	0.25	0.00	0.14
Share non-tradable	0.12	(0.02)	0.12	(0.03)	−0.09	0.33	0.05	0.14
Share construction	0.11	(0.02)	0.10	(0.02)	−0.21	0.19	0.09	0.00
Share other	0.31	(0.06)	0.28	(0.07)	−0.37	0.14	0.05	0.09
Wage growth high-skill	0.06	(0.02)	0.06	(0.01)	−0.05	−0.03	0.05	0.05
Wage growth mid-skill	0.06	(0.01)	0.07	(0.01)	0.34	0.39	0.00	0.18
Wage growth low-skill	0.06	(0.01)	0.06	(0.01)	0.10	0.27	0.00	0.18
Own commuting share	0.86	(0.06)	0.85	(0.06)	−0.08	−0.07	0.09	0.00
Mean log wage	2.26	(0.06)	2.30	(0.04)	0.34	−0.34	0.05	0.14
Multivariate distance					0.22			
N	22.00		22.00					

Notes: The table shows balancing statistics between treatment and control for two samples. In Panel A controls are all potential controls. In Panel B controls are the matched controls. The overlap measures are: Nor Dif = normalized differences, LRSD = log ratios of standard deviations, and $\pi()$ for control and treated units. Normalized differences use the population standard deviation in the full sample in the denominator. $\pi(t)$ ($\pi(c)$) measures the probability mass of units of the treatment (control) group that lie outside the interval between the 0.025th and 0.975th quantile of the control (treatment) group. The multivariate distance is the variance-weighted difference between the vector of means for the treated and for the control group. It is calculated only for the variables used in matching, i.e. without the mean log wage. See Section 3.3.2 for details.

The second-to-last row in each panel measures the multivariate distance between the covariates of the treated and control units. We use the variance-weighted difference between the covariate means of the treated and control units. The matching reduces the distance from 1.18 to 0.22, suggesting that the matching strategy reaches a reasonable balance in the covariates between the treatment and control labour markets.

3.3.3 Identifying assumptions

To assign a causal interpretation to the estimates in equations (2) through (5), we make three assumptions. First, we assume that the matched control areas are unaffected by the labour market integration. This assumption is violated if input or output markets transmit the local shock throughout the rest of the French economy.

Second, we assume that only the agreement on cross-border commuting had a differential impact on French border regions compared to other regions in France. This assumption is plausible because the other agreements targeted very specific sectors, making it unlikely that they impacted the aggregate labour markets in the border region.[15] Additionally, transporting people is costlier than transporting goods (Monte et al., 2018), which suggests that the effects of labour market integration decay more rapidly across space than those of the other agreements. Furthermore, this assumption is not contradicted by available evidence, as far as it can be tested: We find no evidence of increased exports after the reform. Since the trade reform affects a clearly defined set of industries, we also drop these industries and find similar results. Similarly, Beerli et al. (2021, Table A.6, panel E) find no evidence that the trade reform is driving their results.

Third, matching on pre-existing trends in wages prevents us from interpreting pre-event treatment effects as placebo tests; instead, we need to assume that the reform was exogenous to these matched trends. However, in the current context, this appears plausible. Pre-trends could indicate policy endogeneity or anticipation. Policy endogeneity is improbable because the reform was not decided at the local level. Anticipation before 1998 is unlikely because the policy details were not

[15] Tariffs between Switzerland and the EU had been abolished in 1972.

publicly known, and it was uncertain whether the parties would reach an agreement.[16] Additionally, due to data limitations preventing a backdating exercise,[17] we present results from a matching strategy that solely utilizes cross-sectional variables We find similar effects to those in the main approach, along with parallel trends preceding the reform.

4 Results

We first show that French workers could boost their wages by finding a Swiss job and study the impact of the policy reform on the commuting behaviour of French workers. Then, we present the impact on the local labour markets in France, distinguishing between the easing of cross-border commuting in 1999 and the full liberalization in the border region in 2004.

4.1 The integration increases workers' access to highly paid jobs

While Swiss wages were, on average, twice as high as French wages along the border, this may not accurately reflect French residents' wage gains from getting a Swiss job. To better understand those gains, we use the French Labour Force Survey and compare the wages of workers when they are employed in France and Switzerland.

Column 1 of Table 2 shows that workers in Swiss jobs earn, on average, 65 per cent (50 log points) more than workers in French jobs. In column 2, we introduce worker fixed effects, thereby comparing the same worker when employed in Switzerland and France. The wage gap reduces to 20 log points. This reduction in the wage gap between Switzerland and France indicates significant selection of workers into Swiss jobs based on the level of wages in France, as well as a substantial wage increase, conditional upon accepting a Swiss job—comparable to the education premium between workers with mandatory and secondary education.

[16] See also Beerli et al. (2021, pp. 980).

[17] Specifically, one could backdate the event to a pre-event year z, repeat the matching on trends before z and consider the period between z and 1998 as a placebo treatment period. Unfortunately, the earliest available data year is 1995.

However, if cross-border workers are selected based on potential gains, this estimate represents an upper bound for the possible wage gains of the average French worker employed in French firms[18]

[18]Table A2 shows the cross-border wage gap when including migrants—the results are virtually identical. Table A3 shows the average wages of commuters when employed in France are 28 log points higher than wages of non-commuters employed in France. This confirms the strong selection of commuters. The baseline wage gap is, however, substantially smaller for workers with tertiary education.

Table 2. Wage gap between French and Swiss jobs

	Log(hourly wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
Swiss job	0.495	0.195				
	(0.014)	(0.047)				
Swiss job - Non-tertiary educ.			0.510	0.192		
			(0.018)	(0.055)		
Swiss job - Tertiary educ.			0.433	0.213		
			(0.014)	(0.119)		
Swiss job - Low skill occ.					0.526	0.116
					(0.016)	(0.059)
Swiss job - Mid skill occ.					0.494	0.204
					(0.014)	(0.047)
Swiss job - High skill occ.					0.292	0.281
					(0.015)	(0.039)
Labour market FE	Y	N	Y	N	Y	N
Worker FE	N	Y	N	Y	N	Y
Tenure and industry controls	N	Y	N	Y	N	Y
Observations	46620	46620	46620	46620	46620	46620
Number of years	10	10	10	10	10	10
R^2	0.43	0.93	0.43	0.93	0.60	0.93

Notes: The sample are residents in the treatment and control areas (see section 3.3.2) employed in the private sector and not moving across municipalities in two consecutive years. *Swiss job* indicates workers employed in Switzerland; non-tertiary education pools workers with less than tertiary education. *Labour market FE* are fixed effects for the labour market of residence. *Worker FE* are person fixed effects. *Tenure and industry controls* are a cubic in the number of months since the start of the employment spell and fixed effects for 30 broad industry groups. All regressions include fixed effects for year and a gender-specific cubic in age. Regressions are weighted using the survey weights. Standard errors clustered at the labour market level are in parentheses. *Data: Labour Force Survey 1993–2002.*

In columns 3 and 4, we estimate the wage gains separately for workers with and without a tertiary education.[19] We find coefficients with similar magnitudes for both groups, whether or not person fixed effects are included. The estimates for

[19]We pool workers with a mandatory and a secondary education for precision in the specifications with person fixed effects.

highly educated workers are less precise.[20]

The wage gains by occupation-based skill group in columns 5 and 6 show larger differences. First, in column 5, the gains are highest for the low-skill workers (0.53) and smallest for high-skill workers (0.29). But this reverses when adding worker fixed effects: the wage gap for low-skill workers drops to 0.12 and is not significant at the 5 per cent confidence level; the wage gap for high-skill workers remains roughly constant (0.28).

Therefore, workers in high-skill occupations had the highest wage gains from taking a Swiss job. Comparing specifications with and without worker fixed effects, the point estimates suggest little selection for this group. In contrast, low-skill workers had small wage gains, if any, but there was a stronger positive selection based on their baseline wages in France. Thus, for our empirical strategy to accurately estimate the wage impact on workers employed in France, it must be robust to changes in the composition of the workforce.

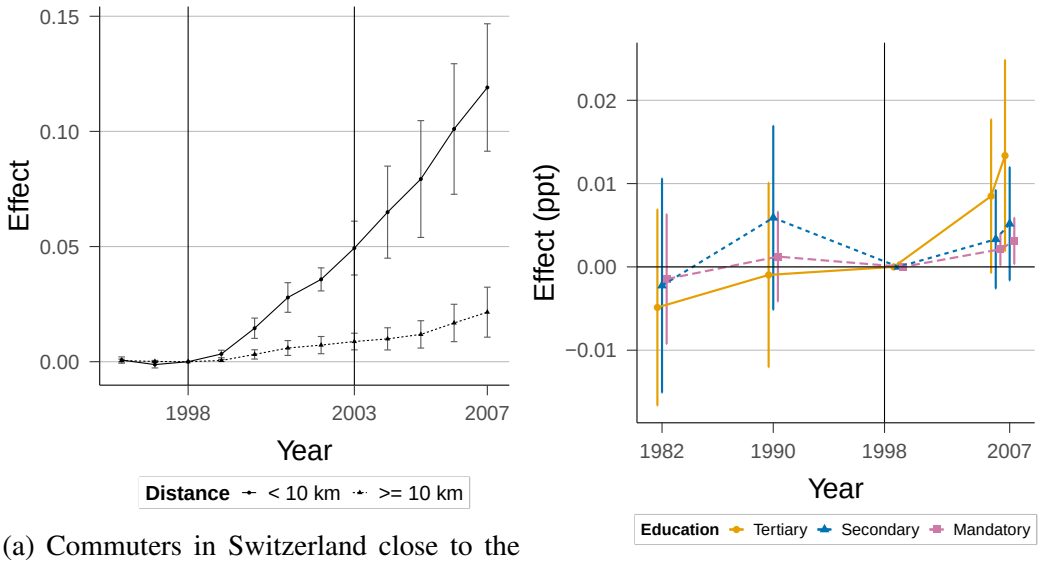
4.2 More people commute from France to Switzerland

We first assess the impact on commuting from France to Switzerland using data from both France and Switzerland.

The results from estimating equation (1) are in Figure 2a. The number of commuters who work in Switzerland close to the French border barely changes from 1996 to 1999, but then starts increasing substantially. The increase is highest closest to the border: In municipalities up to 10km from the next border crossing, the number of commuters relative to employment in 1998 increases by more than 10 percentage points. In municipalities further from the border, the impact is smaller; it is around 2 percentage points.[21]

[20] This imprecision could result from a small sample size, or it may suggest that the gains from obtaining a Swiss job are highly heterogeneous for these workers.

[21] In online appendix E.1, we show some evidence on yearly commuting from French data until 2002.



(a) Commuters in Switzerland close to the French border

(b) Residents in France with a Swiss job

Figure 2
Impact on cross-border commuting

Notes: Figure 2a shows estimated impacts from equation (1). The coefficients estimate the impact of the labour market integration on the presence of commuters in Switzerland along the French border relative to employment in the municipality in 1998. *Distance* indicates the distance to the next border crossing in kilometres. The error bars represent 95% confidence intervals, calculated from standard errors clustered at the commuting zone level. Figure 2b shows the point estimates from equation (2). The treatment indicator is whether the labour market is in the treatment group or not. Regression models include controls for the entry and exit of the working-age population and pre-existing migration patterns (see section 3.3.1 for details). *Data: BFS; Population census 1982–2007.*

We now turn to the evidence from the French census: Figure 2b shows the effect on the local labour market from estimating equation (2). The longer time series allows us to highlight that cross-border commuting between the countries has a long history. With the French data, we focus on the commuting propensity instead of the total number of commuters in order to provide evidence of changes in commuting patterns at the individual level.

From 1982 to 1990, the fraction of cross-border commuters shows a small and insignificant increase for all workers, and most strongly for workers with a secondary education. This trend likely stems from fluctuations in Swiss labour demand, with Switzerland experiencing a recession in 1982 and reaching the peak of an economic boom by 1990. In this time period, the number of valid commuting permits grew from 100,000 to 175,000 (Kreis, 2007). The substantial pre-existing

stock of commuters is also reflected in the 1999 data reported in Table 3: In French markets historically eligible for commuting to Switzerland, 8 to 9 per cent of workers with secondary and tertiary education, and 4 per cent of workers with mandatory education, were employed in Switzerland. Moreover, the time trends documented in Figure 2b indicate that from 1990 to 1999, these percentages remained stable for workers with mandatory and tertiary education and showed a minor decrease for workers with secondary education.

Despite the long history, the labour market integration in 1999 led to substantially more commuting, but in line with findings in Beerli et al. (2021)—mainly among workers with tertiary education. For these workers, Figure 2b shows an increase in the commuting propensity of a bit more than 1 percentage point across all treated labour markets.

Table 3 shows that, in line with the policy, this increase in commuting propensity stems entirely from the eligible labour markets (see appendix E.4 for details on the regression specification). The results from the baseline specification appear in columns 1 to 4, while columns 5 to 8 present the results from our preferred specification, which includes controls for exogenous changes in the size of the working-age population. We focus on this latter set of results.

Across all workers, the commuting propensity increases by 1.5 percentage points (column 5); among workers with tertiary education, the increase is 2.8 percentage points (column 6). This increase among workers with tertiary education corresponds to a 30 percent rise relative to 1999. Among workers with less than a tertiary education, columns 7 and 8 show no increase in the commuting propensity. In appendix figure A3 we further show evidence indicating that most of the commuters had resided in the French border region before securing employment across the border.

Table 3. Impact on propensity to commute from France to Switzerland

	Baseline				Controls			
	All	Tertiary	Secondary	Mandatory	All	Tertiary	Secondary	Mandatory
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$spillover \times post$	0.001	0.002	0.001	0.000	-0.005	-0.004	-0.001	0.002
	(0.000)	(0.001)	(0.000)	(0.000)	(0.003)	(0.004)	(0.004)	(0.002)
$eligible \times post$	0.023	0.036	0.011	0.002	0.015	0.028	0.007	0.003
	(0.006)	(0.008)	(0.004)	(0.003)	(0.005)	(0.007)	(0.006)	(0.002)
Observations	220	220	220	220	220	220	220	220
R^2	0.45	0.52	0.22	0.37	0.67	0.72	0.43	0.43
Outcome mean in 1999 (eligible)	0.07	0.087	0.089	0.041	0.07	0.087	0.089	0.041

Notes: Results from estimating equation (3). The outcome is the fraction of residents with a job in Switzerland. Columns 5 to 8 additionally include controls for entry and exit of the working-age population and pre-existing migration rates (see section 3.3.1 for details). The regressions are weighted by the cell-level resident population size in 1999. Standard errors clustered at the labour market level are in parentheses. The reported outcome mean is from the treated eligible markets. The outcome mean in the treated spillover markets is 0. *Data: Population census 1982–2007.*

Appendix Figure A4 also shows that the impact on commuting is similar for men and women within education groups. This contrasts with the results Bütikofer et al. (2022) who find, in response to the Öresund bridge opening, a larger rise in commuting to Denmark by Swedish men than women. This difference can be explained by the fact that women are more sensitive to commuting time than men (Le Barbanchon et al., 2020), and by the commuting distances involved in each case: distances are small between France and Switzerland—see Figure A2b—but substantial between Malmö and Copenhagen. Thus, women reacted less to the new employment options than men in the Danish-Swedish case but not in the French-Swiss case.

As mainly highly educated workers from the French border regions found more jobs in Switzerland after the reform, it is important to study not only the overall but also the skill-specific impact on wages and employment in French labour markets.[22]

4.3 French employment and the wage growth index

We now present the results on employment and wages in France. The figures include error bars representing 95 per cent confidence intervals, calculated using standard errors that are robust to clustering at the labour market level. Standard errors, clustered at the labour market level, are shown in parentheses in the tables. In some tables, we also show standard errors clustered at the department level in brackets. Since these standard errors are very similar, the discussion will refer only to those clustered at the labour market level.

To ensure our results are not driven by selection into commuting on the level of baseline wages, our main analysis focuses on within-firm within-worker wage growth. All results are relative to the matched inland control regions.

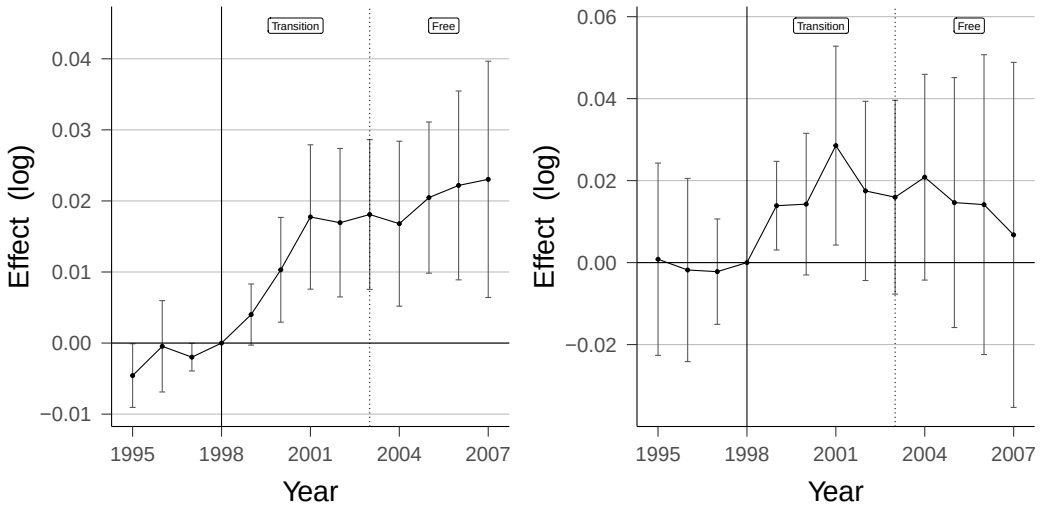
4.3.1 Overall

Figure 3 presents annual estimates of the effect of the labour market integration on wages and employment in France. We look at the impact on workers employed in

[22]Because education is not available in the DADS data, we report differential impacts by skill category of the job.

the French border region, not in Switzerland. The results from equation (2) are in panel a for wages and in panel b for employment. The results from equation (3) for wages and employment of all skill groups are in Table 4.

