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

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Abstract

I study a reform that eased cross-border commuting from France to the high-wage Swiss labor market. Using a difference-in-difference strategy comparing French border labor markets with unaffected inland markets, I find: French wages increase among mid- and low-skill workers; French employment does not decline overall and increases among low-skill workers; population, labor force participation and unemployment rise in France. I interpret the effects with an equilibrium search model where labor demand and supply are endogenous: The reform increased the value of local job search, drawing more workers into the labor force and lowering labor market tightness.

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1 Introduction

In many models of the labor market, better outside employment options increase workers' wages. The effect of options on aggregate employment is, in contrast, ambiguous—it depends on how strongly labor supply and labor demand respond to changes in the outside option: Higher wages can dampen labor demand, but they can also increase labor supply. The relative magnitude of these two channels is key to understanding how the economy adjusts to changes in outside options arising from labor market shocks and policies. But it is challenging to empirically study the aggregate effects of workers' outside employment options: While local labor demand shocks (Schubert et al., 2021; Beaudry et al., 2012) vary workers' options, they by definition impact aggregate local labor demand. In the present paper I study the effects of a labor market reform that improved workers' options without directly changing labor demand.

The reform, announced in 1998, eased worker mobility between France and Switzerland: It removed several restrictions to cross-border commuting. There were large wage differences between the countries—workers could boost their wage by 20 percent 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 percent of the active labor force in the French areas whose residents were eligible work in Switzerland.

I study the effects of the reform on the French labor markets along the border to Switzerland and present three results. First, at French employers, wages increase without lowering employment. Second, there is considerable heterogeneity across skill groups. Wages increase among low- and mid-skill workers while I find no change in the wages of high-skill workers. Employment increases among low-skill workers while I find no change in employment of other groups. Third, the integration increases the active labor force in the treated areas as both labor force participation and the resident population increase. This endogenous supply response is strong enough to increase unemployment and, as argued below, reduce labor market tightness.

To guide the empirical analysis and interpret the findings I use a stylized search and bargaining model. Unemployed French residents find vacancies in two labor markets: France and Switzerland. The labor market integration raises the finding rate for Swiss vacancies. This raises the value of unemployment—workers' outside option when bargaining with firms—and thus the wage. The impact on employment in French firms is ambiguous: Higher wages lower vacancy posting, but because different workers value leisure differently, higher wages can draw more workers to participate in the labor market. The relative strength of these supply and demand adjustments, together with the matching function elasticity, determines the net effect on French employment.

An important contribution of the present paper is the ability to empirically study these supply and demand adjustments. First, since labor supply depends on aggregate conditions in the local labor market, the cross-location variation I 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, 2021; Caldwell and Harmon, 2018). Existing studies on aggregate wage effects of outside options either identify the partial equilibrium wage effects (Beaudry et al., 2012) or exploit variation that changed options for a particular group—workers willing to migrate or commute long distances on a less than weekly basis (Green et al., 2019). The integration I study, in contrast, increased access to high-wage jobs almost next door and thus affected all workers. This is important because some workers may dislike long commutes (Le Barbanchon et al., 2020). Second, by combining evidence from employer-employee records and survey data I can disentangle the labor supply effects—measured through labor force participation—from frictional or other equilibrium channels. Third, the setup allows me to assess the impact on French employment as mediated through the endogenous change of labor supply. The results suggest that, if job creation depends on labor market tightness, the supply response to demand shocks can have feedback effects on employment (Notowidigdo, 2020; Amior and Manning, 2018; Autor et al., 2013; Bound and Holzer, 2000; Blanchard and Katz, 1992). [1]

I estimate the effect of the integration with a difference-in-differences research design. Because the treated labor markets are not a random sample of French labor markets, I compare them to a matched set of control labor markets. I match on labor market characteristics in the last pre-reform year and on the average wage growth in the last three years before the reform. I then compare the change in labor market outcomes before and after the reform between the treated and the control units. The identification assumption is that the reform was exogenous conditional on the matched variables. The assumption is plausible because the reform was decided between Switzerland and the European Union—there was no room for local interests shaping the policy outcome.

I isolate the wage effect of the integration from compositional changes in the workforce in two ways. In the first I calculate local wage growth for all workers that remain employed in two consecutive years. This uses a large but selected sample of workers—the data only report the wage from the preceding year if the worker is at the same firm in both years. In the second I estimate treatment effects at the worker level using a panel dataset. This uses a smaller sample of workers but a representative one. The two approaches yield qualitatively similar results.

I first document the impact on commuting from France to Switzerland. Even though residents with different education levels had similar wage gains from getting a Swiss job, it is highly educated ones that start commuting more: Their commuting propensity increases by 1.1 percentage points—a 30 percent increase relative to the pre-period.

The wage results indicate that the integration raised wages of workers employed in France. The measure of wage growth indicates that wages grow by 1.5 to 2.2 percent. The worker-level wage regressions indicate that wages grow by 1 percent. This stems not only from higher wages of firm stayers and but also from higher re-employment wages after non-employment.

[1] In a related paper, Bütikofer et al. (2020) study the effects of opening the bridge between Malmö in Southern Sweden and the Danish capital Copenhagen. My paper differs in setting and focus. First, Swedes wanting to get a Danish job had to commute at least 18 kilometers (the length of the bridge), while parts of the French-Swiss border share a common urban area. On average, Swiss wages were twice as high as French wages; Danish wages were 13 percent higher than Swedish ones. Second, my paper documents within-worker wage growth and the impact on aggregate employment levels in the sending region, it dissects the labor demand and supply adjustment in more detail and it connects the effects to a search model.

Even though transitions between employment and non-employment could be endogenous, it is consistent with a higher reservation wage from the better outside option. This contrasts with Jäger et al. (2020) who find no effect of unemployment benefits on re-employment wages. My estimates—unlike theirs—also capture the market-level adjustment. But under the interpretation that the integration lowered labor market tightness, the market-level adjustment dampens the increase in the value of unemployment and wages.

Given the heavy concentration of skilled workers among the new commuters, I estimate the effects separately for three different skill groups as defined by their profession. The wage effects are concentrated among workers at the bottom of the skill distribution: Wage growth increases by 1.9 percent for low-skill and by 2.6 percent for mid-skill workers. At the individual level, the wages of these skill groups increase by 1 to 1.5 percent. Among high-skill workers I find only limited evidence of higher wages.