After the labour market integration, wages grow faster in the French border region and, despite the outflow of commuters, there is no evidence of lower employment. Compared to the years before 1999, wages are 1.5 (standard error: 0.4) per cent higher during the transition phase and 2.2 per cent higher (standard error: 0.6) during the free mobility phase (Table 4, column 1). Figure 3a indicates that wages rise most strongly in the first three years of the transition phase, whereas there is no differential change compared to the control group thereafter. While the point estimates on the effect for total employment are positive, they are imprecisely estimated (Table 4, panel A, column 5). In the transition phase, employment is 1.9 per cent higher (standard error: 1) than before 1999. The point estimate remains similar in the free mobility phase, but the standard error increases. The yearly estimates in figure 3b are consistent with this—after a significant increase of 1.7 per cent between 1998 and 1999, the point estimates tend to shrink and become less precise from 2001 to 2007. Nevertheless, the results rule out a substantial fall in overall employment alongside a rise in wages. Before exploring the underlying mechanisms, we show the results for different skill groups.



(a) Index of wage growth (b) Employment

Figure 3
Wage and employment effects in France

Notes: Figures 3a and 3b show the annual point estimates from equation (2). The error bars are confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

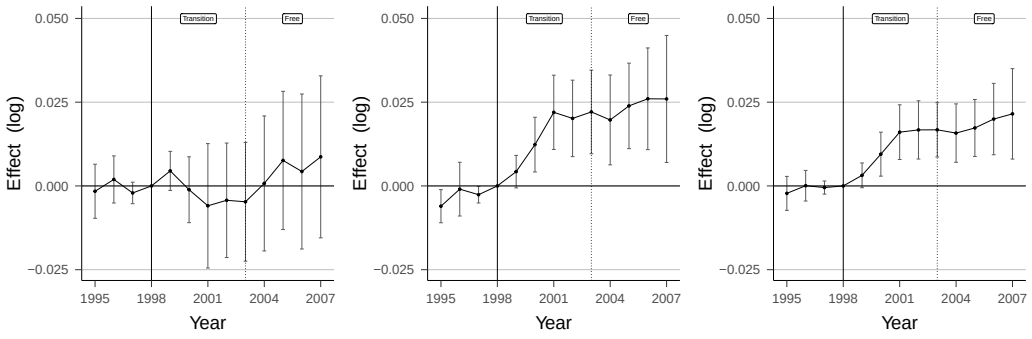
Table 4. Impact on within-worker, within-firm wages and employment

	Within-firm, within-worker wage growth				Employment			
	All professions	High skill	Mid skill	Low skill	All professions	High skill	Mid skill	Low skill
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$treat \times transition$	0.015	-0.002	0.018	0.013	0.019	0.019	0.012	0.038
	(0.004)	(0.006)	(0.004)	(0.003)	(0.010)	(0.024)	(0.013)	(0.013)
	[0.004]	[0.005]	[0.004]	[0.003]	[0.009]	[0.023]	[0.011]	[0.013]
$treat \times free$	0.022	0.006	0.026	0.019	0.015	0.021	-0.006	0.058
	(0.006)	(0.010)	(0.007)	(0.005)	(0.019)	(0.039)	(0.024)	(0.022)
	[0.007]	[0.009]	[0.008]	[0.006]	[0.019]	[0.039]	[0.023]	[0.021]
Observations	572	572	572	572	572	572	572	572
R^2	0.48	0.41	0.47	0.47	0.47	0.51	0.49	0.59

Notes: Results from estimating equation (3). Employment is in logs, the wage growth index in levels. Wage growth is calculated from changes in log residual wage of workers that remain employed at their firm in two consecutive years (see text for details). The regressions are weighted by cell-level employment in 1998. Standard errors clustered at the labour market level are in parentheses; standard errors clustered at the department level are in brackets. *Data: DADS postes 1995–2007.*

4.3.2 Across skill groups

The skill-specific results are in Figures 4 and 5 for the annual estimates, and in Table 4 for the effects in the transition and free mobility periods. Columns 2 to 4 in the table show that the wage increases are concentrated among low- and mid-skill workers. In the transition phase, their wages rise by 1.3 and 1.8 per cent, respectively, and in the free mobility phase by another 0.6 and 0.8 per cent, respectively. For high-skill workers, point estimates indicate no change in wages. This occurs despite the commuting propensity increasing most strongly among high-skill workers.



(a) High-skill professions (b) Mid-skill professions (c) Low-skill professions

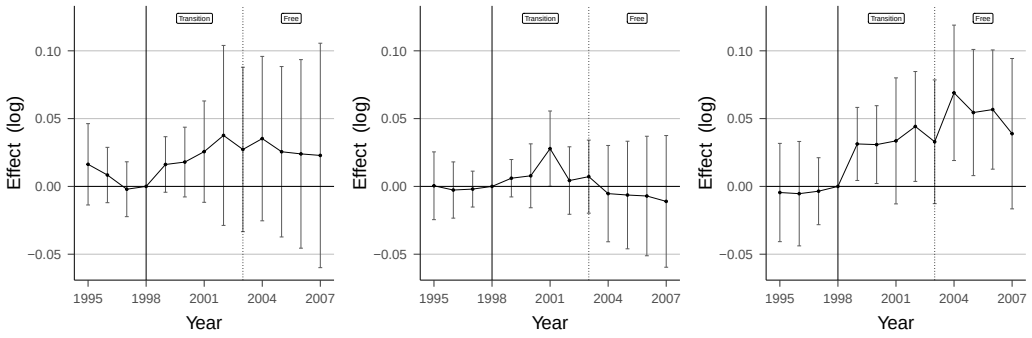
Figure 4
Wage effects by skill

Notes: The figures show the skill-specific effects on the wage growth index from equation (2). The error bars are 95% confidence intervals based on standard errors clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

Columns 6 to 8 of table 4 show the employment effects for each skill group. Low-skill employment grows by 3.8 per cent in the transition period and by an additional 2 per cent in the free mobility period, to an overall increase of 5.8 per cent. The time pattern in figure 5c suggests an immediate increase in employment from 1998 to 1999 and then another jump from the transition to the free mobility phase, although the point estimate declines again thereafter. The point estimate for high-skill employment is positive, but the standard error is large.

Thus, the results indicate that the total employment of high-skill workers and their wages have been stable despite a substantial rise in the commuting propensity

to Switzerland. For low- and mid-skill workers, who do not become more likely to commute to Switzerland, the results are different. Wages rise faster than in the control region. In addition, the total employment of low-skill workers is increasing.



(a) High-skill professions (b) Mid-skill professions (c) Low-skill professions

Figure 5
Employment effects, by skill groups

Notes: The figures show the skill-specific effects on the employment from equation (2). The error bars are confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

Wage growth index and employment by skill and gender Appendix Figure A14 further divides the skill-specific effects by gender. For low-skill workers, wages increase more rapidly for men than for women; however, the coefficients in the free mobility period are similar for both genders. For mid-skill workers, wages grow more for men than women. For high-skill workers, there is no gender difference in the effects. The employment effects for low-skill workers are predominantly driven by men, especially during the free mobility period.

Effects across space Appendix E.4 discusses estimates for the eligible and spillover labour markets. The wage effects are stronger in magnitude in the eligible markets but also rise in spillover markets. The employment effects are more heterogeneous. During the transition phase, low-skill employment increases only in the eligible markets. During the free mobility phase, low-skill employment rises in both types of markets, while overall employment declines insignificantly in the eligible markets.

4.3.3 Robustness checks

Appendix E.2 assesses the sensitivity of the results by using alternative matching approaches, with a placebo test, and by accounting for exposure to national policies that could impact the treated and the control regions differently.

Alternative matching approaches The first alternative matching approach does not match on pre-existing wage trends but only on average wages in 1998. The second compares the treated labour markets to a weighted average of all potential control units, where the weights are such that covariates are perfectly balanced before the labour market reform (Hainmueller, 2012). The effects are comparable across the different approaches. When not matching on pre-trends, the wage effects are smaller, but the qualitative pattern across skill groups remains. Independently of the matching approach, low-skill employment increases. High-skill employment effects are similar to the main results in entropy balancing, but the annual effects indicate a decline in employment towards the end of the sample period when not matching on pre-trends.

Compare directly to dropped inland markets Instead of matching, we compare the treated labour markets to labour markets directly bordering them. We find qualitatively similar results, but the wage effects are more muted, possibly driven by spillover effects, as documented above.

Placebo check A placebo test that replaces the treated labour markets with French labour markets along the border to Spain, and reruns the matching algorithm, shows no evidence of changes in employment or wages around the year of the reform. This underlines that our results are not driven by a shock to French border regions as a whole but by the shock to the French-Swiss border specifically.

Alternative controls and measurement The results are also robust to controlling for the labour markets' exposure to minimum wage changes and to the workweek reform that started in 1998 (Askenazy, 2013). Further, we show that excluding pre-trends affects the precision of the estimates but not their magnitude, the effect on

hours is similar to the effect on employment, and the impact on the wage index is not driven by skill-upgrading.

4.4 Worker-level wages

Table 5 shows the wage effects at the worker level from estimating equation (5); appendix Figure A16 shows the yearly effect for different skill groups. Column 1 indicates that, on average, the wages of employees in France grew by 1 per cent in the transition period and then remained stable in the free mobility period. To relate to the main results on the within-firm wage growth index, Column 2 presents the outcomes when a firm fixed-effect is included in the regression: the estimates decrease by approximately 20 per cent yet remain significant, suggesting that most wage gains are not driven by workers finding employment at higher-paying firms. A further difference to the main results is that in the panel, we estimate the wage effects for workers already present in the treatment region by 1998, showing that the wage effects are not attributable to entrants in the treated labour markets.

Column 3 shows that the skill-specific effects on worker-level wages are qualitatively similar to those observed in the wage growth index, albeit smaller. High-skill workers' wages do not change in the transition phase and decline insignificantly during the free mobility phase. The effects on the wages of low- and mid-skill workers lie between 1 and 1.5 per cent during the transition and the free mobility phase. The inclusion of firm fixed effects, reported in column 4, lowers the estimated effect for mid-skill workers but less so for the other skill groups.

Table 5. Within-worker wage impact

	Log(hourly wage)			
	Pooled		By skill	
	(1)	(2)	(3)	(4)
$treat \times transition$	0.010	0.008		
	(0.003)	(0.003)		
$treat \times transition \times high$			-0.002	-0.002
			(0.007)	(0.007)
$treat \times transition \times mid$			0.012	0.009
			(0.003)	(0.003)
$treat \times transition \times low$			0.010	0.009
			(0.004)	(0.003)
$treat \times free$	0.011	0.007		
	(0.004)	(0.003)		
$treat \times free \times high$			-0.012	-0.008
			(0.010)	(0.009)
$treat \times free \times mid$			0.014	0.008
			(0.004)	(0.004)
$treat \times free \times low$			0.013	0.011
			(0.003)	(0.003)
Firm fixed effects	N	Y	N	Y
Observations	519329	519329	519329	519329
Number of workers	65106	65106	65106	65106
Number of years	13	13	13	13
R^2	0.32	0.29	0.32	0.29

Notes: Results from estimating versions of equation (5). Workers are sampled and treatment is assigned based on the labour market of the last spell before 1999. Standard errors clustered at the labour market level are in parentheses. R^2 is calculated on the residualized data, after netting out the fixed effects. *Data: DADS Panel 1995–2007.*

4.5 Adjustment margins

The previous results indicate that, although wages rise, total employment does not decline in the treated labour markets during most of the sampling period. Employment in low-skill jobs even rises. In contrast, wages for highly educated workers in France do not rise, even though it is this group whose commuting propensity to Switzerland increases the most.

To understand why, we show the impact of labour market integration on labour supply and demand. On the supply side, we focus on the size of the local population and the labour force participation rate, while on the demand side, we consider firms' output, productivity and material inputs. On the one hand, the supply-side response is crucial for understanding the incidence of the benefits of labour market integration. On the other hand, it is important to consider the demand side response for its role in the general equilibrium effects of the reform that go beyond the direct effects of better outside options.

To complement the empirical results and their discussion, we present in Appendix D an equilibrium search model of the labour market with endogenous labour force participation and population. The model provides a specific thought framework for the results but is not necessary to follow the discussion in the main text.

4.5.1 Labour supply

Table 6 shows the estimated effects on the log of population, labour force participation rate, employment rate, and unemployment. Column 1 indicates that the workforce increases by 4.3 per cent, driven by a 3.2 per cent increase in population (column 2) and a 1 per cent increase in the participation rate (column 3). For workers with tertiary education, the larger labour force is solely due to a higher population, while the labour force participation rate remains constant. For workers with mandatory and secondary education, the larger workforce results from both a higher population and increased participation.

These results are consistent with the results based on DADS data. First, with the Census data, we find a 3.7 per cent increase in the population of workers with tertiary education, partially offset by a 1.3 per cent reduction in the employment

rate in France, implying that total employment of high-skill workers in France increases by approximately 2.4 per cent. This closely aligns with the imprecisely estimated 2 per cent increase in employment of high-skill workers from the DADS data. Second, with the Census data, we find that employment in France rose by 4.8 per cent for workers with mandatory education and did not change for workers with a secondary education. Again, these results are consistent with the stable employment in mid-skill jobs and a rise in low-skill employment of 5.8 per cent in the DADS data.

We have documented so far that the active labour force substantially grows following labour market integration, driven by an increased population and a higher labour force participation rate. This implies that although the total number of commuters to Switzerland substantially increases—as shown in Section 4.2—the employment rate in France declines only slightly for workers with tertiary education and even increases for those with mandatory education. These results demonstrate that, although the labour market integration leads to increased commuting to Switzerland, the substantial increase in labour supply is enough to absorb the additional labour demand from Switzerland.

To complement that interpretation, we also show the effects on the unemployment rate. As the active labour force grows by more than total employment, we find an increase in the unemployment rate. For highly educated workers, the increase in the unemployment rate is about 6 per cent and is imprecisely estimated. For workers with secondary or mandatory education, the increase was larger at 11 per cent.

Table 6. Impact on labour supply, unemployment and employment among residents

	Labour force			Employment rate			Unemployment	
	Total	Pop.	Part. rate	Total	France	CH	Rate	Counts
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: All Education groups								
treat × *post*	0.043	0.032	0.011	-0.005	-0.008	0.006	0.112	0.155
	(0.011)	(0.009)	(0.005)	(0.006)	(0.007)	(0.003)	(0.030)	(0.029)
Observations	220	220	220	220	220	220	220	220
R^2	0.86	0.91	0.62	0.61	0.54	0.62	0.58	0.64
Panel B: Tertiary education								
treat × *post*	0.037	0.037	0.000	-0.001	-0.013	0.012	0.059	0.096
	(0.023)	(0.023)	(0.004)	(0.004)	(0.007)	(0.005)	(0.054)	(0.047)
Observations	220	220	220	220	220	220	220	220
R^2	0.69	0.72	0.71	0.71	0.73	0.68	0.59	0.55
Panel C: Secondary education								
treat × *post*	0.020	0.009	0.011	-0.002	0.000	0.003	0.115	0.135
	(0.015)	(0.015)	(0.004)	(0.005)	(0.009)	(0.004)	(0.044)	(0.047)
Observations	220	220	220	220	220	220	220	220
R^2	0.70	0.73	0.58	0.59	0.55	0.43	0.58	0.56
Panel D: Mandatory education								
treat × *post*	0.065	0.028	0.037	0.019	0.020	0.003	0.109	0.174
	(0.015)	(0.011)	(0.008)	(0.011)	(0.011)	(0.002)	(0.035)	(0.042)
Observations	220	220	220	220	220	220	220	220
R^2	0.70	0.82	0.51	0.51	0.41	0.42	0.50	0.56

Notes: Results from estimating equation (3). Models include controls for entry and exit of the working age population and pre-existing migration (see section 3.3.1 for details). All outcomes are in logs. Standard errors clustered at the labour market level are in parentheses. The regressions are weighted by the cell-level resident population size in 1999. The labour force are all employed and unemployed workers from 16 to 64; the population are all residents from 16 to 64; the participation rate is the number of employed and unemployed workers relative to population; the employment rate is the number of employed workers relative to population, and the columns *France* and *CH* indicate the respective country of work; the unemployment rate is the number of unemployed workers relative to the participating labour force. *Data: Population census 1982–2007.*

Figure A15 in the appendix presents the estimated treatment effects by gender and by education. The increase in the population is similar for men and women, but the increase in participation is stronger for women. Appendix E.5 shows that women with a mandatory education increase participation in the first four years after the reform.

To summarize, labour market integration directly increases the demand for French workers from Switzerland. Yet, overall employment in France does not decline. While this is consistent with the strong labour supply response to the reform—driven by an increase in the population and the labour force participation rate—it raises the question of how labour demand by French firms adjusts to the reform. We show the effects on firms in the next section.

4.5.2 Labour demand

In this section, we examine how French firms adjust to the labour market integration in terms of sales, material costs, and overall labour costs.

The labour market integration affects firms through various channels, and their importance varies across economic sectors. First, despite an increasing total number of commuters to Switzerland, the labour market integration increases local labour supply instead of reducing it. Second, the increase in local population likely raises demand for goods.

Firms in the non-tradable sector sell mostly locally; thus, we expect an increase in local demand for goods to impact the non-tradable and construction sectors more than the tradable sector. In contrast, firms in the tradable sector, which sell both nationally and internationally, are primarily affected by the increased labour supply and higher wages in the region.

We therefore report the effects separately by broad economic sector. Furthermore, we present the results separately for the subsets of the tradable sector that are affected by the concurrent trade reform.

Table 7. Impact on Sales, Labour Cost, and Material Costs

					Tradable		
	All sectors (1)	Non-tradable (2)	Cons-truction (3)	Other (4)	All (5)	w/ trade reform (6)	w/o trade reform (7)
Panel A: Sales							
$treat \times transition$	0.037	0.028	0.042	0.051	0.029	0.033	0.025
	(0.009)	(0.012)	(0.013)	(0.011)	(0.015)	(0.017)	(0.020)
$treat \times free$	0.054	0.047	0.081	0.077	0.032	0.004	0.044
	(0.018)	(0.014)	(0.024)	(0.021)	(0.024)	(0.024)	(0.029)
Observations	572	572	572	572	572	572	572
R^2	0.51	0.43	0.49	0.39	0.33	0.32	0.29
Panel B: Labour Cost							
$treat \times transition$	0.028	0.032	0.018	0.031	0.031	0.043	0.024
	(0.010)	(0.014)	(0.011)	(0.012)	(0.016)	(0.020)	(0.018)
$treat \times free$	0.039	0.059	0.033	0.046	0.041	0.012	0.054
	(0.020)	(0.018)	(0.021)	(0.021)	(0.026)	(0.025)	(0.029)
Observations	572	572	572	572	572	572	572
R^2	0.54	0.49	0.46	0.31	0.50	0.38	0.46
Panel C: Material Costs							
$treat \times transition$	0.036	0.026	0.049	0.051	0.023	0.024	0.023
	(0.009)	(0.012)	(0.016)	(0.013)	(0.016)	(0.019)	(0.021)
$treat \times free$	0.055	0.049	0.086	0.084	0.024	-0.011	0.041
	(0.018)	(0.015)	(0.027)	(0.024)	(0.024)	(0.025)	(0.032)
Observations	572	572	572	572	572	572	572
R^2	0.48	0.40	0.44	0.37	0.30	0.28	0.26

Notes: Results from estimating equation (3). All outcomes are in logs. The regressions are weighted by sector-level employment in 1998. Standard errors clustered at the labour market level are in parentheses. *Data: DADS postes 1995–2007; Ficus 1995–2007.*

Table 7 shows the impact of the labour market integration on sales, labour costs and material costs. Comparing the results in column (1) across Panels A, B, and C, we see that for all sectors combined, the increase in sales (5.4%) was slightly smaller than the increase in material costs (5.5%) but larger than the increase in labour costs (3.9%) during the free period. The same pattern holds with lower magnitudes in the transition period. The nearly equal rise in material input costs and sales suggests that firms, rather than raising prices, expanded production.

Across sectors, shown in columns 2-7, we observe heterogeneous effects:

1. Non-tradable sector (column 2): Sales and material costs increased by similar magnitudes (4.7% and 4.9%, respectively), while labour costs increased more (5.9%) during the free period.

2. Construction sector (column 3): Sales and material costs increased substantially (8.1% and 8.6%, respectively) compared to labour costs (3.3%) during

the free period.

3. Other sectors (column 4): Sales, labour costs, and material costs all increased significantly (7.7%, 4.6%, and 8.4%, respectively) during the free period.

4. Tradable sectors (columns 5-7): Sales and material costs increased less in the tradable sectors compared to the non-tradable sectors. Within the tradable sectors, those without the trade reform (column 7) experienced larger increases in sales and material costs compared to those with the trade reform (column 6). Firms in the tradable sectors with a trade reform show almost no change in sales, material costs, or labour costs during the free period.

The results show that firms particularly exposed to local demand see substantial increases in sales and input costs, while firms in the tradable sector show only modest increases in sales and input costs. Within the tradable sector, firms not undergoing concurrent trade reforms are driving these results. Overall, the results are consistent with a substantial effect of the labour market integration on local demand. Furthermore, the results show that in the aggregate, firms' sales increase by at least as much as labour costs; therefore, the extra labour input and higher wages do not lead to a rise in the labour share. To complement those results, we next focus on whether productivity increases by more or less than wages. We do so by estimating how the reform impacts per-worker outcomes of value-added, material cost, and labour cost—that is, wages.

The results are in table 8. Labour productivity increases in all sectors in the free period. The concurrent rise in material costs again suggests higher total output per worker in quantity rather than increased prices. Moreover, since growth in the value added per worker outpaces wage growth, the labour market integration does not solely lead to higher wages because of the better outside option but actually expands productivity more than it increases wages.

This could be a direct result of the labour market integration because the larger population and higher earnings from Switzerland increased local demand—a mechanism highlighted, for example, by Moretti (2010). Further, Beerli et al. (2021) show that the labour market integration increases productivity on the Swiss side of the border. This could have spillover effects on productivity and local demand for

French firms. However, as the productivity effects are concentrated in the sectors most exposed to local demand and only modest in the tradable sector, there is no clear evidence for productivity spillovers.

Lastly, while productivity changes were highly heterogeneous across sectors—ranging from a 5.7% increase in construction to only a 1.1% increase in the "other" sectors— wage increases were common and very similar, ranging between 2% and 2.6% across sectors.

Table 8. Impact on labour productivity, material costs and wages

					Tradable		
	All sectors	Non-tradable	Cons-truction	Other	All	w/ trade reform	w/o trade reform
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Labour productivity							
$treat \times transition$	0.013	0.035	0.017	0.021	0.008	0.041	-0.026
	(0.007)	(0.015)	(0.007)	(0.010)	(0.011)	(0.018)	(0.014)
$treat \times free$	0.031	0.045	0.057	0.011	0.027	-0.001	0.021
	(0.010)	(0.021)	(0.012)	(0.012)	(0.019)	(0.031)	(0.018)
Observations	572	572	572	572	572	572	572
R^2	0.34	0.30	0.28	0.22	0.37	0.34	0.27
Panel B: Material Cost per worker							
$treat \times transition$	0.017	0.027	0.041	0.027	0.002	0.023	-0.024
	(0.008)	(0.015)	(0.013)	(0.014)	(0.014)	(0.019)	(0.017)
$treat \times free$	0.040	0.045	0.078	0.042	0.016	-0.022	0.019
	(0.013)	(0.020)	(0.017)	(0.019)	(0.027)	(0.036)	(0.028)
Observations	572	572	572	572	572	572	572
R^2	0.32	0.24	0.29	0.30	0.38	0.32	0.30
Panel C: Wages							
$treat \times transition$	0.015	0.014	0.022	0.008	0.017	0.008	0.019
	(0.004)	(0.007)	(0.008)	(0.004)	(0.005)	(0.007)	(0.005)
$treat \times free$	0.022	0.025	0.026	0.020	0.021	0.015	0.024
	(0.006)	(0.014)	(0.015)	(0.004)	(0.007)	(0.011)	(0.008)
Observations	572	572	572	572	572	572	572
R^2	0.48	0.48	0.36	0.53	0.36	0.26	0.39

Notes: Results from estimating equation (3). All outcomes are in logs. The regressions are weighted by sector-level employment in 1998. Standard errors clustered at the labour market level are in parentheses. *Data: DADS postes 1995–2007; Ficus 1995–2007.*

In summary, sales and labour productivity increased strongly in treated labour markets. Material usage rose by about as much as sales, suggesting higher produc-

tion instead of solely higher prices. Labour costs increased less than sales, implying that the labour share did not increase. Moreover, labour productivity increased more than wages. The increase in labour productivity, concentrated in the non-tradable and construction sectors, is consistent with a demand-driven output increase.

Thus, the results are overall consistent with the labour market integration leading to a local boom. The local population and labour force participation rate increase, while firms expand production and increase productivity. In equilibrium, the increase in labour supply and local demand are strong enough to compensate for the increase in commuting to Switzerland resulting from the labour market integration.

5 Conclusion

We study the effects of the integration of local labour markets between France and Switzerland. The reform provides plausibly exogenous variation in outside options of French workers. The results indicate that the integration has a small positive effect on the wages of workers employed in France. Despite the higher labour cost, there is no evidence of lower employment among French firms, and the employment of low-skill workers increases.

We document that the labour market integration increased both labour supply and labour demand. The local workforce increases through a larger population and a higher labour force participation rate. Firms increase sales, particularly in sectors exposed to local demand. Sales increase more than labour costs, and value-added per worker increases more than wages. There is thus no evidence that the labour market integration led to a higher labour share.

Overall, the labour market integration led to a local boom in the French border region despite increased competition for workers from Switzerland. Our results show that if the local labour supply is sufficiently elastic, labour markets can expand and absorb additional competition for workers.

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Appendix

Appendix A Institutional Setting

A.1 Wage setting in France

Wages are set at three different levels. The government defines a national minimum wage. Bargaining at the industry level between employers and trade unions defines minimum wages at the industry-occupation level.[23] In 1992, these agreements covered around 90% of workers. Since the agreements only define wage floors, single employers keep considerable room to pay higher wages. As a result, an important fraction of wages are set at the company-level (OECD, 2004, p. 151), either through bargaining with unions or through individualised pay rises. For instance, 75 percent of large firms (above 50 employees) granted their workers individualised pay rises in the year 1998 (Barrat et al., 2007). As the French labour market is similarly decentralised as the German or the Dutch market, studies have found wage dispersion across employers and that employer competition is important in determining French wages (Abowd et al., 1999; Cahuc et al., 2006) .

A.2 Details on the bilateral treaties

A.2.1 All agreements

The agreements between Switzerland and the EU from 1999 cover a range of areas. Table A1 shows for each agreement the relevant change and its effects if they are known.

[23] The majority of these agreements are at the national level.

Table A1. The Content of the Bilateral Treaties between Switzerland and the EU

Agreement	Change	Effects
Free movement of people	Access to labour markets without restrictions	Expansion of local labour markets
Mutual recognition agreement	lower administrative costs for approval of products for some manufacturing sectors	Cost savings of 0.5 – 1 % of product value per year. Corresponds to less than 0.2% of trade volume between EU and Switzerland. Increased mostly imports to Switzerland at the intensive margin.
Land traffic	Higher weight limit on carriages, tax on alp-crossing transport	By 2006, accumulated reduction in cost for transports between Switzerland and EU of 8.3%
Air traffic	More competitive pressure for airlines	More and cheaper connections from Geneva Airport
Public procurement	Swiss purchasers (municipalities, utilities, rail, airports, local traffic) need to tender internationally	Unknown (10% of bidders for municipal purchases were foreign)

Notes: The treaties on cooperation on research and on agriculture were excluded from the table. *Sources: Eidgenösisches Aussendepartement (EDA) (2016), Hälg (2015), Staatsekretariat für Wirtschaft (SECO) (2008).*

A.2.2 Other regulations for cross-border commuters

The labour market agreement made it easier for French residents to get a job in Switzerland as a border commuter. There was only a change in health insurance coverage, while taxation, unemployment insurance and the way pensions are calculated did not change with the bilateral agreements.

Taxation The bilateral agreements explicitly do not touch the existing accords on double taxation between Switzerland and other EU member states (European Union and Swiss Government, 1999, Article 21). This also includes the definition of a cross-border commuter for tax purposes. The treaty on double taxation between France and Switzerland from 1966 makes it possible for the earnings of French

residents in Switzerland to be taxed in Switzerland (French and Swiss Government, 1966). This is the case in Geneva, where the canton of Geneva transfers 3.5 per cent of the gross earnings of French commuters in Geneva to French authorities. In contrast, other Swiss cantons close to the French border do not tax the earnings of French border commuters (French and Swiss Government, 1983).[24] In particular, French residents who work in these cantons pay their taxes in France, and the French authorities transfer 4.5 per cent of the gross earnings of border commuters to Switzerland.

Unemployment insurance French residents who work in Switzerland contribute to the Swiss unemployment insurance both before and after the bilateral treaties with the EU. Until 2009, Switzerland transferred the contributions of French commuters employed in Switzerland to France. Unemployment benefits are paid by the system of the country of residence, except for short-time work, where they are paid by the country of work. Employment spells in Switzerland and France count equally towards the calculation of how long the worker receives unemployment benefits, and this was also the case before 1999 (French and Swiss Government, 1978).

Health insurance With the bilateral treaties, it becomes mandatory for cross-border commuters to register with the Swiss health insurance system, and they can choose whether they want to be treated either in the country of residence or in the country of work. Before 1999, cross-border commuters could voluntarily register with the Swiss health insurance system (Swiss Federation, 1995; Bundesrat, 1999).

Pensions Contributions to pension schemes in each country are derived from the relative contributions to the system in either country, both before 1999 (French and Swiss Government, 1975, Article 18) and thereafter (European Council, 2004, Article 46 2a).

[24] The cantons are: Bern, Solothurn, Basel-Stadt, Basel-Landschaft, Vaud, Valais, Neuchâtel, Jura.

Border controls During the sample period, the Swiss border was an external border to the Schengen area. While traffic that crosses external Schengen borders is subject to border controls, "cross-border commuters who are well-known to the border guards are subject to only random checks" (European Commission, 2006). Anecdotal evidence suggests that border guards on both sides of the Swiss border had a similar practice until Switzerland joined the Schengen area in 2008. In particular, around two per cent of cross-border commuters were checked by Swiss guards (Aeschlimann, 2004), and their peers across the border were similarly lenient (Bischoff, 1997; Saameli, 2002; Kislig, 2004).

Appendix B Further Information On The Data

B.1 General data processing

Sample restrictions We focus on firms and workers in the private sector, excluding agriculture. We keep workers that are at least 16 and at most 64 years old. We drop apprentices, interns, and workers with missing data on occupation or place of work.

Local labour markets Large parts of the analysis rely on data aggregated at the cell level. A labour market cell is defined as a combination of the local labour market, year and demographics such as skill, education and gender. Local labour markets are defined by the French Statistical Office. There are 297 units in France and their average size and commuting patterns are comparable to counties in the United States.

Skill and education groups Skill groups are defined based on workers' two-digit occupational classification.[25] High-skill occupations include managers, executives, scientists, engineers, and lawyers. Mid-skill occupations include technicians, foremen, skilled blue-collar workers and administrative employees. Low-skill occupations include unskilled blue and white-collar workers (craft, manufacturing, sales clerks). When possible,[26] we group workers into three education groups based on their highest degree; the education groups are mandatory education, secondary education and tertiary education.

[25] The classification is similar to Combes et al. (2012) and Cahuc et al. (2006). There was a major revision of occupational classifications in 2002, but the 2-digit variable used for the skill assignment ("socioprofessional category") was reported with almost no change until 2008. It changed in 2002 for some managers, but both their old and their new two-digit socioprofessional categories lie in the high-skill group.

[26] The administrative datasets do not report workers' education. But there is a reasonable correspondence between skill and education groups: According to the labour force survey in 1998, in the treated labour markets, 60 per cent of high-skill employees had a tertiary education, 57 per cent of mid-skill employees had a secondary education, and 55 per cent of low-skill employees had a mandatory education.

Sectors We define four economic sectors: *Tradable sectors* are all manufacturing sectors and business services as in Combes et al. (2012); *construction* and *non-tradable* sectors are defined as in Mian and Sufi (2014); the remaining sectors are classified as *other*. For some results we further separate sectors by whether they were exposed to the trade agreements or not. The list of four-digit sectors is taken from Bello and Galasso (2020).

B.2 Matched employer-employee data

The main data come from social security declarations by employers ("DADS") from 1995 to 2007. For each year, the data report employment spells between workers and establishments. For each spell, the data report salary, hours worked, gender, age, occupational category, municipality of work and residence, the start and end date, as well as an indicator of whether it is the worker's main spell in that year.[27] We use two versions of the DADS data: The *DADS Postes* (Insee [Producer], 1995) that has limited longitudinal information on workers and the *DADS Panel* (Insee [Producer], 2017) where we observe workers across years.

B.2.1 Sample selection and wage calculation

The *DADS* record all spells that are subject to social security, including many small spells and salary payments at the beginning of the year that refer to the previous year if, for instance, the worker left the firm. We follow the recommendation by Insee to retain the relevant workers. First, we drop so-called "anecdotal employment". The definition is also from Insee, and it aims to further retain only actual spells in any year. The definition is as follows:

1. The worker works at least 78 hours for the establishment.
2. During the whole spell, the worker works at least 4.9 hours per week on average.
3. The salary is at least 381 Euros (as of 1999; we adjusted the threshold for inflation).

[27] The definition is provided by Insee and is based on the spell's duration and total compensation.

4. During the whole spell, the average monthly salary is at least 381 Euros (also inflation-adjusted).

To calculate employment levels, we only keep the main spell of worker in any given year. This variable is calculated by Insee and reported in the data.

To calculate the wage growth of establishment stayers (see below) in the *DADS Postes*, we keep workers if they have a non-anecdotal spell at the same establishment in both years. We do not impose the restriction of having the main spell in both years at the same establishment, as this would drop workers who get hired late in the preceding year or separate early in the current year. Among non-anecdotal spells in a given year, this procedure keeps 70 per cent of high-skill spells, 67 per cent of mid-skill spells and 55 per cent of low-skill spells during the full sample period in all of metropolitan France. In the *DADS Panel*, we keep worker spells when they are not anecdotal and when they are the worker's main spell.