Despite the increase in cross-border commuting and higher wages I find no evidence of a decline in French employment during the sample period. If anything, there is an imprecise increase in employment in French firms of around 1.5 percent that is larger in the first years of the integration. Splitting up the employment effects across skill groups reveals an increase of low-skill employment of four to six percent and no evidence of a decline among the other groups.

Two alternative matching approaches confirm the wage effects across skill groups, and most of the employment effects; an exception is an insignificant decline in high-skill employment in one of the approaches. The effects also persist when controlling for regional exposure to nation-wide policies that could impact the wages of different skill groups differently.

Assessing how labor demand and labor supply adjust, I find no evidence that the employment effects are demand-driven. First, there may be a general equilibrium effect: Because cross-border commuters earn higher salaries in Switzerland, labor demand in local non-tradable sectors may increase in France. Yet low-skill employment increases in the tradable sector, while it does not change in the non-tradable service sector and declines insignificantly in the construction sector. Second, the labor market integration was part of a set of other agreements between Switzerland and the European Union. While the agreements concerned specific areas and were unlikely to impact the labor market in the aggregate, I allay concerns that they had confounding effects. First, the share of exports of French firms' sales does not increase after the reform. Second, while one agreement lowered the fixed cost of trade in some manufacturing sectors, the positive employment effect on low-skill workers persists when dropping these sectors.

In contrast to labor demand, labor supply responds substantially in the affected French labor markets: The active labor force increases by almost four percent—amounting to almost 100'000 workers, this vastly overcompensates for the outflow of commuters to Switzerland. It stems from a higher population and a higher labor 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. As a result of higher labor supply both the number of unemployed persons and the unemployment rate increase.

Because employment does not decline and the unemployment rate increases, I infer that the increase in the labor force lowered labor market tightness. Concretely, the unemployment rate increases because it takes longer for unemployed workers to find a French vacancy. With a standard matching function, this stems from more unemployed workers or from fewer vacancies. But fewer vacancies would imply lower employment, which is not consistent with the results.

This finding is also relevant for the literature on the minimum wage: Higher labor supply can offset higher labor cost (Manning, 2021). While some structural work finds that minimum wages increase participation and the unemployment rate (Ahn et al., 2011; Flinn, 2006), quasi-experimental studies on this channel are limited: They focus on a specific segment of the labor market (Godøy et al., 2021) and also abstract from aggregate employment effects (Lavecchia, 2020; Giuliano, 2013; Brochu and Green, 2013). My paper in contrast finds that a policy-induced rise in labor cost can increase participation in large parts of the population; the resulting slack in the labor market increases the employment level for low-skill workers. This suggests that local labor supply is elastic enough to compensate for the reduction in labor demand from a small increase in wages.

2 The integration of local labor markets

In late 1998, Switzerland and the European Union (EU) announced seven bilateral agreements that were signed in June 1999. The agreements were activated in June 2002, having passed the European and Swiss parliament as well as a referendum in Switzerland. Among the agreements, the one on free movement of persons guarantees free worker mobility between the EU and Switzerland for cross-border migrants and for cross-border commuters. Because of higher cost of living in Switzerland, it was more attractive for French residents to become a cross-border commuter instead of migrating to Switzerland.[2]

Even though the labor market integration was the outcome of a negotiation, it was unlikely driven by particular interests in the French-Swiss border region. Specifically, because the EU's negotiating position was based on two general principles—that all agreements became active at the same time, and that they were in line with the 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 some specific sectors:[3] Air and land traffic was liberalized; Swiss public entities needed to tender internationally; and in some manufacturing sectors the approval of products was eased, lowering the fixed cost of trade. I will carefully discuss and empirically assess whether these agreements had a confounding effect.

[2] As a result, the stock of commuters from France was higher than the stock of French migrants in Switzerland already before the labor market integration, and the difference increased after the labor market integration.

[3] See table A1 for details.

Cross-border commuting had been possible already before the reform, but there were restrictions. The first restriction was geographic. A border region, containing municipalities on both sides of the border, had been established in 1946. Residents from the border regions received a border card and could freely cross the border since. They were also the only French residents who could get a job in Switzerland. The second restriction was that Swiss firms had to first look for a worker in Switzerland before hiring a cross-border commuter.[4] [5]

The restrictions were removed in three steps.[6] First, the transition phase 1999 to 2003 eased labor mobility in the border region: Weekly instead of daily commuting became possible; the duration of a work permit increased from one to five years; and it became possible to change the workplace in Switzerland. In addition, new French commuters no longer had to live in the border region for six months before accepting a job in Switzerland. Thus, internal migrants in France could accept a job in the Swiss border region, move to a French municipality in the border region and start commuting from there. During this transition phase, there can be anticipation effects: Swiss authorities handled permit applications more leniently after the announcement of the integration (Beerli et al., 2021) and French residents were aware of the integration at least in late 1999 (Merckling, 1999).

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

Figure 1a illustrates the labor markets along the French-Swiss border. The black dotted line is the Swiss country border. The grey area on both sides of the border is the border region. The yellow areas are French labor markets that have at least one municipality in the border region. I call them eligible labor markets. The blue areas are French labor markets that could be affected by spatial spillover effects, as argued in section 4.2.1.

Insert Figure 1 about here.

The empirical analysis focuses on the time period until 2007 and omits the impact of abolishing the border region in 2007 for two reasons. First, because workers minimize the time spent commuting, the increase in outside options is strongest for workers living close to the border. This limits the impact of the last liberalization step. Second, the macroeconomic environment changed after 2007: As the Swiss Franc appreciated and the economic crisis hit Europe, it may have become more attractive to get a job in Switzerland. This could confound the direct impact of the labor market integration.

[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]While in theory it was also possible to commute from Switzerland to France, few Swiss chose to do so: In 2000, around 0.03 percent of the Swiss labor force in the border region worked in France (Federal Statistical Office, 2000).

[6]Other regulations did not change. In particular, regulations for unemployment insurance and pension contributions did not change, but cross-border commuters had to register with the Swiss health insurance after the reform. The taxation of commuters did not change either, 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.