While salaries are not per se top- or bottom-coded, we winsorize hourly wages at the first and 99th quantiles.

B.2.2 DADS Postes

We use the full-count records for measuring employment and wage growth at the cell level. Employment is the count of workers in employment on June 30 each year; this includes part-time workers because the reporting of part-time employment changes during the sampling period.[28]

Index of wage growth The wage in a cell is an index of workers' wage growth relative to 1998 that is robust to changes in the composition of the workforce. It is based on the cumulated change in residual wages of workers who work at the same establishment for two consecutive years. In any given year, the *DADS Postes* reports wages and hours from the preceding year only if the worker was employed at the same establishment in the preceding year. The following procedure calculates the average wage growth of establishment stayers in four steps. First, in

[28] We find similar effects for employment and hours which assures me that the employment effects are not driven by more part-time work.

any given year, we select all workers who are employed at the same employer in the current and in the previous year. This is the only sampling condition; i.e., a worker in 2002 is included independently of whether she was employed in any of the years besides 2001 and 2002. This also means that we can only shut down worker selection on their level of wages, but not on their wage growth over time. Second, we residualized their wages with respect to gender, age and year using a regression model estimated on a ten per cent subsample of the French workforce. Third, we calculate a worker's wage growth as the change in the log residual hourly wage between the previous and the current year. Because worker-level growth rates exhibit large tails, we winsorize them at the first and 99th percentile. Fourth, we aggregate workers' wage growth. We aggregate within a cell where the skill of the worker is measured in the preceding year. Cumulating across years gives me the final index of wage growth in a cell relative to 1998. For instance, the outcome in 2002 is the sum of the average worker-level wage growth in the cell for the years from 1998 to 2002.

Wage measures when workers self-select to Switzerland The index of wage growth and the worker-level wage regressions are based on worker-level variation in wages over time. They are thus robust to worker selection if workers select into Swiss jobs based on their average wage in the two countries, as for instance the basic Roy model would predict. But we need to assume that there is no worker selection based on future wage growth. This assumption is not testable but it is weaker than in existing work on the aggregate effect on outside options. For instance, the idea in Beaudry et al. (2012) is that a construction worker in New York can ask for a higher wage than a construction worker in Miami when labour demand in manufacturing is stronger in New York than in Miami. As their empirical strategy relies on changes in cross-sectional wages in construction in New York versus Miami, it assumes that labour demand growth in manufacturing has no direct impact on the composition of workers in construction in terms of unobservables, e.g. ability. Despite this, it is possible that some of the skill differences in the wage impact we find are driven by differential selection across skill groups. However, that selection has to happen on expected wage growth. Given the results, the most plausible scenario is that hew

high-skill commuters are positively selected with respect to future wage growth, which will underestimate the impact on wages in France.

B.2.3 DADS Panel

The wage index ignores the wages of workers who start new jobs. Because low-skill workers more often change employers (or are out of employment), the wage index also covers skill groups differently, and this could introduce a bias. For this reason, we also estimate worker-level wage effects using the *DADS Panel* data set, which is a four per cent sample of the full-count DADS data. The data are at the spell-year level; a spell that lasts five years therefore contributes five observations to the data. We sample workers as follows. First, we select workers whose last employment spell before 1999 is in one of the treated or control labour markets.[29] Second, we keep all spells from 1995 to 2007 of these workers when they are employed in one of the treatment or control labour markets. We assign workers to skill groups based on the occupation in the last spell before 1999. This yields a sample of up to 65'000 workers each year.

B.3 Population census

The census (Insee [Producer], 1990) is representative of the entire population at the place of residence and includes cross-border workers as well as non-employed persons. The relevant census years are 1982, 1990, 1999, 2006 and 2007. The cell-level outcomes we measure are population, the propensity to commute to Switzerland and labour market status: the participation, employment and unemployment rate. We assign the census data from 1999 to the pre-period since the data were collected already in March 1999—shortly after the labour market integration was announced in December 1998. To the extent that the reform already has effects in this short time period, the estimates would understate the true effects.

For 1982, 1990 and 1999, we use the 25% sample of the population census, which reports the labour market variables relevant to the paper. Since 2006, the

[29] The data only report employment spells; information on unemployment receipts is not available in the sample years.

census is conducted on an annual rolling basis but on a smaller scale. We use the data for 2006 and 2007 which were collected in a 5-year window around the respective year. We separate unemployed from inactive persons based on the labour market status they report.

Accounting for demographic trends The treated and control labour markets differ in population dynamics before the labour market integration. First, the out-migration rate is lower in the treated than in the control labour markets. This holds for the $1982-1990$ and for the $1990-1999$ census periods. Second, the working-age population is growing in the treated labour markets because of differences in entry to and exit from the working-age population. We account for these trends as follows. The first set of controls are the in- and out-migration rate of group g between 1990 and 1999 in labour market m, normalized to reflect annual rates. We interact these migration rates with a full set of year dummies, which allows the migration rates to have a different impact on the outcome in each year. The second set of controls are the flows into and out of the working-age population in year t. The outflows from the working-age population for $1990-1999$ are the number of workers in 1990 that are 56 to 64 years old, relative to the working-age population in year 1999. The inflows into the working age population for $1990-1999$ are the number of workers in 1999 that are 16 to 24 years old, relative to the working-age population in year 1999. We define inflows to and outflows from the working-age population between 1999 and 2006 and 2007 in a similar way. Figure A10 compares the results for the models with and without these demographic controls.

Alternative specifications that extrapolate the 1990 to 1999 trend in the outcome yield very similar results.

B.4 Labour Force survey

The survey (Insee [Producer], 1993) is also collected at the place of residence, but the sample size is much smaller than the census and the collection methodology changed in 2003. It is collected in March of each year, except for 1999 when it was collected in January because of the census. Persons are included in the sample for

three consecutive years. We use the survey to study the change in the propensity to commute. We include all persons if they satisfy the age restriction. The data report the country of the workplace, allowing the identification of cross-border commuters.

The labour force survey was redesigned in 2003. Many variables can be corresponded between the two surveys, but there is a sharp drop in the number of cross-border commuters from 2002 to 2003. This is why we only use the data from the old survey until 2002. We calculate transitions between employment states and employment in Switzerland based on the retrospective monthly diaries that workers fill out. The diaries report the labour market status, but the country of work is only reported yearly. If a new cross-border worker reported having been unemployed in one of the twelve preceding months before the survey, she is classified as having transitioned to Switzerland from unemployment.

Data for estimating the wage gains from getting a Swiss job We focus on employees in the private sector. Because the survey does not follow persons when they move house and to make sure the worker fixed effect captures the same person in different years, we focus on persons who report having lived in the same municipality in the last year. The data do not report whether the worker changed house or not, but since French municipalities are small, the fraction of within-municipality movers is likely small.

B.5 Firm-level data from tax declarations

The firm-level balance sheet data are drawn from *FICUS* (Insee and Ministère des Finances (DGFiP) [Producer], 1995). The data contain annual information on the total wage bill, the book value of capital, sales, material use as well as other observables such as the municipality of the headquarters, a unique firm identifier and the five-digit industry of economic activity (NACE classification). The data are quasi-exhaustive and exclude very small firms with annual sales of less than 80'300 Euros[30] as well as finance and insurance companies. The data cleaning and

[30]This threshold is from 2010, but only changes marginally over time (Di Giovanni et al., 2014).

preparation follows Gopinath et al. (2017), and nominal variables are deflated at the two-digit industry level with deflators from EU-KLEMS.

B.6 Swiss data on commuters

The data report, since 1996, the counts of cross-border commuters by municipality of work (Federal Statistical Office, 2017). The counts are estimated based on commuting permits issued by Switzerland and other administrative and survey data. Because the data do not report in which country the commuter lives, we use the work municipality's closeness to the French border as a proxy for the country of residence.[31] We use these data to document the time trend in cross-border commuting—there is no French data set that reports commuter counts from a large sample at a high frequency, and that covers the full sample period.[32]

[31] Specifically, closeness for a municipality is defined by the country to which the closest border crossing connects.

[32] The Swiss data are collected at a higher frequency than the French census and cover more years than the French labour force survey.

Appendix C Treatment Group And Matching

The border municipalities were all French municipalities within 10km from the French-Swiss border and the municipalities in Haute Savoie and Pays Gex. They were defined in an earlier treaty between France and Switzerland from 1946 that regulated the mobility of residents in the border area (Swiss Federation, 1946).

C.1 Defining the treated labour markets

Labour markets consist of municipalities. Denote the municipalities of labour market i as j_i, $j_i \in \{1, ...J_i\}$. Define the set of border municipalities B_F.[33] A labour market i is eligible if $\{j_i\}_{j=1}^{J_i} \cap B_F \neq \emptyset$, e.g. if at least one municipality is a border municipality. This gives 12 eligible labour markets and denote this set as L_E. We assign to each labour market the distance between the municipality that is furthest away from the next Swiss border crossing, formally $d_i = \max_{j \in J_i}\{dist_{j_i,Switz}\}$. Then define $\bar{d} = \max_{i \in L_E}\{d_i\}$ and a labour market is in the treatment group if $d_i \leq \bar{d}$. This procedure yields $\bar{d} = 84km$.

C.2 Balance before and after matching

To assess balance of the matching strategy, we compare the overlap in covariate distributions between the treatment and the control group using three measures.[34] Normalized differences measure the position of the distributions, relative to the population standard deviation. Log ratios of standard deviations measure the dispersion of the distributions. The fraction of treated (control) units that lies in the tails of the values of the control (treatment) units measures how well treatment and control areas overlap in the tails. More specifically, it measures the probability mass of the treated units that lies outside the 0.025 and 0.975 quantiles of the distribution of the control units, and vice versa. Intuitively it is more difficult to impute the potential outcome for those units because there are not many in the

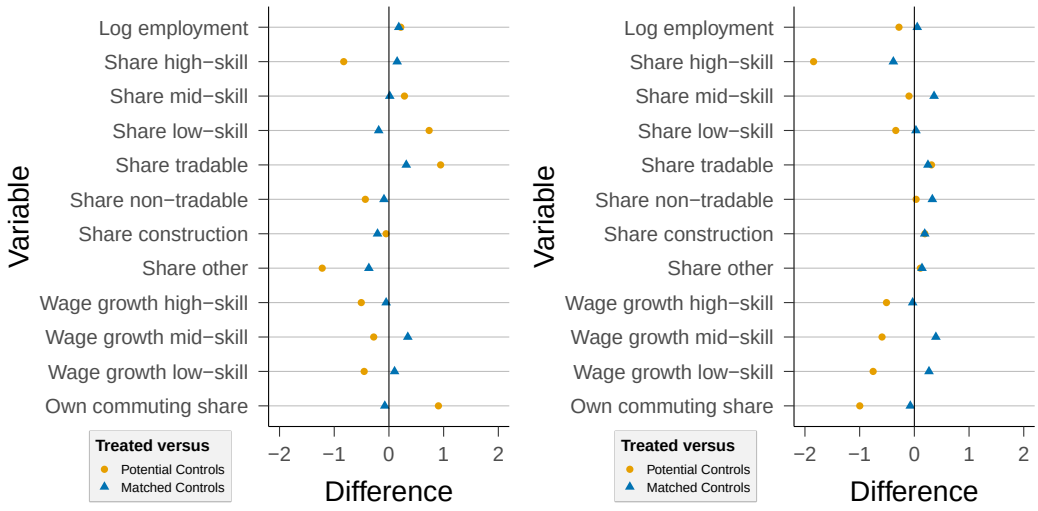
[33] Recall that this is the navy blue area on the French side of the border in Figure 1a.

[34] The measures are preferable to t-statistics because they are invariant to sample size (Imbens and Rubin, 2015).

control (treatment) group.[35]

Figure A1 presents normalized differences and log ratios of standard deviations of the covariates used for matching. The x-axis denotes the value of the measure and the y-axis denotes the variables. The left panel shows the normalized differences and the right panel shows the log ratio of standard deviations. In each panel, the red dots compare the treatment group and all potential controls. The green triangles compare the treatment group and the matched control group. The red dots indicate that there is considerable imbalance in the overall sample. Treated areas have more employment in the tradable sector and a higher own commuting share. Wages grow less in the treatment group than in the pool of potential controls before the market integration. Some covariates are also substantially less dispersed in the treatment group than in the potential control areas, most notably the share of high-skill workers, the wage growth and the own-commuting share. This suggests that treated labour markets are more homogenous than the potential control areas. The green dots indicate that the matching strategy improves balance for most covariates. Normalized differences shrink in all but two cases. The variability of covariates also shrinks considerably, implying that covariates are more similarly distributed in both the treated and the control areas.

[35]For reference, in a randomized experiment this number should be 0.05 in expectation, meaning that 5 percent of units have covariate values that make imputing missing potential outcomes difficult.



(a) Normalized Differences

(b) Log Ratio of S.D.

Figure A1
Balance Before and After Matching

Notes: The figure shows the normalized differences and log ratio of standard deviations between the treatment group and the control group for each variable as indicated on the y-axis. Normalized differences are the differences in means between the treated and the control units, normalized with respect to the standard deviations of the treated and control units. Controls are all potential controls for the red dots and the matched controls for the green diamonds. The variables refer to: log employment, employment share of workers in high, mid and low-skill occupations, employment share in tradable, non-tradable construction and other sector, all in 1998. Wage growth for high, mid and low-skill is cumulative residual wage growth of firm stayers in two consecutive years from 1995 to 1998. Own commuting share is the share of employees in the labour market that also live in that market in 1998. See the Table 1 and text for details.

Appendix D Search And Bargaining In Local Labour Markets

In this section, we introduce an equilibrium search model of the labour market with endogenous labour force participation following Chapter 7 in Pissarides (2000). We extend the labour supply margin by introducing a location choice in order to capture the population response found in the empirical results. We suppress reference to time as we consider only comparative statics. We introduce the model by referring to homogenous workers and will discuss heterogeneity across education groups with respect to certain parameters only at the end. We effectively assume segmented labour markets by skill/education group. Finally, the option of commuting to Switzerland is introduced as an exogenous number of vacancies in Switzerland with an exogenous wage offer distribution.

D.1 Model

Labour force participation Workers enjoy a flow value V_0 when not in the labour force. The value V_0 is heterogeneous and distributed according to $H(V_0)$. Workers choose to participate in the labour force if the value of searching for a job is higher than the value of non-participation. The flow value of unemployment is rU. Thus, a worker with value V_0 participates in the labour force if $V_0 \leq rU$, implying that the local labour force size is $L = PH(rU)$ where P is the population size. The local labour force participation rate is pinned down by the local value of unemployment

$$\frac{L}{P} = H(rU). \tag{A.1}$$

To determine the size of the labour force, we also need to pin down the size of the local population. Consider a simple model of location choice with an idiosyncratic taste for locations where workers have the option to move to an outside labour market and search for a job there. The idiosyncratic tastes are iid and follow a Fréchet distribution with scale parameter η. The flow value of the outside labour market is $r\bar{U}$. We normalise the number of people potentially choosing between the local labour market and the outside labour market to 1. Then, the local population

size follows as

$$P = \frac{U^{\eta}}{U^{\eta} + \bar{U}^{\eta}}. \tag{A.2}$$

The limit case with free mobility is informative on what role the outside labour market plays. When we consider free mobility, the local value of search is equal to search in the outside market $\lim_{\eta \to \infty} U = \bar{U}$, as long as we are in an interior solution with a positive population in both the outside location and the local labour market (Rosen, 1982; Roback, 1982).

This setup implies that both the local population and the local labour force participation rate are (weakly) increasing in the local value of job search rU. However, in the limit case, when the spatial supply of workers is very elastic, all adjustment takes place through the population size, and the labour force participation rate is fixed, as $\lim_{\eta \to \infty} U = \bar{U}$.

Job Matching Workers and jobs match in a frictional labour market. Meetings are governed by a constant returns to scale matching function. The labour force is of size L, the unemployment rate is u, and the vacancy rate is v. The number of matches in the labour market follows as $m(uL, vL) = m(u,v)L = Lu^{\alpha}v^{1-\alpha}$.

There are vacancies in France v_F and vacancies in Switzerland v_{CH} and $v = v_F + v_{CH}$. Note here, that vacancies are defined as ratios to the size of the labour force, importantly for Swiss vacancies we will consider an increase in the number of vacancies $\tilde{v_{CH}}$, and $v_{CH} = \frac{\tilde{v_{CH}}}{L}$. Market tightness is the ratio of vacancies to job searchers $\theta = \frac{v}{u}$

The job contact rate of unemployed workers with jobs is given by

$$\lambda = a\theta^{1-\alpha} \tag{A.3}$$

$$\lambda_F = a\frac{v_F}{v_F + v_{CH}}\theta^{1-\alpha} \tag{A.4}$$

$$\lambda_{CH} = a\frac{v_{CH}}{v_F + v_{CH}}\theta^{1-\alpha}, \tag{A.5}$$

where a is a constant that captures the efficiency of the matching technology. The

contact rate of French vacancies with unemployed workers is then given by

$$q_F = a\frac{v_F}{v_F + v_{CH}}\theta^{1-\alpha} * \frac{u}{v_F} \tag{A.6}$$

$$= a\frac{u}{v_F + v_{CH}}\theta^{1-\alpha} = a\theta^{-\alpha} \tag{A.7}$$

Unemployment and employment evolve according to the following law of motion:

$$\dot{u} = -\lambda_F u - \lambda_{CH} u + \delta_{CH} e_{CH} + \delta_F e_F \tag{A.8}$$

$$\dot{e}_{CH} = \lambda_{CH} u - \delta_{CH} e_{CH} \tag{A.9}$$

$$\dot{e}_F = \lambda_F u - \delta_F e_F \tag{A.10}$$

And the total number of workers in unemployment and employment needs to add up to the local labour force

$$u + e_c + e_F = L. \tag{A.11}$$

Job Creation There is free entry of jobs. To fill a job, a vacancy is posted at flow cost Ac. The value of a filled job is J. The value of a vacancy follows

$$rV = -Ac + q(\theta)(J - V) \tag{A.12}$$

Under free entry, a vacant job has zero value $V = 0$, thus the value of a job is

$$J = \frac{Ac}{q(\theta)} \tag{A.13}$$

A filled job produces output at rate A and pays the worker a wage w. Jobs are destroyed at the exogenous rate δ. Thus, the value of a job follows

$$rJ = A - w - \delta J \tag{A.14}$$

$$A - w = (r + \delta)\frac{Ac}{q(\theta)} \tag{A.15}$$

Thus the gap between the marginal product of labour A and wages w increases in the cost of creating a vacancy. Note here that $\theta = \frac{v_F + v_{CH}}{u}$, that is, absent changes in fundamentals or wages, vacancies from Switzerland crowd out French vacancies 1:1.

Workers When in the labour force, workers are either unemployed or employed. When employed, they earn wage w and become unemployed at rate δ. The value of employment follows as

$$rW = w + \delta(U - W) \tag{A.16}$$

The value of unemployment depends on a home production value $\tilde{b}$ and the expected value of job search.

$$rU = \tilde{b} + \lambda_F(W_F - U) + \lambda_{CH}(W_{CH} - U) \tag{A.17}$$

Wage determination Once an employer and a worker meet, the wage is set via Nash bargaining.

Nash bargaining delivers the standard wage equation

$$w = rU + \beta(A - rU), \tag{A.18}$$

where β is the bargaining power of the worker.

For simplicity, we assume that the wage in Switzerland is taken as given, i.e. Nash Bargaining only applies to the French segment of the labour market. One could easily relax this assumption and achieve the same wage with a particular productivity level in Switzerland.

Local Labour Market Equilibrium (in France) The model is solved by finding the values of u, e_F, e_{CH}, v_F, w, U, W, J, V, L and P that satisfy the following conditions:

1. Free entry holds, $V = 0$ and J is given by equation (A.13).

2. Employment value W is given by equation (A.16) for both Switzerland and France.

3. Wages in France follow from Nash bargaining equation (A.18).

4. Vacancies $\tilde{v}_{CH}$ and wages w_{CH} in Switzerland are taken as given.

5. Value of unemployment follows (A.17).

6. The distribution of workers across unemployment and employment in both Switzerland and France solves the law of motion (A.8), (A.9) and (A.10) with $\dot{u} = 0$, $\dot{e}_{CH} = 0$ and $\dot{e}_F = 0$.

7. The distribution of workers across unemployment and employment in both Switzerland and France is consistent with the aggregate resource constraint (A.11).

8. Labour force participation L follows (A.1).

9. Local population P satisfies (A.2).

D.2 Fall in restrictions to cross-border commuting

We use the model to interpret the empirical results described in the main text. To represent the fall in restrictions to cross-border commuting, we consider an increase in the number of vacancies in Switzerland $v_{\tilde{CH}}$.

First, note that labour force participation and the local population size are pinned down by the local value of job search rU and the value of the outside labour market $r\bar{U}$, which is taken as given. Thus, we interpret the rise in labour force participation and the local population, through the lens of the model, as an increase in the local value of job search. Then, we consider the implications of the labour supply response on the per-worker job-finding rate in Switzerland. Lastly, we analyse the results on wages and productivity using the block on the local labour market equilibrium.

Labour Supply adjustment The model implies a one-to-one relationship between the local value of job search and (i) local population and (ii) local labour force participation rates. The local population follows $P = \frac{U^{\eta}}{U^{\eta}+\bar{U}^{\eta}}$. That is, a rise in the local population reflects a rise in the local value of job search, with η scaling the response. The local labour force participation rate follows $H(rU)$; for simplicity, assume the same setup as for location choice $H(rU) = \frac{(rU)^{\phi}}{(rU)^{\phi}+V_0^{\phi}}$. Thus, a rise in the local value of job search implies a rise in the local labour force participation rate; the response is scaled by ϕ. Thus, this framework implies that labour force participation and local population should increase jointly with the local value of job search. The relative response of each margin depends on the supply elasticities η and ϕ.

For workers with mandatory education, the rise in labour force participation is slightly larger than the rise in population, suggesting a supply elasticity across space smaller than the local participation elasticity $\eta_L < \phi_L$. For workers with secondary education the responses are smaller in levels, but similar across the two margins, suggesting $\eta_M \approx \phi_M$. In contrast, workers with tertiary education see a large rise in population, but no rise in local labour force participation. Consistent with Malamud and Wozniak (2012) this can be explained by higher spatial mobility of workers with tertiary education. We discussed the limit case with free mobility above, but a finite elasticity of moving that is substantially larger compared to the elasticity of local labour force participation is consistent with the results, i.e. $\eta_H >> \phi_H$. Lastly, we do not compare the supply elasticities across education groups, because we can not empirically separate out the size of the demand shift for each education group.

The labour supply adjustment also has implications for wages through the outside option. With a large supply elasticity, additional local search value through more vacancies in Switzerland will be (partially) competed away by additional workers. The effective number of Swiss vacancies available per worker in the French border region depends on the size of the labour force $v_{CH} = \frac{\tilde{v_{CH}}}{L}$. Thus, a rise in the local labour force size will reduce the per capita number of Swiss vacancies. This is consistent with the results, as the per capita employment rates in Switzerland move only modestly while the local labour force size increases substantially. Thus, while the border opening can be considered a labour demand

increase from Switzerland, a substantial increase in the labour force size can mute the impact at the individual level. In equation (A.17), the value of unemployment depends on the effective job-finding rate in both Switzerland and France; with a large response in the size of the labour force L, there is a limited response of λ_{CH} and the per worker job-finding and employment rates in Switzerland will not change much. If that is the case, there is also limited pressure on wages in France through the outside option as it is competed away by additional workers in the local labour market.

To summarise, a rise in the number of jobs available in Switzerland will affect the number of French workers commuting to Switzerland. How much it affects the per capita employment in Switzerland will strongly depend on the size of the labour supply response. However, even if Swiss employment rates do not rise much, the rise in the local labour force size will affect the local labour market. How, depends on the adjustment of French labour demand which we discuss next.

Labour Demand adjustment We now consider the local labour market equilibrium in France, i.e. the adjustment of French vacancies and other equilibrium outcomes.

The local labour market in the model features constant returns to scale. Thus, a larger local labour force will be fully absorbed with no changes in per-capita outcomes. This is reasonable if the local output is sold elsewhere and faces a flat demand curve or if the local labour force creates its own local demand. Given the results show a rise in sales in the data this seems plausible.

For the remaining discussion, let us consider three sets of workers separately, low, mid and high skilled workers.

High-Skill workers Consider the rise in Swiss vacancies $v_{\tilde{CH}}$. First note that the impact on $v_{CH} = \frac{v_{\tilde{CH}}}{L}$ is muted by a labour supply response L.

Nevertheless, if v_{CH} rises, consistent with the increase in the cross-border commuting propensity, it follows from the free entry condition (A.13) and $\theta = \frac{v_{CH}+v_F}{u}$, that Swiss vacancies will crowd out French vacancies, unless the job-filling rate falls.

However, as unemployment rises slightly the job-filling rate is likely not falling. Thus, there is likely some crowding out of French vacancies. This is consistent with the fall in the employment rate in France. Additionally, we'd expect a further crowding out through the increase in the value of unemployment that implies an increase in the reservation wage. However, with a rise of working Switzerland of only 1.2 percentage points, the rise in the reservation wage would be modest at the market level. Further, we see no increase in the labour force participation rate suggesting no change in the value of local job search and implying no change in the reservation wage. We discuss wages of high-skill workers further below taking into account option values from on-the-job search.

Mid-Skill workers For mid-skilled workers, the rise in the local labour force size is not as substantial. And the employment rate in Switzerland remains unchanged. Thus, we consider a constant Swiss vacancy rate v_{CH}. Nevertheless, wages in France rose. This is consistent with the model as long as there is a rise in productivity, which we document. To also explain the rise in unemployment a rise in posting costs alongside productivity is necessary. Again consistent with the main results as per worker productivity rose faster than wages.

Low-Skill Workers The same as for mid-skill workers holds. The only difference is the larger labour supply response.

Thus, to explain the results it is necessary that there is a shift in local labour demand, above and beyond what one would expand by a 1:1 expansion of output with the labour force size. That is productivity needs to increase. However, to be consistent with the rise in unemployment job creation costs also should rise. The evidence provided by Manning (2011) suggests that the latter assumption is reasonable. Similarly, abandoning the stark free entry assumption, would weaken the models implications considerably. In a model with a finite entry elasticity of jobs marginal jobs become more costly to create as the market grows.

Discussion of Stochastic Matching Incorporating stochastic matching gives room for equilibrium changes in productivity without a change in A by shifting the reser-

vation productivity. However, given the likely small changes in reservation values, as wage changes are modest, the rise in productivity is most likely to be driven by other developments driving productivity A.

Discussion of On-the-job Search Considering on-the-job search is relevant for the interpretation of the results, particularly for wages of high-skill workers. Generally, the extent to which the option value of searching for another job gets lost when becoming employed is weakened with on-the-job search. Once workers can search on-the-job, reservation values will adjust less to changes in the value of job search. However, then wage growth on the job can also be directly affected by the additional employment opportunities (Cahuc et al., 2006). For low and mid-skill workers, the employment rate in Switzerland did not increase; thus, we assume that this discussion is not relevant for these groups. Not because they do not search on-the-job, but because search opportunities seem to have remained the same.

For high-skill workers, the employment rate in Switzerland did increase. Thus, the option value of search on and off the job likely has increased. This would imply that high-skill workers' employment value increased more than their wage through the option value of searching for a job in Switzerland. That is, workers may move to the border region and take a French job to continue searching for a Swiss job. In that case, firms do not actually need to raise wages but face higher turnover. We can not directly measure this effect with the DADS postes data, but it is consistent with the results as we see no wage increase for high-skill workers but a large increase in population for high-skill workers.

Appendix E Additional Results

E.1 Further evidence on commuting

E.1.1 Recent migrants and the wage premium of Swiss Jobs

Table A2 shows the cross-border wage gap when including migrants—the results are virtually identical.

Table A2. Wage gap between French and Swiss jobs: not dropping migrants

	Log(hourly wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
Swiss job	0.497	0.190				
	(0.013)	(0.046)				
Swiss job - Non-tertiary educ.			0.512	0.188		
			(0.017)	(0.054)		
Swiss job - Tertiary educ.			0.437	0.199		
			(0.014)	(0.114)		
Swiss job - Low skill occ.					0.529	0.117
					(0.013)	(0.059)
Swiss job - Mid skill occ.					0.497	0.201
					(0.014)	(0.046)
Swiss job - High skill occ.					0.296	0.274
					(0.014)	(0.041)
Labour market FE	Y	N	Y	N	Y	N
Worker FE	N	Y	N	Y	N	Y
Tenure and industry controls	N	Y	N	Y	N	Y
Observations	50162	50162	50162	50162	50162	50162
Number of years	10	10	10	10	10	10
R^2	0.43	0.93	0.43	0.93	0.59	0.93

Notes: The sample are residents in the treatment and control areas (see section 3.3.2) employed in the private sector. *Swiss job* indicates workers employed in Switzerland; non-tertiary education pools workers with less than tertiary education. *Labour market FE* are fixed effects for the labour market of residence. *Worker FE* are person fixed effects. *Tenure and industry controls* are a cubic in the number of months since the start of the employment spell and fixed effects for 30 broad industry groups. All regressions include fixed effects for year and a gender-specific cubic in age. Regressions are weighted using the survey weights. Standard errors clustered at the labour market level are in parentheses. *Data: Labour Force Survey 1993–2002.*

E.1.2 Recent migrants and the wage premium of Swiss Jobs

Table A3 shows the average wages of commuters when employed in France are 28 log points higher than wages of non-commuters employed in France. This confirms the strong selection of commuters. The baseline wage gap is, however, substantially

smaller for workers with tertiary education.

Table A3. Gap in French wages between commuters and non-commuters

	Log(hourly wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
Commuter	0.216	0.261	0.275			
	(0.053)	(0.048)	(0.053)			
Commuter - Non-tertiary educ.				0.231	0.276	0.297
				(0.052)	(0.050)	(0.050)
Commuter - Tertiary educ.				0.120	0.160	0.128
				(0.163)	(0.158)	(0.143)
Secondary educ.	0.175	0.169	0.150	0.175	0.169	0.150
	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)
Tertiary educ.	0.490	0.500	0.435	0.490	0.500	0.435
	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)
Tenure controls	N	Y	Y	N	Y	Y
Industry controls	N	N	Y	N	N	Y
Observations	47161	47161	47161	47161	47161	47161
Number of years	10	10	10	10	10	10
R^2	0.36	0.41	0.47	0.36	0.41	0.47

Notes: The sample are residents in the treatment and control areas (see section 3.3.2) employed in the private sector in France and not moving across municipalities in two consecutive years. *Commuter* indicates workers that will be or were employed in Switzerland after or before the observed French wage; non-tertiary education pools workers with less than tertiary education. *Secondary educ.* and *Tertiary educ.* are dummies for the two education levels. *Tenure controls* and *Industry controls* are a cubic in the number of months since the start of the employment spell and fixed effects for 30 broad industry groups, respectively. All regressions include fixed effects for year, for labour market of residence, and a gender-specific cubic in age. Regressions are weighted using the survey weights. Standard errors clustered at the labour market level are in parentheses. *Data: Labour Force Survey 1993–2002.*

E.1.3 Swiss side

Here we closely follow Beerli et al. (2021, figure 2, panel A), but we use a different data set[36] and we report the annual count of commuters rather than the share of commuters in total employment in Switzerland. The count is more relevant for understanding the magnitude of commuting from France to Switzerland.

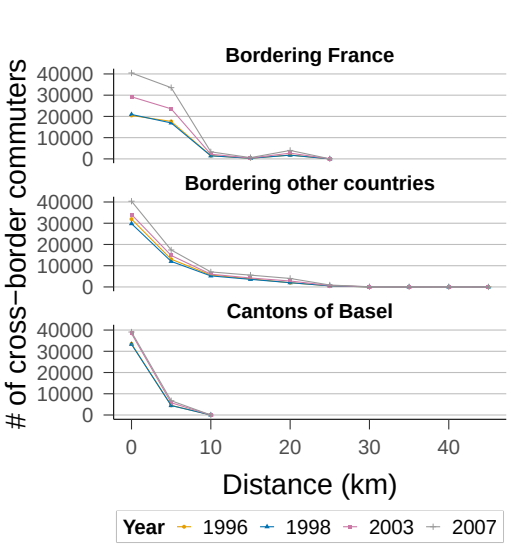
Figure A2a shows the number of commuters in Swiss municipalities in the border region for different distance bins from the next border crossing. The panels split the data into three broad groups, proxying for the likely country of origin of the cross-border commuters: municipalities close to France, municipalities in the Basel area which is close to Germany and France, and municipalities close to other regions.[37] Comparing the counts in 1996 and 1998 indicates no pre-trend in commuting during that time period. Consistent with the results in the paper, the figure shows that French residents start commuting already substantially more to Switzerland during the transition period from 1999 to 2003. In fact, the change in the number of commuters is almost the same in the transition and in the free mobility period.[38]

Figure A2b shows a similar picture on the place of residence of the commuters in eligible municipalities. In the municipalities closest to the border, cross-border commuters already made up more than a fourth of the population in 1999 and before. Again the figure does not indicate any pre-trend in the fraction of commuters, except for a drop between 1990 and 1999 in the municipalities closest to the border. From 1999 to 2007, the fraction of commuters increases in almost all eligible municipalities, but most strongly closest to the border.

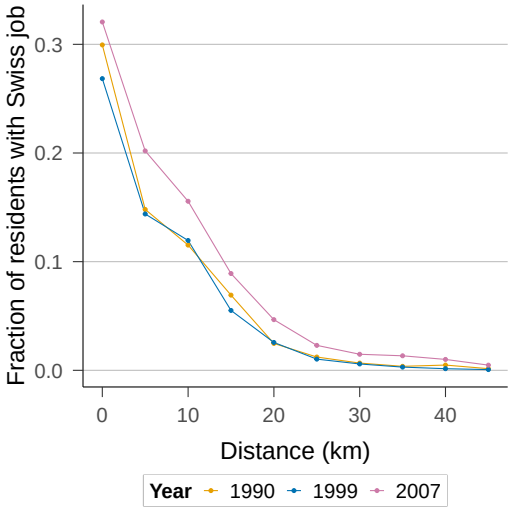
[36] The survey data they use is not available anymore at the municipality level, preventing me from exactly reproducing their figures.

[37] Closeness is defined by the country to which the closest border crossing connects. The data do not report the place of residence of the commuters.

[38] When pooling all groups together, the increase is also evident already in the transition period. This is in some contrast to the evidence in Beerli et al. (2021), who find no increase in the fraction of commuters from 1998 to 2004 in Swiss municipalities closest to the border. The difference could stem from the different measure or from the different data set used.