3 Search and bargaining in local labor markets

I study the effects of the labor market integration through the lens of an equilibrium search model with bargaining, drawing on Flinn (2006) and Schmutz and Sidibé (2019). The model—discussed in detail in appendix D—is a standard search and bargaining model in continuous time with two key extensions. First, workers find vacancies in two labor markets $m \in \{1, 2\}$—1 for France and 2 for Switzerland. Second, labor supply is endogenous because workers have a heterogeneous value of leisure.

3.1 Setup

Unemployed French workers find vacancies from either market at rate λ_m.[7] For now, I assume that they are exogenous but relax it below. Throughout the analysis, I take the number of Swiss vacancies as given. French firms decide on posting vacancies which has a fixed cost. They post vacancies until a free entry condition is met, and so the expected value of opening vacancy is zero. Matching is random, and when a worker finds a vacancy, the match productivity θ—drawn from the cumulative distribution function $G_m(\theta)$—is revealed. Nash bargaining delivers the standard expression for wages:

$$w_m(\theta, V_n) = \alpha_m \theta + (1 - \alpha_m)\rho V_n \tag{1}$$

where α_m is workers' bargaining power when bargaining with a firm in market m. ρV_n is the value of unemployment and therefore the workers' outside option when bargaining with the employer. It measures unemployed workers' expected benefits from search for a job. It depends on the flow value of unemployment b and on the option of receiving a job offer from France or Switzerland. Formally, it can be written as

$$\rho V_n = b + \alpha_1 \frac{\lambda_1}{\rho + \eta_1} \int_{\rho V_n} [\theta - \rho V_n] dG_1(\theta) + \alpha_2 \frac{\lambda_2}{\rho + \eta_2} \int_{\rho V_n} [\theta - \rho V_n] dG_2(\theta) \tag{2}$$

This is the first key equation of the model. The option value of being unemployed in France depends on how easy it is to find a job in either of the markets (λ_m), on the probability that the job is destroyed (η_m), on the distribution of match productivity and on workers' bargaining power in the market. Workers never accept jobs that pay wages below ρV_n because they are better off with continuing to search.

The value of unemployment also determines labor force participation. Specifically, when workers are out of the labor force, they have utility ρV_o, which is distributed according to some continuous distribution function $Q(\rho V_o)$. Since newly participating workers start off as unemployed, any worker whose reservation utility is $\rho V_o < \rho V_n$ participates in the labor market, and the participation rate is $Q(\rho V_n)$.

[7] I abstract from search on the job. If workers would also find Swiss jobs while employed, the sign of the change in the value of unemployment depends on whether search on or off the job becomes more effective. The evidence I present suggests the latter. On-the-job search would also complicate the analysis (see also Flinn (2006, section 2.3)).

A common matching function M for both labor markets makes the job finding rate endogenous. It takes the form: $M(\tilde{u}_1 + \gamma_u \tilde{u}_2, v_1 + \gamma_v v_2)$. It is concave, increasing in both arguments and has constant returns to scale. $\tilde{u}_m$ is the number of unemployed job seekers residing in market m. v_m is the number of vacancies in market m. γ_v is the visibility of Swiss vacancies to French workers, relative to French vacancies. γ_u is the visibility of unemployed Swiss workers to French firms, relative to unemployed French workers.[8] In principle, the labor market integration increased both γ_v and γ_u; but since Swiss workers had few incentives of working in France, I abstract from γ_u and assume the labor market integration only increased γ_v. The rate at which French workers find a vacancy depends on the number of vacancies and unemployed workers in both markets; with probability $\pi_1 = \frac{v_1}{v_1+\gamma_v v_2}$ the vacancy is from a French firm, and with probability $\pi_2 = \frac{\gamma_v v_2}{v_1+\gamma_v v_2}$ the vacancy is from a Swiss firm. More formally the job offer arrival rate for Swiss jobs is $\pi_2 \frac{q(k)}{k}$ where $q(k) \equiv M(k, 1)$ and $k = \frac{\tilde{u}_1+\gamma_u \tilde{u}_2}{v_1+\gamma_v v_2}$. $1/k$ is the market tightness from the point of view of workers.

An equilibrium is then given by the value of unemployment, the size of the participating labor force, the unemployment rate, the number of unemployed workers, and the number of vacancies.

3.2 Impact of the labor market integration

I will compare steady states before and after the reform, which requires constant fraction of residents in French and Swiss jobs and no more changes in the wage. There is some support for this assumption: While I have no annual data on the fraction of French residents with a Swiss job beyond 2001, I find that wage growth levels off in the first four years after the integration.

3.2.1 The integration increases workers' access to highly paid jobs

Equation (2) shows that access to the Swiss labor market impacts the value of unemployment through the average wages $\alpha_2 \int_{\rho V_n} [\theta - \rho V_n] dG_2(\theta)$ and through the vacancy finding rate λ_2, net of the job destruction rate η_2 and the discount rate. I now assess their empirical counterparts.

First, the vacancy finding rate increases through an increase in γ_v. Empirically I can measure the job finding rate for Swiss jobs, which is $\lambda_2 \overline{G}_2(\rho V_n)$, where $\overline{G}_2(\rho V_n)$ indicates the survivor function $1 - G_2(\rho V_n)$. Appendix figure A1 suggests that, in the first years of the integration, the annual job finding rate for Swiss jobs among unemployed French residents increased from around 1.5 percent to almost 3 percent. But in France as a whole, the annual job finding rate of the unemployed is around 30 percent. This indicates that there remained substantial search frictions for finding a Swiss job. The figure also shows that, for employed workers in France, the job finding rate for Swiss jobs barely changed. This supports the decision to abstract from on-the-job search.

Second, along the border, Swiss wages were on average twice as high as French wages at the time of the reform. But because such large differences may not fully translate into wage gains

[8] This approach is taken from Meghir et al. (2015, section 5).

for French workers from getting a Swiss job,[9] I estimate wage differences between the countries in the Labor Force Survey. I exploit its short panel structure—workers are included for three years—and the information on the country of work to estimate wage regressions at the worker level.