(a) Number of commuters in Switzerland



(b) Fraction of French residents with a job in Switzerland

Figure A2
Residence and workplace of cross-border commuters

Notes: Panel A2b shows, for different years, the fraction of residents in the French border region that has a job in Switzerland. The sample are all eligible French municipalities. Panel A2a shows the number of commuters by year, by the distance to the next border crossing, and region. The sample are all Swiss municipalities that are in either of the border regions to France, Germany, Italy or Austria. The regions proxy for the likely country of residence. *Cantons of Basel* refers to Swiss side of the Basel Metropolitan area (cantons Basel-Stadt and Basel-Landschaft), bordering both Germany and France. *Bordering France* are all other municipalities whose closest border crossing is to France. *Bordering other countries* are municipalities whose closest border crossing is to Germany, Italy or Austria and are not in either of the Basel cantons. In both panels, municipalities are grouped by 5km-distance bins. The bin at 10km, for instance, refers to municipalities that are between 10 and 15km away from the next border crossing. *Data: BFS (Switzerland); Population census (France) 1982–2007.*

E.1.4 French side

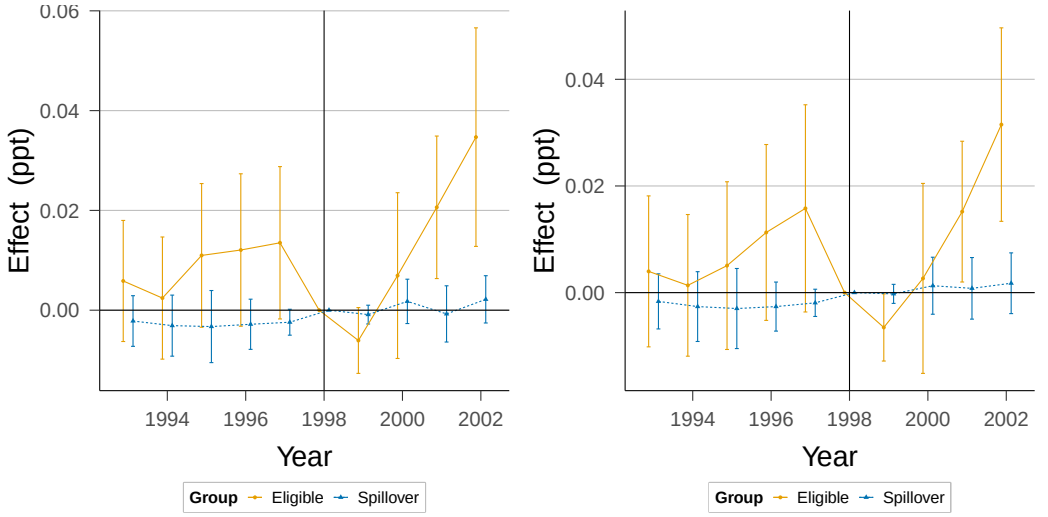
Here we estimate the impact of the labour market integration on cross-border commuting in the labour force survey until 2002. Since commuting was initially restricted to residents from the border region, we compare the commuting behaviour of residents in the treated group with that of the residents in the control group. Because the eligibility to commute varied by municipality, we estimate the following

regression for person i residing in municipality c in year t:

$$y_{ict} = \alpha_c + \alpha_t + \sum_{\tau \neq 1998} \beta_\tau treat\_BordReg_c \times 1[t = \tau] + \sum_{\tau \neq 1998} \theta_\tau treat\_noBordReg_c \times 1[t = \tau] + \gamma X_{ict} + v_{ict}. \tag{A.19}$$

Municipality fixed effects α_c absorb permanent differences in the commuting propensity across municipalities; year fixed effects α_t absorb differences in the commuting propensity across years that are common to all municipalities. $treat\_BordReg_c$ is a dummy indicating whether the municipality belongs to the eligible area in the treated labour markets; $treat\_noBordReg_c$ is a dummy indicating whether the municipality belongs to the non-eligible area in the treated labour markets. γX_{ict} includes personal covariates such as age, gender and education. The coefficients β_τ are of main interest since they measure the evolution of the commuting propensity to Switzerland relative to 1998. The coefficients θ_τ should be zero since the residents of these municipalities are not allowed to start commuting. The regressions are weighted using the survey weights. Because of the small sample size of the labour force survey, we cannot estimate equation (A.19) for sub-group—the municipality-group fixed effects would not be identified in many cases.

The results from the estimating equation (A.19) are shown in Figure A3. The results are similar independently of whether we consider the whole population (as in panel a) or only people who lived in the same municipality in the previous year (panel b). While there is no significant trend in the propensity to commute to Switzerland from 1993 to 1998, this changed in the year 2000 when more and more residents start commuting to Switzerland. By 2002, the fraction of residents in the border municipalities with a job in Switzerland is 4 percentage points higher compared to 1998. The figure also confirms that residents in municipalities that were not eligible to commute did not do so. The standard errors for the eligible areas are large because the number of eligible municipalities is small and because the treatment likely varies across space—that is, stronger in areas closer to the Swiss border.

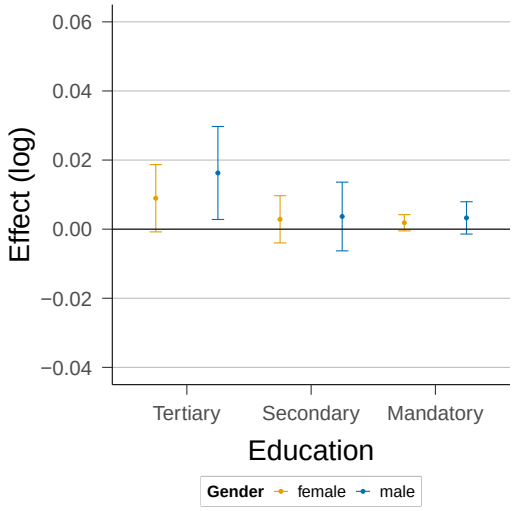


(a) All residents (b) No migrants

Figure A3
Commuting across French municipalities

Notes: The Figure shows the annual point estimates from equation (A.19). *Eligible* are municipalities in the border region; *Spillover* are municipalities other municipalities in the treated labour markets. Panel a shows the results with all residents; panel b shows the results when people are excluded that did not live in the same municipality in the previous year. *Data: Labour Force Survey 1993–2002.*

Figure A4 shows that the impact on commuting is similar for men and women within education groups. This contrasts with the results Bütikofer et al. (2022) who find, in response to the Öresund bridge opening, a larger rise in commuting to Denmark by Swedish men than women. This difference can be explained by the fact that women are more sensitive to commuting time than men (Le Barbanchon et al., 2020), and by the commuting distances involved in each case: distances are small between France and Switzerland—see Figure A2b—but substantial between Malmö and Copenhagen. Thus, women reacted less to the new employment options than men in the Danish-Swedish case but not in the French-Swiss cas



(a) By education and gender

Figure A4
Heterogeneous impact on commuting propensity

Notes: Figure A4a shows the estimated impact of the labour market integration by education group (columns) and by gender (color) in the eligible markets, using equation (A.20) and including controls for exogenous changes in the size of the working-age population (see section 3.3.1 in the main text). The error bars are 95% confidence intervals clustered at the local labour market level. *Data: Population Census 1982–2007.*

E.2 Robustness checks

E.2.1 Alternative matching approaches

We use two alternative matching strategies. In the first, we do not match on pre-trends in wages and thus match on characteristics in the 1998 cross-section: wages by skill group, total employment, employment shares by skill group and by sector, the own commuting share and the number of establishments per worker. In the second, we use entropy balancing (Hainmueller, 2012); this matching approach calculates weights for all potential control units so that the first and second moments of the distribution of covariates in the treatment and the control areas are identical. I match on the following covariates: own commuting share, total employment, skill-specific employment shares, industry employment shares, average wages in 1998 and average wage growth from 1995 to 1998. We use total employment in 1998 as the starting weight of the algorithm. The method requires setting a balancing

constraint m so that the difference of (weighted) means and variances between the treatment and the control group are at most m. We use $m = 0.0001$.

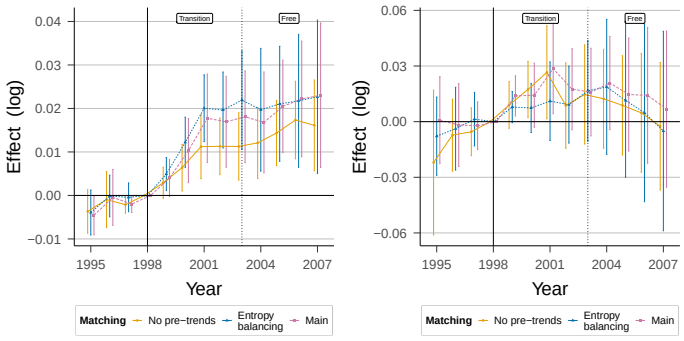
Both strategies use different units in the control group than the main matching strategy. When using cross-sectional characteristics only, 20 of 22 control units change compared to the baseline matching strategy. When using entropy balancing, the control units from the main matching strategy make up 25 per cent of the sum of weights among the control units.

Table A4. Robustness: alternative matching strategies

	Within-firm, within-worker wage growth				Employment			
	All professions	High skill	Mid skill	Low skill	All professions	High skill	Mid skill	Low skill
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Not matching on pre-trends								
$treat \times transition$	0.010	-0.004	0.014	0.007	0.024	-0.001	0.022	0.041
	(0.003)	(0.004)	(0.003)	(0.004)	(0.009)	(0.018)	(0.011)	(0.014)
$treat \times free$	0.016	-0.009	0.022	0.015	0.014	-0.024	0.008	0.045
	(0.004)	(0.006)	(0.005)	(0.007)	(0.014)	(0.024)	(0.018)	(0.021)
Observations	572	572	572	572	572	572	572	572
R^2	0.50	0.44	0.51	0.42	0.47	0.54	0.53	0.51
Panel B: Entropy balancing								
$treat \times transition$	0.017	-0.002	0.022	0.012	0.013	0.021	0.002	0.040
	(0.004)	(0.007)	(0.004)	(0.004)	(0.012)	(0.024)	(0.013)	(0.022)
$treat \times free$	0.022	-0.007	0.029	0.016	0.010	0.029	-0.016	0.071
	(0.008)	(0.010)	(0.009)	(0.008)	(0.026)	(0.043)	(0.037)	(0.041)
Observations	3380	3380	3380	3380	3380	3380	3380	3380
R^2	0.01	0.00	0.02	0.01	0.01	0.00	0.00	0.01

Notes: Results from estimating equation (3). Employment is in logs, the wage index in levels. The wage index is calculated from workers that remain employed at their firm in two consecutive years (see text for details). The results in panel A are estimated on a matched set of labour markets without matching on pre-existing trends. Regressions are weighted by cell-level employment in 1998. The results in panel B are estimated on the full set of potential control labour markets in metropolitan France. Regressions are weighted by weights that balance the matched characteristics across treated and control labour markets. Regressions do not have pair-specific time trends because the entropy balancing is not pair-wise. *Data: DADS Postes 1995–2007.*

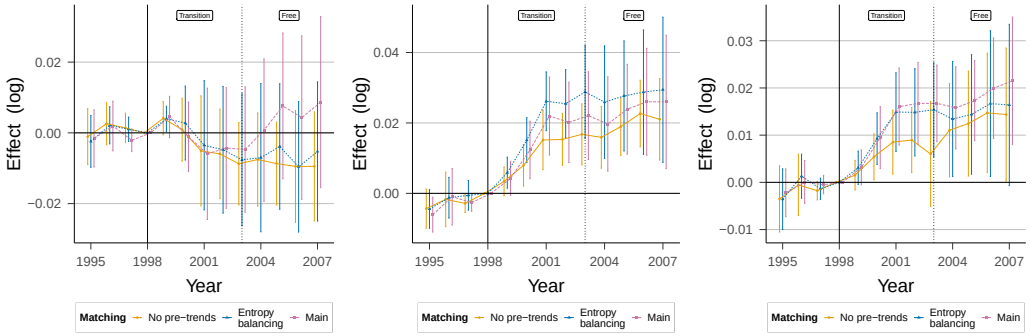
Results Table A4 shows the results. Overall, the effects are comparable across the different matching approaches. Compared to the main results, wage effects are smaller when not matching on pre-trends but similar when using entropy balancing; the inability to include pair-specific trends has little impact on the standard error. The overall employment effects are closer to the main results when not matching on pre-trends than when using entropy balancing. Low-skill employment increases by 4 percent with both approaches but they are less precise particularly for entropy balancing. High-skill employment effects are similar to the main results in entropy balancing, but the annual effects indicate a decline in employment towards the end of the sample period when not matching on pre-trends. The figures also show that there were no significant pre-existing trends in wages and employment in most cases.



(a) Wages (b) Employment

Figure A5
Alternative matching strategies, all workers

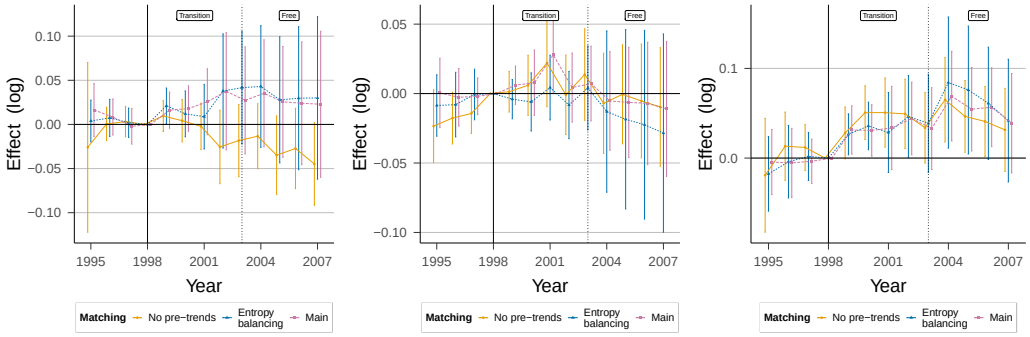
Notes: The figures show effects on the employment and wages from equation (2). The coefficients and confidence intervals refer to different matching approaches: *No pre-trends* is from matching one control labour market to each treated labour market without using pre-existing trends in wage growth as features for matching. *Entropy balancing* uses all control labour markets in the regressions, with weights calculated following Hainmueller (2012). *Main* is the main matching approach used in the paper. The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*



(a) High-skill professions (b) Mid-skill professions (c) Low-skill professions

Figure A6
Alternative matching strategies, wages by skill group

Notes: The figures show the effects on wages by skill from equation (2). The coefficients and confidence intervals refer to different matching approaches: *No pre-trends* is from matching one control labour market to each treated labour market without using pre-existing trends in wage growth as features for matching. *Entropy balancing* uses all control labour markets in the regressions, with weights calculated following Hainmueller (2012). *Main* is the main matching approach used in the paper. The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*



(a) High-skill professions (b) Mid-skill professions (c) Low-skill professions

Figure A7
Alternative matching strategies, employment by skill group

Notes: The figures show the effects on employment by skill from equation (2). The coefficients and confidence intervals refer to different matching approaches: *No pre-trends* is from matching one control labour market to each treated labour market without using pre-existing trends in wage growth as features for matching. *Entropy balancing* uses all control labour markets in the regressions, with weights calculated following Hainmueller (2012). *Main* is the main matching approach used in the paper. The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

E.2.2 Using "excluded inland" areas as controls

Panel B of table A5 shows the results when using the dropped inland labour markets—French areas up to 150km from the Swiss border but not in the treatment group—as controls;[39] Panel A of the table shows the main results.

Qualitatively, the results are very similar to the main results: wage increases for mid- and low-skill workers, and employment rises for low-skill workers. Quantitatively, wage effects are more muted, which could be explained by spillover effects reaching further inland and which was why we dropped these regions in the main analysis. Estimates for high-skill workers are generally more negative for both employment and wages with this alternative set of control areas.

[39] we only drop Lyon from the inland area as it is a major city and the treatment region does not contain any comparable labour market.