As shown in column 1 of table 1, workers in Swiss jobs earn on average 0.5 log points or around 65 percent more than workers in French jobs. Because workers self-select into having a Swiss job, in column 2 I add a worker fixed effect to the regression. This amounts to comparing the wages of the same worker when she changes between a French and a Swiss job. The wage gap drops to 0.19 log points. Further controls for a cubic in job tenure[10] and broad industry—added in column 3—do not change the estimate. While this indicates substantial selection into Swiss jobs based on the level of French wages, it also suggests an important wage boost conditional on accepting a Swiss job—roughly equivalent to the education premium between workers with a mandatory and a secondary education. Yet, if French workers select into Swiss jobs based on the gains from it, these estimates are an upper bound for the potential wage gains of French workers employed in French firms.

Insert Table 1 about here.

Because—as documented in the results section—the propensity to commute increased most strongly for highly educated workers, in the remaining columns of table 1 I compare the gains across two education groups: tertiary education and below.[11] Column 4 shows a large wage gap in both groups. The gap is higher for less educated workers (0.5 log points) than for workers with a tertiary degree (0.43 log points). In the remaining columns I progressively add person fixed effects and tenure and industry controls to the regression. The preferred specification in column 6 indicates similar gains for both education groups of around 0.2 log points. But for highly educated workers the confidence intervals include gains of up to 0.4 log points.[12]

3.2.2 Equilibrium impact on French labor markets

The value of unemployment depends on a weighted average of expected French and Swiss wages where the weights depend on the job finding rates. The integration increases the weight on the high-wage Swiss jobs. This increases the value of unemployment and therefore wages.[13]

[9] It could be that they work in systematically different jobs than Swiss workers do, or that they have less bargaining power with Swiss employers, or that they are less productive in the same job, for instance because they lack some country-specific human capital. French is the main language in most Swiss areas along the border so that language barriers are unlikely to be the key driver for any observed wage gaps between Swiss workers and French border commuters.

[10] Since I estimate the gains from recent job switchers, French workers in Swiss jobs will tend to have lower tenure compared to the average worker in a French job in the sample.

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

[12] This could stem from a small sample size, or it could indicate that for these workers, the gains of getting a Swiss job are very heterogeneous.

[13] In the most standard model, the Nash rule holds continuously in an on-going job, so that wages also grow for job stayers. This would not hold for instance in Pissarides (2009).

The impact on French employment is ex-ante unclear. On one hand, fewer matches are formed: Workers only accept a job when the match productivity is at least ρV_n. On the other hand, the higher value of unemployment may draw more workers into the labor force.[14] The relative magnitudes of these two effects depends on the densities of the distribution functions $\overline{G}_1(\rho V_n)$ and $Q(\rho V_o)$—the elasticities of labor demand and supply—around the current ρV_n. The impact on employment also depends on the equilibrium adjustment in the number of vacancies and the number of unemployed workers, and therefore on the elasticity of the matching function.

The impact on the French unemployment rate is also ex-ante unclear. First, if wage differences between France and Switzerland are not driven by higher bargaining power in Switzerland, then the higher visibility of Swiss jobs lowers the unemployment rate in France: The increase in the finding rate for Swiss jobs is higher than the decrease in the finding rate for French jobs. But the equilibrium adjustment may increase the unemployment rate: either through fewer vacancies, induced by the truncation of the match productivity distribution, or through an increase in labor force participation. The former predicts a decline in employment levels, while the latter does not. Thus, if the unemployment rate increases overall after the labor market integration, I can infer the relative size of the labor supply and demand adjustments by comparing it to the change in French employment levels.

4 Data & Empirical design

4.1 The data sources

To investigate the impact of the labor market integration on the French labor market I use several data sets. Before describing them in detail, I explain the data processing that is common to all of them.

4.1.1 General sample selection and definitions

I focus firms and workers in the private sector, excluding agriculture. I keep workers that are at least 16 and at most 64 years old. I drop apprentices and interns, and workers with missing data on occupation or place of work. Large parts of the analysis rely on data aggregated at the cell level. A labor market cell is defined as a combination of local labor market, year and demographics such as skill, education and gender. Local labor 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 groups are defined based on workers' two-digit occupational classification.[15] High-skill occupations are managers, executives, scientists, engineers, lawyers. Mid-skill occupations are technicians, foremen, skilled

[14] An extension to multiple markets and a migration decision would also predict an increase in the number of residents; see for instance Schmutz and Sidibé (2019).

[15] 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") is reported with almost no change until 2008. It changes in 2002 for some managers, but both their old and their new two-digit socioprofessional category lie in the high-skill group.

blue collar workers and administrative employees. Low-skill occupations are unskilled blue and white collar workers (craft, manufacturing, sales clerks). Where available,[16] I group workers into three education groups based on their highest degree; the education groups are: mandatory education, secondary education and tertiary education. Furthermore, some results are disaggregated by four 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); and the remaining sectors are classified as *other*.

4.1.2 Data sets

This is an overview of the data used. More information is in appendix A.3

Matched employer-employee data The main data come from social security declarations by employers ("DADS") from 1995 to 2007 (Insee, 1995). 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 whether it is the worker's main spell in that year.[17] I use two versions of the DADS data: The *DADS Postes* that has limited longitudinal information on workers and the *DADS Panel* where I observe workers across years.

DADS Postes I 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 how part-time employment is reported changes during the sampling period.[18] 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 that work at the same establishment in two consecutive years; appendix A.3 explains in detail how I calculate the wage growth and shows that this measure relies on weaker assumptions about worker selection than existing work on the aggregate effects of outside options (Beaudry et al., 2012).

DADS Panel The wage index ignores the wages of workers that start new jobs. Because low-skill workers more often change employer (or are out of employment), the wage index also covers skill groups differently and this could introduce a bias. For this reason I also estimate worker-level wage effects using the *DADS Panel* data set, which is a four percent 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. I sample workers as follows. First, I select workers

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

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

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

whose last employment spell before 1999 is in one of the treated or control labor markets.[19] Second, I keep all spells from 1995 to 2007 of these workers when they are employed in one of the treatment or control labor markets. I 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 in each year.

Population census The census is representative for the entire population at the place of residence and includes cross-border workers as well as non-employed persons. The relevant census years are 1990, 1999, 2006 and 2007. The cell-level outcomes I measure are population, the propensity to commute to Switzerland and labor market status: the participation, employment and unemployment rate. I assign the census data from 1999 to the pre-period since the data were collected already in March 1999—shortly after the labor 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.