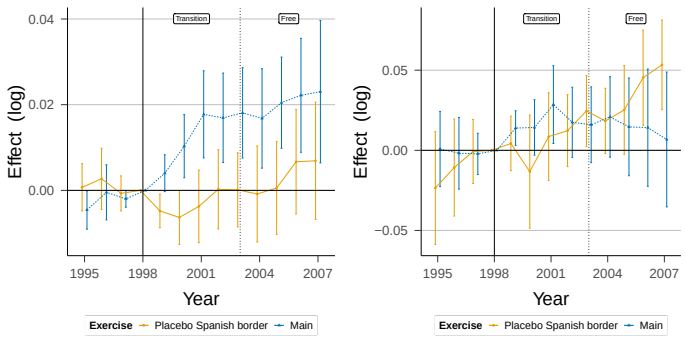
Table A5. Robustness: comparing to dropped inland markets

	Within-firm, within-worker wage growth				Employment			
	All professions	High skill	Mid skill	Low skill	All professions	High skill	Mid skill	Low skill
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Baseline								
$treat \times transition$	0.015	-0.002	0.018	0.013	0.019	0.019	0.012	0.038
	(0.004)	(0.006)	(0.004)	(0.003)	(0.010)	(0.024)	(0.013)	(0.013)
$treat \times free$	0.022	0.006	0.026	0.019	0.015	0.021	-0.006	0.058
	(0.006)	(0.010)	(0.007)	(0.005)	(0.019)	(0.039)	(0.024)	(0.022)
Observations	572	572	572	572	572	572	572	572
R^2	0.48	0.41	0.47	0.47	0.47	0.51	0.49	0.59
Panel B: Dropped inland as controls								
$treat \times transition$	0.006	-0.016	0.010	0.008	0.014	-0.019	0.011	0.038
	(0.005)	(0.008)	(0.005)	(0.005)	(0.008)	(0.027)	(0.010)	(0.017)
$treat \times free$	0.011	-0.024	0.015	0.015	-0.004	-0.050	-0.021	0.053
	(0.009)	(0.010)	(0.009)	(0.010)	(0.022)	(0.048)	(0.036)	(0.037)
Observations	754	754	754	754	754	754	754	754
R^2	0.03	0.09	0.04	0.04	0.02	0.03	0.03	0.03

Notes: Results from estimating equation (3). Employment is in logs, the wage index in levels. The wage index is calculated from workers that remain employed at their firm in two consecutive years (see text for details). The results in panel A are from the main matching approach. The results in panel B are comparing the treated labour markets to the dropped inland labour markets in figure 1b. Regressions are weighted by cell-level employment in 1998. *Data: DADS Postes 1995–2007.*

E.2.3 Placebo check

To make sure our results are not driven by another shock that impacted French border regions differently from other regions, we conduct a placebo test: instead of using the French-Swiss border as the treatment group, we use the labour markets along the Spanish-French border as the treatment group. Following the main analysis, we use the same matching approach to find controls among the inland labour markets and then run the same regressions. The results are in figure A8, where the yellow line refers to the placebo estimates at the Spanish border and the blue line to the baseline estimates for the Swiss border. We find no evidence of effects along the Spanish border around the treatment year 1998. Panel a shows that the estimated wage changes along the Spanish border are approximately zero. Panel b shows shows an approximately linear positive trend for employment along the Spanish border, but no evidence of a break around the treatment year.



(a) Wages (b) Employment

Figure A8
Placebo along Spanish border, all workers

Notes: The figures show effects on the employment and wages from equation (2). The coefficients and confidence intervals compare the main specification—denoted *Main*—to effects estimated from a placebo—denoted *Placebo Spanish border*. For the placebo exercise, the treatment group are French labour markets along the French-Spanish border, and the control group are matched inland labour markets—selected by the same method as for control group for the actual treatment group. The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

E.2.4 Alternative controls and measurement

Table A6 contains the estimates from equation (3) for the main matching strategy, but changes the control variables used. First, the wage effect could be driven

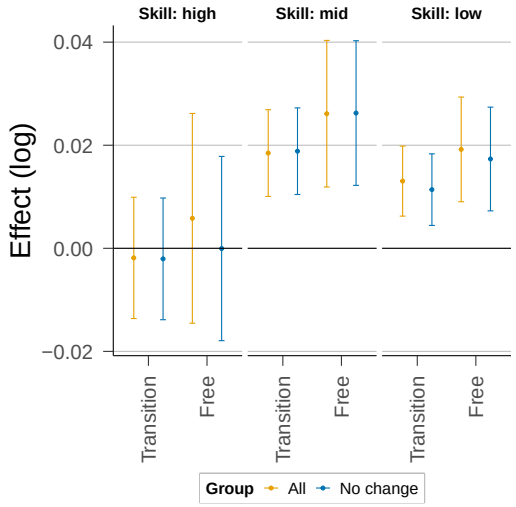
by other policies: Higher national minimum wages may increase wages more in labour markets with more low-wage workers; the workweek reduction may increase hourly wages because it lowered a workers' number of hours worked while keeping earnings constant (Askenazy, 2013). Panel B shows that the results are robust when controlling for a time-varying impact of the labour market's exposure to minimum wage increases and to the workweek reduction. Second, panel C shows that the pair-specific time trends account for important trends that are common to any given pair of treatment and control units. This is particularly the case for the employment effects.

Table A6. Robustness: other specifications

	Within-firm, within-worker wage growth				Employment			
	All professions (1)	High skill (2)	Mid skill (3)	Low skill (4)	All professions (5)	High skill (6)	Mid skill (7)	Low skill (8)
Panel A: Baseline								
$treat \times transition$	0.015	-0.002	0.018	0.013	0.019	0.019	0.012	0.038
	(0.004)	(0.006)	(0.004)	(0.003)	(0.010)	(0.024)	(0.013)	(0.013)
$treat \times free$	0.022	0.006	0.026	0.019	0.015	0.021	-0.006	0.058
	(0.006)	(0.010)	(0.007)	(0.005)	(0.019)	(0.039)	(0.024)	(0.022)
Observations	572	572	572	572	572	572	572	572
R^2	0.48	0.41	0.47	0.47	0.47	0.51	0.49	0.59
Panel B: National policies								
$treat \times transition$	0.013	-0.001	0.016	0.009	0.017	0.022	0.008	0.038
	(0.004)	(0.006)	(0.004)	(0.003)	(0.009)	(0.024)	(0.011)	(0.015)
$treat \times free$	0.018	0.008	0.022	0.012	0.011	0.028	-0.013	0.057
	(0.006)	(0.011)	(0.007)	(0.003)	(0.016)	(0.039)	(0.020)	(0.026)
Observations	572	572	572	572	572	572	572	572
R^2	0.53	0.42	0.53	0.56	0.49	0.53	0.53	0.59
Panel C: No pair-specific trends								
$treat \times transition$	0.014	-0.005	0.017	0.013	0.015	0.024	0.006	0.035
	(0.005)	(0.009)	(0.005)	(0.004)	(0.011)	(0.036)	(0.014)	(0.021)
$treat \times free$	0.019	0.000	0.022	0.019	0.008	0.030	-0.018	0.051
	(0.008)	(0.014)	(0.009)	(0.007)	(0.026)	(0.058)	(0.039)	(0.044)
Observations	572	572	572	572	572	572	572	572
R^2	0.12	0.01	0.12	0.10	0.01	0.01	0.01	0.02

Notes: Results from estimating equation (3). Employment is in logs, the wage index in levels. The wage index is calculated from workers that remain employed at their firm in two consecutive years (see text for details). Panel A are the baseline estimates as reported in table 4. Panel B includes controls for the labour market's exposure to national policies. Exposure to minimum wage increases is proxied by the fraction of workers at or below the minimum wage in 1998. Exposure to the workweek reform is proxied by the fraction of employees in firms above 20 employees. The exposure proxies are interacted with a linear time trend. The regressions are weighted by cell-level employment in 1998. *Data: DADS postes 1995–2007.*

The effects on the wage growth index is not driven by skill-upgrading as the results are robust to only including workers that remain in the same skill group, as shown in Figure A9. Lastly, the effects on employment are not driven by workers switching from full- to part-time employment: Table A7 shows that hours worked also increase. Focusing on low-skill workers, the magnitude is similar to the employment effect in the transition period and larger in the free mobility period.



(a) Wages

Figure A9
Wage effects: dropping workers that change the skill between consecutive years

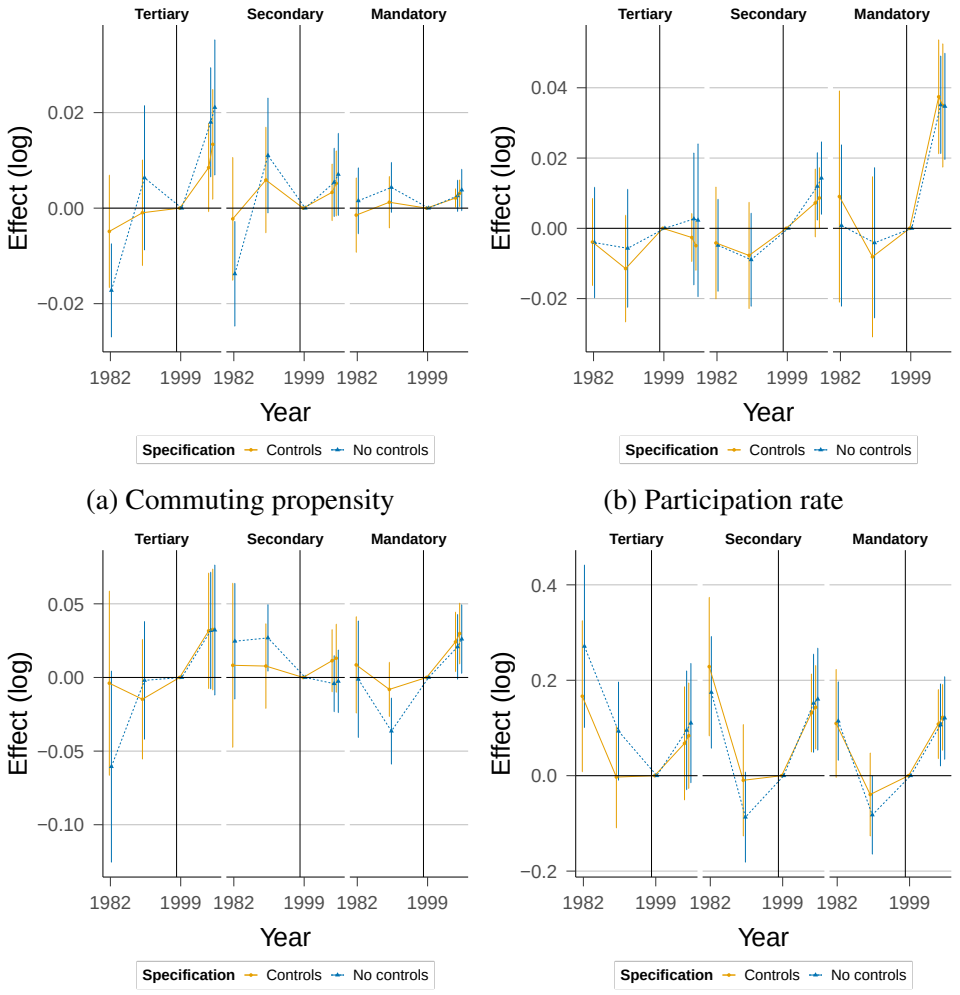
Notes: The figure shows the estimated coefficients from equation 3, separately by skill group. Yellow are estimates when all workers in the respective skill group are included, blue are the estimates when only workers are included that do not change their skill in two consecutive years. *Transition* is the coefficient for the transition period, *Free* is the coefficient for the free mobility period. The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

Table A7. Impact on hours worked

	Hours worked			
	All professions	High skill	Mid skill	Low skill
	(1)	(2)	(3)	(4)
$treat \times transition$	0.017	0.023	0.007	0.042
	(0.011)	(0.024)	(0.013)	(0.014)
	[0.010]	[0.023]	[0.011]	[0.016]
$treat \times free$	0.013	0.017	-0.013	0.074
	(0.020)	(0.038)	(0.025)	(0.024)
	[0.020]	[0.038]	[0.024]	[0.021]
Observations	572	572	572	572
R^2	0.49	0.51	0.52	0.62

Notes: Results from estimating equation (3). The outcome is in logs. The regressions are weighted by cell-level employment in 1998. Standard errors clustered at the labour market level are in parentheses, and clustered by department in brackets. *Data: DADS postes 1995–2007.*

E.3 Annual effects for other census outcomes



(a) Commuting propensity

(b) Participation rate

(c) Population

(d) Unemployment rate

Figure A10
Yearly effect on outcomes in census

Notes: Estimates from equation (3). *Controls* are coefficients estimated with controls for entry and exit of the working-age population and pre-existing migration are included in the regressions, as described in section 3.3.1 of the main text. *No controls* are coefficients estimated without these controls. The error bars are 95% confidence intervals clustered at the local labour market level. *Data: Population census 1982–2007.*

E.4 Effects across space

We also estimate treatment effects by the labour market's exposure to the integration. On one hand, commuting should increase only in the eligible labour markets. On the other hand, there may be spillover effects to neighboring, non-eligible labour markets. We modify equation (3):

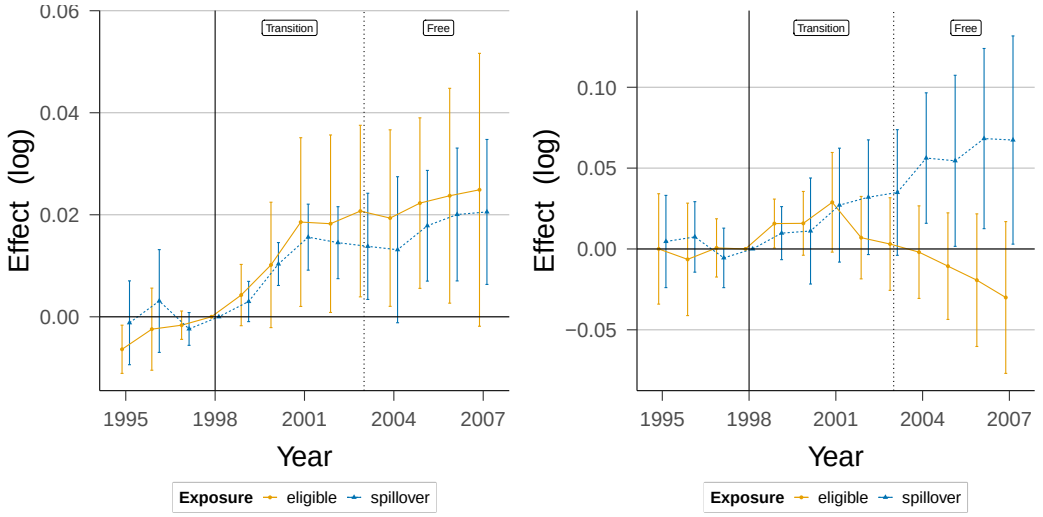
$$\begin{aligned} y^g_{mt} =& \alpha^g_m + \alpha^g_{t,elig} + \alpha^g_{t,spillover} + \beta^g_{\text{transition,elig}} elig_m \times 1[1999 \leq t < 2004] \\ &+ \beta^g_{\text{transition,spillover}} spillover_m \times 1[1999 \leq t < 2004] \\ &+ \beta^g_{\text{free,elig}} elig_m \times 1[2004 \leq t \leq 2007] \\ &+ \beta^g_{\text{free,spillover}} spillover_m \times 1[2004 \leq t \leq 2007] + \gamma^g X^g_{mt} + v^g_{mt}. \end{aligned} \tag{A.20}$$

Here, *elig* refers to labour markets whose residents became eligible to commute, *spillover* refers to the spillover labour markets. The control labour markets are assigned to the same group as the group of their matched treated labour market. We account for exposure-specific year fixed effects with $\alpha^g_{t,elig}$ and $\alpha^g_{t,spillover}$. The interest is in the β coefficients.

Here we discuss detailed results from estimating differential treatment effects by the labour market's exposure to the reform. For the wage results, we focus on the results in the full-count data because of the larger underlying number of observations.

E.4.1 Wages and employment

Figure A11 shows the annual effects by exposure for total employment and wages.



(a) Wage growth index

(b) Employment

Figure A11
Wage and employment effects across space

Notes: The figures show the annual effects on eligible and spillover labour markets, using equation (A.20). The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

Table A8 contains the main results from equation 3 in panel A, and the results by exposure from equation A.20 in panel B. Column 1 shows positive wage effects both in the eligible and in the spillover labour markets. In the free mobility period, wages in the eligible labour markets are 2.5 percent higher than in the period before the reform, while they are 1.8 percent higher in the spillover labour markets. Columns 2 to 4 show the effects for different skill groups. For mid- and low-skill workers, the effects are larger in the eligible labour markets, but still positive and significant in the spillover labour markets. For high-skill workers, wages do not change during the transition phase neither in the eligible nor in the spillover labour markets. Their wages grow, however, by 1.7 percent in the spillover markets during the free mobility phase, while the point estimate for the eligible labour markets is zero.