Labor Force survey The survey 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. I use the survey to study the change in the propensity to commute. I include all persons if they satisfy the age restriction.

Firm-level data from tax declarations Balance sheets from tax declarations measure several firm-level variables: labor cost, wage bill, exports, sales and value added. For multi-establishment firms, I only observe the firm's total, and thus apportion the values to establishments based on their employment share within the firm. The data are then aggregated at the cell level, defined by year, labor market and sector.

4.2 Empirical design

4.2.1 Estimating the effect of the labor market integration

To estimate the effect of the labor market integration, I define the set of treated labor markets as markets that are at most a distance $\bar{d}$ away from the French-Swiss border. It includes eligible labor markets that contain at least one border municipality as defined in the agreement. It also includes markets that could be affected by ripple effects: Because of commuting linkages, local labor markets overlap spatially and a shock in one area can have spillover effects on areas close by (Manning and Petrongolo, 2017; Monte et al., 2018; Nimczik, 2020). To consider such spillovers in the estimation, I define $\bar{d} = 84$ kilometers as the width of a belt drawn around the French-Swiss border. $\bar{d}$ is defined by the municipality in the eligible labor markets that

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

is furthest away from Switzerland. The resulting set of 22 treated labor markets is shown in figure 1a. The eligible labor markets are in yellow and the spillover labor markets are in blue.[20]

I 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 4.2.2; here I present the regression models.

Worker-level labor force survey data In a first step, I estimate the impact of the labor market integration on cross-border commuting in the labor force survey until 2002. Since commuting was initially restricted to residents from the border region, I compare the commuting behavior of residents in the treated group with the one of residents in the control group. Because the eligibility to commute varied by municipality, I estimate the following regression for person i residing in municipality c in year t:

$$\begin{aligned} y_{ict} = \alpha_c + \alpha_t + \sum_{\tau \neq 1998} \beta_\tau treat\_BordReg_c \times 1[t = \tau] \\ + \sum_{\tau \neq 1998} \theta_\tau treat\_noBordReg_c \times 1[t = \tau] + \gamma X_{ict} + v_{ict}. \end{aligned} \tag{3}$$

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 labor markets; $treat\_noBordReg_c$ is a dummy indicating whether the municipality belongs to the non-eligible area in the treated labor 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 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 labor force survey, I cannot estimate equation (3) for sub-group—the municipality-group fixed effects would not be identified in many cases.

Aggregate data French municipalities are small and they do not represent a local labor market. To estimate the aggregate impact of the integration I use a range of difference-in-difference regression models at the level of the local labor market m. The first model estimates annual treatment effects for each year $\tau \neq 1998$ for a group of workers g:

$$y^g_{mt} = \alpha^g_m + \alpha^g_t + \sum_{\tau \neq 1998} \beta^g_\tau treat_m \times 1[t = \tau] + \gamma^g X^g_{mt} + v^g_{mt}. \tag{4}$$

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

Given the aggregate nature of the data, the models are estimated separately for each worker group g. α_m^g are fixed effects for labor market m of worker group g and account for time-constant heterogeneity at the level of the labor 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 labor markets. The coefficients of interest are β_τ^g: They estimate the effect of the labor market integration on workers in group g for different years. X_{imt}^g is a set of additional controls. First, it includes a linear time trend that is, for each group g, specific to the matched treated-control pair of labor markets. Including the trends improves the precision of the estimates; point estimates when not including them are reported for robustness and are often very similar in magnitude. Second, in robustness checks I add further labor-market specific observables from 1998. The observables are interacted with a linear time trend. v_{it}^g is an error term orthogonal to the treatment assignment.

When using the census data, only coefficients for years 1990, 2006 and 2007 will be estimated, with 1999 being the omitted category. Some outcomes have pre-existing trends between 1990 and 1999, stemming from differences in demographic composition and from differences in migration rates that exist at least since 1982. In appendix A.4 I explain how I account for these differences with a set of controls for the pre-existing migration rate and for changes in the working-age population stemming from retirement and labor market entry.

I modify model 4 to estimate treatment effects for the two periods of the labor market integration. Similar to Beerli et al. (2021) I estimate a treatment effect for the transition period ($1999-2003$) and for the free mobility period ($2004-2007$):

$$\begin{aligned} y_{mt}^g =& \alpha_m^g + \alpha_t^g + \beta_{\text{transition}}^g treat_m \times 1[1999 \leq t < 2004] \\ &+ \beta_{\text{free}}^g treat_m \times 1[2004 \leq t \leq 2007] + \gamma^g X_{mt}^g + v_{mt}^g. \end{aligned} \tag{5}$$

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

All regressions for aggregate data are weighted by cell-level employment in 1998 for employment and wages and by the cell-level resident population in 1999 for census data.

Worker-level panel data I modify the regression models from the aggregate data to the worker panel. I estimate annual treatment effects as follows:

$$y_{it} = \alpha_i + \alpha_t^{G(i)} + \sum_g \sum_{\tau \neq 1998} \beta_\tau^g treat_i \times 1[G(i) = g] \times 1[t = \tau] + \gamma^g X_{m(i)t}^{G(i)} + v_{it}. \tag{6}$$

$G(i)$ denotes the skill group g of worker i, defined by the skill in the last observed spell before 1999. Her labor market $m(i)$ is assigned in the same way. Treatment effects are specific to the worker group g. In contrast to equations (4) and (5), the parameters for different worker types are estimated in one equation, and the year fixed effects as well as the linear time trends in $X_{m(i)t}^{G(i)}$ are specific to the worker group $\times$ matched labor market pair.

The fourth model is adopted from (5) for the worker-level data:

$$\begin{aligned} y_{it} =& \alpha_i + \alpha_t^{G(i)} + \sum_g \beta^g_{\text{transition}} treat_m \times 1[1999 \leq t < 2004] \times [G(i) = g] \\ &+ \sum_g \beta^g_{\text{free}} treat_m \times 1[2004 \leq t \leq 2007] \times [G(i) = g] + \gamma^g X^{G(i)}_{m(i)t} + v_{mt}. \end{aligned} \tag{7}$$

Inference I cluster the standard errors at the level of the labor market. There are 44 clusters in the main specification. The assumption that outcomes across labor markets are independent from each other may be strong. I thus also report standard errors clustered at the level of the department, the next higher sub-national unit.[21] Here there are 27 clusters and I calculate the small-sample correction by Imbens and Kolesar (2016).[22] In effect, the standard errors from the two approaches are very similar.

4.2.2 Matching to find a suitable control group

Equations (3) to (7) compare the evolution of outcomes in affected areas with non-affected ones. Because the labor market integration was not randomly assigned across labor markets, differences between the treatment and control group may bias the estimated effect. One reason are differing labor market dynamics as wages in the control area could be growing more slowly than wages in the treatment area already before 1998. Another reason is that labor markets may have different sectorial structures that expose them to different time-varying shocks. In both cases the regressions would wrongly attribute differences in the change in outcomes to the labor market integration when in reality they are driven by other factors.

I define the control areas as follows. To minimize the risk that spillovers across areas contaminate the control group, I consider as potential controls only labor markets that are at least 150 kilometers away from the Swiss border. To find suitable control units that are as similar as possible to the treated labor markets I use Mahalanobis matching. It is relatively robust in different settings, in particular in small samples, but the set of included covariates should not be too large (Zhao, 2004; Stuart, 2010). I therefore include a limited set of covariates that I believe impact potential outcomes after 1998.[23]

Specifically, I match on the index of wage growth for the three skill groups between 1995 and 1998 to account for different labor market dynamics before the labor market integration. I also match on the following covariates in the cross-section in 1998 to account for other unobserved heterogeneity that could affect the labor market after 1998:[24] the employment shares of the

[21]But labor markets can overlap department boundaries. When they do, I assign the market the department where it has the largest employment share in 1998.

[22]They show that the approach has good coverage rates even in small samples with heterogeneous cluster sizes, and it is simple to compute.

[23]I have also experimented with adding more variables but the overall match quality worsens.

[24]Accounting for differences in the industry structure is important because industries may react differently to the market integration. For instance, when French firms need to raise wages, the ones that sell to a local consumer base may be better able to raise prices and pay their workers more (Harasztosi and Lindner, 2019). Accounting for the distribution of employment across skill groups is important because macroeconomic shocks could affect different skill groups differently. Accounting for the own commuting share is important to account for heterogeneous responses in commuting across French labor markets which can affect how the labor market

four sectors, the employment shares of the three skill groups and the share of residents that live and work in the same labor market. I call the latter the own commuting share. I loosely call the full set of variables covariates even though some of them are pre-existing trends in outcomes.

The resulting status of local labor markets is shown in figure 1b. The yellow labor markets are in the treated group, and the blue labor markets are in the control group. The excluded inland labor markets are shown in pink.

To assess balance of the main matching strategy, I compare the overlap in covariate distributions between the treatment and the control group using three measures.[25] 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 control (treatment) group.[26]

Table 2 presents summary statistics for the sample before and after matching. Panel A compares, for each covariate,[27] the treated units to all potential control units, and 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 the 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.

Insert Table 2 about here.

The second-last row in each panel measures the multivariate distance between the covariates of the treated and control units. It is the variance-weighted distance between covariate means of treated and controls. The matching reduces the distance from 1.19 to 0.22, suggesting that the matching strategy reaches a reasonable balance in the covariates between the treatment and control labor markets.[28]

integration affects the local economies (Monte et al., 2018).

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

[26]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.

[27]I have not matched on the log wage in 1998 but include it in the table as additional information.

[28]I am not aware of benchmarks for these measures, but Imbens and Rubin (2015) refer to substantial imbalance for a sample with multivariate distance of 1.78, and to excellent balance for a sample with multivariate distance of 0.44.

4.2.3 Identifying assumptions

To give the estimates in equations (3) to (7) a causal interpretation, I make three assumptions.

First, I assume that the matched control areas are not affected by the labor market integration. The assumption is violated if input or output markets transmit the local shock to the rest of the French economy.

Second, I assume that only the agreement on cross-border commuting had a differential impact on French border regions, relative to other regions in France. This assumption is ex-ante plausible and there is no evidence against it. The assumption is plausible because the other agreements concerned very specific areas, making it unlikely that they affected the aggregate labor markets in the border region.[29] The assumption is also plausible because transporting people is more costly than transporting goods (Monte et al., 2018), which implies that the effect of the labor market integration decays much more quickly across space than any effects of the other agreements. The assumption is neither rejected—to the extent that it is testable—by the evidence. I find no evidence of higher exports after the reform. Because the trade reform affected a clearly defined set of sector, I also drop these sectors 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, I match on pre-existing trends in wages. This prevents me from interpreting pre-event treatment effects as placebo tests; instead I need to assume that the reform was exogenous to these matched trends. But in the present setting, this appears plausible. Pre-trends may indicate policy endogeneity[30] or anticipation. Policy endogeneity is unlikely in the present case because the reform was not decided at the local level, but between the Swiss government and the European Union. Anticipation before 1998 is also unlikely because the details of the policy were not known in the public and it was unclear whether the parties would even reach an agreement.[31]

5 Results

I now turn to the results. The figures report error bars corresponding to 95 percent confidence intervals using standard errors robust to clustering at the labor market level. The tables have standard errors, clustered at the labor market level, in parentheses. Some tables have standard errors, clustered at the department level, in brackets. Since they are very similar, the discussion will refer only to the former.

5.1 Commuting from France

I start by assessing how likely residents in French municipalities in the border region were to work in Switzerland before and after the announcement of the reform in 1998. The results

[29] Tariffs between Switzerland and the EU had been abandoned in 1972.

[30] For instance, minimum wages may rise more when labor market demand is high.

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

from estimating equation (3) are shown in Figure 2a: While there is no significant trend in the propensity to commute to Switzerland from 1993 to 1998, this changes 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.

Even though these results indicate that the labor market integration rapidly changed eligible workers' access to Swiss jobs,[32] they are limited for three reasons: the coverage ends in 2002; the sample is small so that subgroup analysis is difficult; and the estimates do not reflect the impact on the local labor market because eligible municipalities are part of a larger local labor market.

Insert Figure 2 about here.