Table A8. Impact on within-worker, within-firm wages and employment by exposure

	Within-firm, within-worker wage growth				Employment			
	All professions (1)	High skill (2)	Mid skill (3)	Low skill (4)	All professions (5)	High skill (6)	Mid skill (7)	Low skill (8)
Panel A: Baseline								
$treat \times transition$	0.015	-0.002	0.018	0.013	0.019	0.019	0.012	0.038
	(0.004)	(0.006)	(0.004)	(0.003)	(0.010)	(0.024)	(0.013)	(0.013)
	[0.004]	[0.005]	[0.004]	[0.003]	[0.009]	[0.023]	[0.011]	[0.013]
$treat \times free$	0.022	0.006	0.026	0.019	0.015	0.021	-0.006	0.058
	(0.006)	(0.010)	(0.007)	(0.005)	(0.019)	(0.039)	(0.024)	(0.022)
	[0.007]	[0.009]	[0.008]	[0.006]	[0.019]	[0.039]	[0.023]	[0.021]
Observations	572	572	572	572	572	572	572	572
R^2	0.48	0.41	0.47	0.47	0.47	0.51	0.49	0.59
Panel B: By exposure								
$eligible \times transition$	0.017	-0.004	0.021	0.015	0.016	0.009	0.003	0.049
	(0.006)	(0.009)	(0.007)	(0.005)	(0.013)	(0.034)	(0.015)	(0.016)
$spillover \times transition$	0.012	0.002	0.013	0.010	0.021	0.030	0.020	0.022
	(0.003)	(0.005)	(0.003)	(0.005)	(0.017)	(0.019)	(0.019)	(0.020)
$eligible \times free$	0.025	-0.001	0.031	0.022	-0.014	-0.011	-0.047	0.057
	(0.010)	(0.015)	(0.011)	(0.007)	(0.023)	(0.053)	(0.028)	(0.034)
$spillover \times free$	0.018	0.017	0.019	0.015	0.060	0.075	0.056	0.060
	(0.005)	(0.006)	(0.007)	(0.007)	(0.028)	(0.038)	(0.034)	(0.022)
Observations	572	572	572	572	572	572	572	572
R^2	0.49	0.44	0.49	0.48	0.52	0.55	0.55	0.60

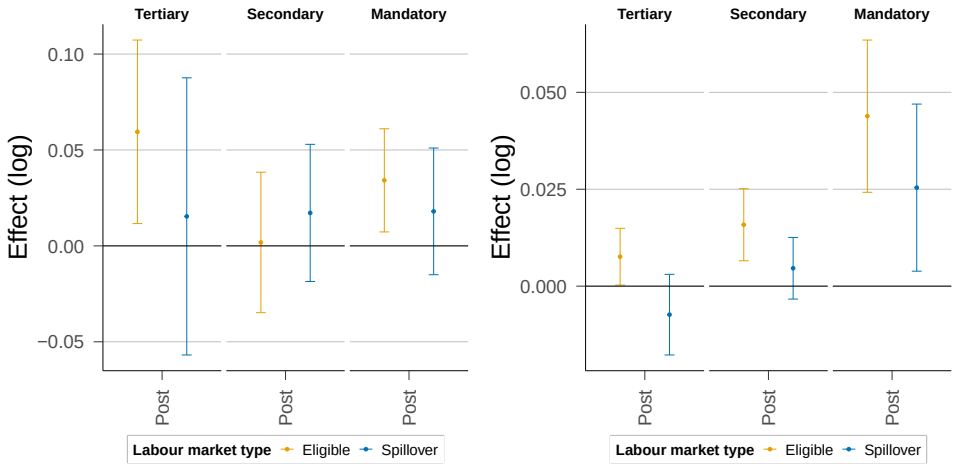
Notes: Results from estimating equations (3) (panel A) and (A.20) (panel B). Employment is in logs, the wage growth index in levels. The wage growth index is calculated from workers that remain employed at their firm in two consecutive years (see text for details). The regressions are weighted by cell-level employment in 1998. Standard errors clustered at the labour market level are in parentheses; standard errors clustered at the department level are in brackets. *Data: DADS postes 1995–2007.*

Columns 5 to 8 show the estimated effects on employment in the two groups of labour markets. The effects differ by time period. During the transition period, the overall employment effects (column 5) are positive, not significant but quantitatively similar in both the eligible and the spillover labour markets; in the free mobility period, the effect is larger and statistically significant in the spillover labour markets, while the point estimate for eligible labour markets is -1.4 percent (se: 2.3). The effects across skill groups show, first, that the negative employment effect arises from a decline in mid-skill employment of around 4.7 percent. The positive employment effect in the spillover labour markets stems from employment gains in all skill groups, but the coefficients are only significantly different from zero for the low-skill workers. For these workers, the employment effect is stronger in the eligible market than in the spillover markets in the transition period, while they are similar in both markets in the free mobility period.

The documented wage effects across space are qualitatively consistent with the labour market integration having the largest impact in the eligible labour markets, but the results reveal important spillover effects on wages in neighboring, non-eligible labour markets. The documented employment effects across space reveal heterogeneity by exposure: a robust increase in employment in the spillover labour markets, and an imprecise decline in employment in the eligible labour markets. We will discuss these findings further after assessing the effects on labour supply across space.

E.4.2 Labour supply

In figure A12 we present the estimated impact on population and on labour supply by education group and by the labour market's exposure to the reform. The population effects are similar in both types of labour markets. The labour force participation effects are stronger in the eligible markets than in the spillover markets—and this holds also within education groups—, but the estimates do not rule out the same effect in both labour market types.



(a) Population (b) Participation rate

Figure A12
Impact on labour market supply across space

Notes: Estimates from equation (A.20). Controls for entry and exit of the working-age population and pre-existing migration are included in the regressions (see section 3.3.1 in the main text). The error bars are confidence intervals clustered at the local labour market level. *Data: Population census 1982–2007.*

E.4.3 Discussion

All effects indicate important spillovers to non-eligible labour markets. Even though the effects on the wage and on labour force participation suggest a slightly stronger impact in eligible labour markets, the employment effects are negative in the eligible markets and positive in the spillover markets.

One explanation is that there are two opposing effects on total employment: an increase in supply from participation, and a slower decrease in supply from progressively more commuting. The two effects may explain both the pattern across space and the temporal pattern of the employment effect in figure A11: An inverse-U shape for the eligible markets and a steady increase in employment in the spillover markets. Another explanation is that the reform increased labour market turnover in the eligible markets. If turnover has a negative impact on firm performance, then this may dampen the absorption of the increased labour supply in the eligible markets more compared to the spillover markets. Other explanations are also possible.

Yet it is important that the wage and participation effects are plausibly a direct consequence of the increase in the finding rate for Swiss jobs. In contrast, how this supply is absorbed in different labour markets may be driven by unobservables that correlate with the distance from the Swiss border.

E.5 Labour force participation: annual effects in labour force survey

The results on labour force participation use the census that is only available in some years. Here we show that for the group with the strongest participation response, women with a mandatory education, the effect on participation is detectable in the smaller labour force survey in the early years of the reform. We estimate the following regressions for worker i residing in labour market m in year t:

$$y_{imt} = \alpha_m + \alpha_t + \sum_{\tau \neq 1998} \beta_\tau^g treat_m \times 1[t = \tau] + \gamma^g X_{mt}^g + v_{mt}^g. \tag{A.21}$$

m is as in equation (2) the labour market (Zone emploi). y_{imt} is an indicator variable that is 1 if the worker is in the labour force (employed or unemployed) and 0 if she is out of the labour force. $\gamma^g X_{mt}^g$ includes a matched pair-specific linear trend as in the regressions in the paper. It also includes a cubic in age. In a robustness check we add a trend adjustment: We add the pre-existing trend in the department-level participation rate from 1993 to 1998 interacted with year indicators to account for pre-existing trends in the outcome.

The results are in figure A13. While there is a pre-existing downward trend in participation before 1998, the trend reverses after 1998 and by 2002, the participation rate increased by 5 percentage points relative to 1998. Accounting for the existing time trend eliminates the pre-trend and yields a similar pattern post-1998. Since the survey for 1999 was conducted in January, it is perhaps not surprising that the effect only materializes after the 1999 survey.

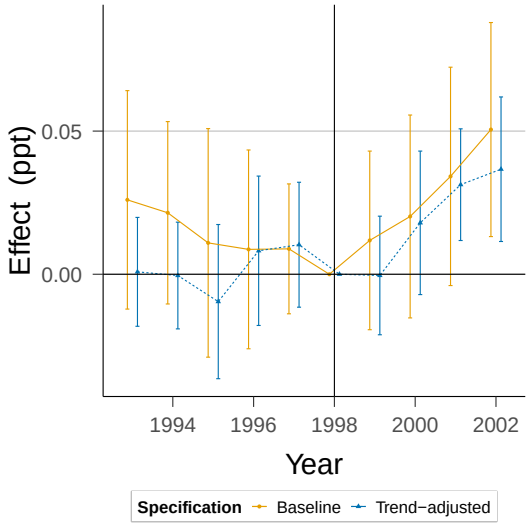
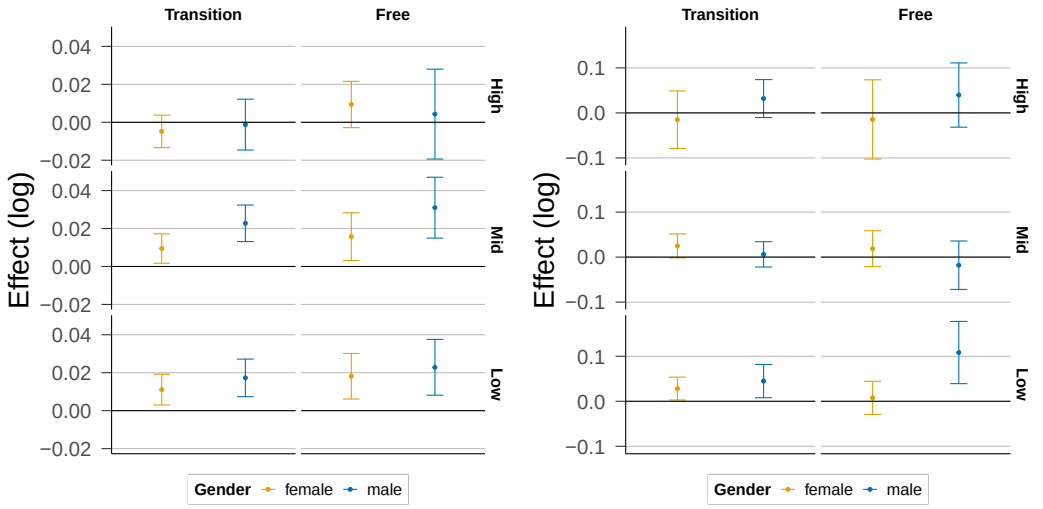


Figure A13
Labour force participation of women with mandatory education

Notes: Estimates from equation (A.21). In contrast to the *Baseline* specification, *Trend-adjusted* includes as controls the department-level change in the labour force participation rate of women with low education from 1993 to 1998 interacted with year dummies. All regressions include a cubic in age; they are weighted with the survey weights. The error bars are confidence intervals clustered at the local labour market level. *Data: Labour Force Survey 1993–2002.*

E.6 Additional Tables and Figures

Figure A14 shows the main effects estimated effects split up by gender.

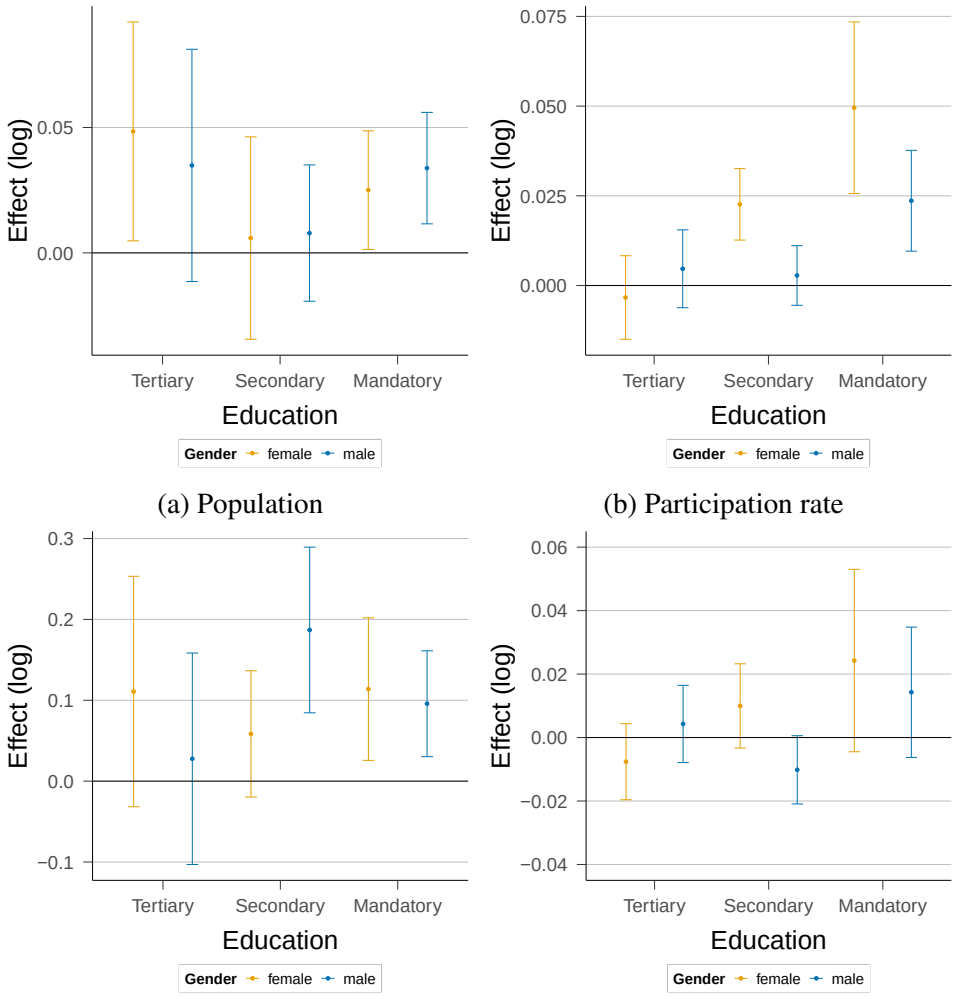


(a) Wage growth index (b) Employment

Figure A14
Wage and employment effect by detailed demographics

Notes: The figures show the estimated impact of the labour market integration by detailed demographics, using equation (3). The columns refer to the transition and to the free mobility period. The rows refer to the three skill groups. The colors refer to women (yellow) and men (blue). The error bars are 95% confidence intervals clustered at the local labour market level. *Data: DADS Postes 1995–2007.*

Figure A15 shows the estimated impact on population and on labour supply by detailed demographics.



(a) Population

(b) Participation rate

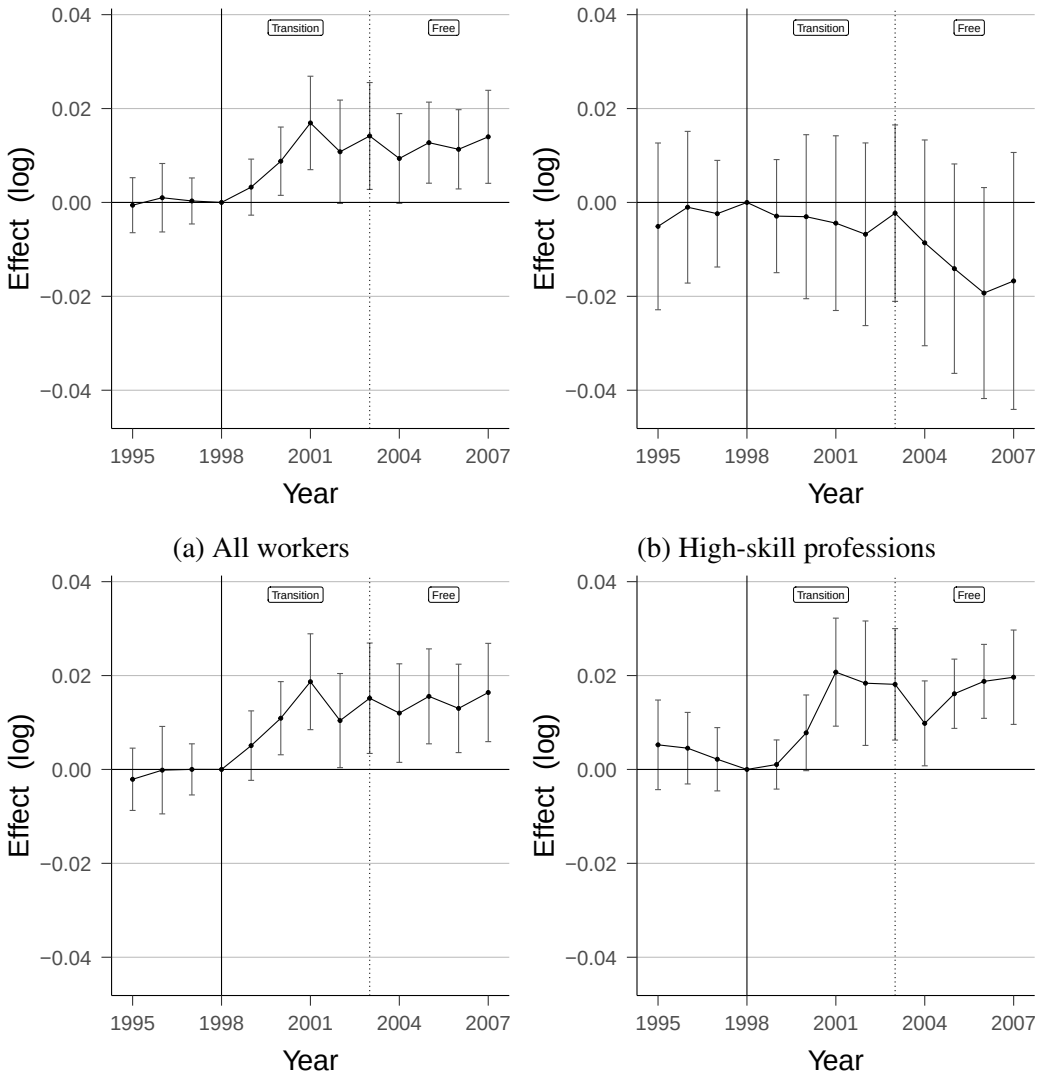
(c) Unemployment rate

(d) Employment rate

Figure A15
Impact on population and labour market status by detailed demographics

Notes: Estimates from equation (3). Controls for entry and exit of the working-age population and pre-existing migration are included in the regressions (see section 3.3.1 in the main text). The error bars are confidence intervals clustered at the local labour market level. *Data: Population census 1982–2007.*

Figure A16 shows yearly estimates of the wage effects using the worker-level panel data.



(a) All workers

(b) High-skill professions

(c) Mid-skill professions

(d) Low-skill professions

Figure A16
Worker-level wage effects

Notes: The figures show the skill-specific effects on wages from equation (4). The sample are workers employed in one of the treated or control labour markets between 1995 and 1998. Workers are assigned to labour markets and skill groups based on their last employment spell before 1999. The error bars are confidence intervals clustered at the local labour market level. *Data: DADS Panel 1995–2007.*

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