Thus, in figure 2b, I show longer-term estimates of the effect on the local labor market from estimating equation (4) in the census data. From 1990 to 1999, the fraction of commuters insignificantly rises for highly educated workers but not for other education groups. The fraction increases significantly from 1999 to 2007, mostly among highly educated workers.

Table 3 contains the results from estimating equation (5). The fraction of commuters increases by one percentage point from 2.5 percent in 1999. For workers with a tertiary education, the probability to commute increases by 1.7 percentage points. Estimates for other education groups close to zero. Columns 5 to 8 report the estimates from including the controls for pre-existing population dynamics. The point estimate for workers with a tertiary education drops to 1.1 percentage points. While the qualitative patterns across education groups persist, the table also indicates a significant but smaller increase in commuting of less educated workers. Relative to the commuting propensity in 1999, the effect size is one third for highly educated workers and roughly one fifth for the other education groups. Because the outcome is the propensity to commute, the increase in population I document in section 5.4.1 implies a larger increase in commuting if were population were held fixed in 1999.

In addition, appendix figure A10 shows that the impact on commuting is stronger in the eligible labor market and similar for men and women within education groups. Because women were less likely to commute before the reform, the effect sizes are larger in magnitude for women than men.

Insert Table 3 about here.

[32]In online appendix C.1 I show some evidence on commuting patterns across space in the French border region. Using data from Switzerland I also show that the increase in commuting from France is similarly strong from 1999 to 2003 as from 2003 to 2007.

As particularly highly educated workers from the French border regions found more jobs in Switzerland after the reform, it will be important to study not only the overall, but also the skill-specific impact on wages and employment in French labor markets.[33]

5.2 French employment and the wage growth index

5.2.1 Overall

Figure 3 presents annual estimates on wages and employment in France. The results from equation (4) are in figure 3a for wages and in figure 3b for employment. The results from equation (5) for wages and employment of all skill groups are in table 4.

After the labor market integration, wages grow in France, 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) percent higher during the transition phase and 2.2 (0.6) percent higher 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 they do not change differentially from the control group after that. 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 (1) percent higher than before 1999. Although the point estimate remains similar in the free mobility phase, the standard error grows. The yearly estimates in figure 3b are consistent with this—after a significant increase of 1.7 percent between 1998 and 1999, the point estimates tend to shrink and become less precise from 2001 to 2007.

Insert Figure 3 about here.

Insert Table 4 about here.

5.2.2 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 gain are concentrated among low- and mid-skill workers. In the transition phase their wages rise by 1.3 and 1.8 percent, respectively, and in the free mobility phase by another 0.6 and 0.8 percentage points, respectively. Similar as for the average effects, wages grow most strongly in the first three years after the labor market integration is announced.

Columns 6 to 8 of table 4 show the employment effect for each skill group. Low-skill employment grows by 3.8 percent in the transition period, and by another 2 percent more in

[33]Because education is not available in the DADS data, I report differential impacts by skill. But among workers that transition from a French job to a Swiss job, the transition rates are around 6 percent in high-skill occupations, 4 percent among mid-skill occupations and 2 percent among low-skill workers.

the free mobility period, to an overall increase of 5.8 percent. 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. While the point estimate for high-skill employment is positive, the standard error is large.

So far, two conclusions stand out. First, wages grow more among workers who are less likely to take up the new job opportunities in Switzerland. Second, while more highly educated workers start commuting from France to Switzerland, I find no decline in overall employment and an increase in low-skill employment.

Wage growth index and employment by skill and gender Appendix figure A5 splits the skill-specific effects further up by gender. For low-skill workers, wages grow more quickly for men than women, but 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. The employment effects for low-skill workers are driven by men, particularly in the free mobility period.

5.2.3 Robustness checks

I assess the sensitivity of the results documented above in two ways: by using alternative matching approaches, and by accounting for exposure to national policies that could impact the treated and the control regions differently. I also assess the importance of including pair-specific time trends.

Alternative matching approaches To address some concerns about the matching strategy, here I present estimates from two alternatives. First, I match on the level of skill-specific in 1998 wages instead of their pre-existing wage growth. Second, because the Mahalanobis matching relies only on a small number of control units, I use entropy balancing (Hainmueller, 2012). It is a re-weighting estimator that creates weights across all potential control units so as to perfectly balance the first and second moment of the covariate distribution. A limitation of entropy balancing is that I cannot include matched time trends for each matched pair because the matching is not unit-specific. Appendix C.2 provides more details on the alternative matching approaches.

Table 5 shows the results; the corresponding event study plots are in the appendix C.2. 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.

Alternative controls and measurement Table A2 contains the estimates from equation (5) 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 labor 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 labor 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.

The effects on the wage growth index are also robust to only including workers that remain in the same skill group, as shown in figure A6. Lastly, the effects on employment are not driven by workers switching from full- to part-time employment: Table A3 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.

If the highest-earning workers leave their jobs in France to Switzerland, this may lower firms' wage bill and their labor cost may not change. Table A4 shows that this is not the case: The labor cost by 3 to 4 percent after the reform, even though the estimates are less precise than the ones for wages. The table also shows that labor cost increase in all sectors.

Appendix C.5 discusses estimates for the eligible and spillover labor markets. The wage effects are stronger in magnitude in the eligible markets, but also rise in spillover markets. The employment effects are more heterogeneous. In the transition phase, low-skill employment increases only in the eligible markets. In the free mobility phase, their employment rises in both types of markets, and overall employment declines insignificantly in the eligible markets.

5.3 Worker-level wages

I now turn to the wage effects at the worker level from estimating equation (6). Figure 6 shows the yearly effect of the labor market integration on the wages of workers. Figure 6a shows the average effect across all worker groups. From 1999 to 2001, the annual effects are similar to the effects on the wage growth index discussed earlier. Thereafter, the point estimates become smaller, but they remain within the confidence intervals of the wage growth index. The wage effects by skill group in figures 6b to 6d show qualitatively similar effects as for the wage growth index: There is no evidence of higher wages for high-skill workers. If anything, their wages decline in the free mobility period, but the estimates are not significant, and this could explain why the impact on overall wages in figure 6a declines over time. For both mid- and low-skill workers, wages grow by a similar magnitude during the transition period. The estimated coefficient drops temporarily for low-skill workers in 2004, but recovers in the following years.

One prediction of the search model is that wages can increase through two channels: through the higher outside option in same job, or through a reallocation of workers to more productive matches, stemming from the left-truncation of the match productivity distribution. To partly account for such changes in match productivity, I include firm fixed effect in some specifications of equation (7), whose results are reported in table 6. Column 1 indicates that across all workers, wages grew by 1 percent in the transition period and then did not increase any further in the free mobility period. In column 2 where I account for firm fixed effects the coefficient drops by around 20 percent but remains significant, implying that wage gains are not driven by workers finding jobs at more high-paying firms.

Column 3 shows that the skill-specific effects on worker-level wages are qualitatively similar to the wage growth index, but smaller. High-skill wages do not change in the transition phase and decline insignificantly in the free mobility phase. The effects on the wages of low- and mid-skill workers lie between 1 and 1.5 percent in 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.

Insert Table 6 about here.

Another prediction of the search model is that workers' reservation wages increase after the labor market integration. While I cannot measure reservation wages directly, I can study the impact on re-employment wages for workers that go through a spell of non-employment. Thus I estimate effects for three types of job spells:[34] new hires from non-employment, new hires from employment (job-to-job transitions), and job stayers. Two caveats apply to this analysis. First, because I do not observe spells at Swiss firms, a hire from non-employment could also be a hire previously employed at a Swiss firm. Second, the analysis conditions on an outcome—whether the worker transitions to non-employment or not—that may itself be a result of the labor market integration.

The results are in column 5 of table 6. It shows that wages grow for new hires from non-employment—around 1.8 (se: 0.6) percent in the transition phase—, as well as for job stayers—around 1.1 percent (se: 0.3) during the transition phase. Particularly for the re-employment wages, the point estimates are more precise during the transition phase than during the free mobility phase. There is no evidence for higher wages for job-to-job transitions. This makes sense since for these transitions, the outside option is the wage at the old job. Controlling for firm fixed effects increases the effect on re-employment wages in the transition phase to 2.3 but leaves the coefficient unaffected in the free mobility phase. Again, this indicates that the higher wages are not driven by workers finding jobs and higher-paying firms.

Appendix table A7 reports the effects separately by skill and transition type. Besides lower precision in the point estimates, it should be interpreted with caution: Skill differences in the treatment effect on re-employment wages may stem from difference in how labor market transitions within France change for different skill groups. Nevertheless, the table shows that

[34]See section A.3 for details.

re-employment wages increase for all skill groups; for high- and mid-skill workers more during the transition phase and for low-skill workers more during the free mobility phase.

5.4 Adjustment margins

5.4.1 Labor supply

The previous results indicate that it is hard to detect an employment decline in the treated labor markets during most of the sampling period, and that employment rose among low-skill workers. To understand why, this section explores the impact of the labor market integration on various adjustment margins of labor supply.

Table 7 contains the estimated effects on the log of population, of the participation, employment and unemployment rate, and of the unemployment counts. Column 1 indicates that the active labor force increases by 3.9 percent; this stems both from a higher population—column 2—and from a higher participation rate—column 3. The active labor force increases for workers with a tertiary and with a mandatory education. The margins differ—the increase stems from the population margin for highly educated workers while the two margins are equally large for workers with a mandatory education.

The remaining columns of the table show that most of the increase in labor force participation went towards unemployment, and not towards employment. Specifically, column 4 indicates perhaps a lower employment rate (significant at the 10 percent confidence level), while column 5 shows an increase in the unemployment rate of 12 percent. The unemployment counts—one input to the matching function—increase by around 16 percent overall; it is strongest for workers with a mandatory education.

Insert Table 7 about here.

Figure 7 presents the estimated treatment effects by gender and by education. Within education groups, the population effects are similar between men and women. The rise in participation is inversely related to the education level, and—except for tertiary educate workers—stronger for women than men. For workers with a mandatory education, the point estimate is twice as large for women than for men. Figure 7c shows that the increase in the unemployment rate differs across gender and education groups: It is driven by highly educated women, men with a secondary education and by men and women with a mandatory education. Finally, appendix C.6 shows that women with a mandatory education increase participation in the first four years after the reform.

Insert Figure 7 about here.

5.4.2 Labor demand

I now assess different labor demand channels that could have increased local employment. I do so by studying the impacts across sectors on firms' exports.

Employment effects across sectors Understanding the effects across sectors is a first step to assess whether increased labor demand can explain the observed wage and employment effect. The reform could directly increase labor demand through two channels. First, the demand for local non-tradable services and housing may increase because more people work in Switzerland with higher salaries (Moretti, 2010). To investigate the channel, I estimate the effects across the four broad sectors mentioned in section 4.1. Second, another agreement reduced the fixed cost of trade that could have increased the exports of French firms in the treatment area differentially from French firms in the control group. To investigate the channel, I estimate the effect on the tradable sector, but exclude the four-digit sectors affected by the reduced fixed cost of trade. The list of affected sectors is based on Bello and Galasso (2020); the trade agreement covered sectors when there was already an existing similar agreement within the EU.[35]

Table 8 shows the skill-specific employment effects across sectors. Column 1 shows the overall effects from table 4, columns 2 to 5 show the effects across the four broad sectors, and column 6 shows the effect for the tradable sector excluding the sectors impacted by the trade reform. The total employment effects—pooling all skill groups—across sectors in panel A indicate no change in the non-tradable and construction sectors but an increase in employment in "other" sectors. The latter stems from an increase in mid-skill employment (panel C). Panel D shows that the positive employment effect for low-skill workers stems entirely from the tradable sector where the treatment effect is 8 percent for the transition phase and 13 percent in the free mobility phase. When dropping industries impacted by the trade reform, these effects are 11 percent in the transition phase and 7 percent in the free mobility phase, but the latter effect is statistically insignificant. Point estimates for other sectors indicate no change in low-skill employment in the non-tradable and in the sectors classified as "other", and suggest a negative impact in the construction sector although they are not precisely estimated.

Insert Table 8 about here.

Appendix table A5 shows the effects on the wage index across the different sectors. First, the magnitude on the wage effect across skill groups, in panel A, is similar across sectors, and there is no particular sector that drives the observed overall wage effects. The wage effects in the tradable sector are similar when the sub-sectors affected by the trade reform are included (column 5) or not (column 6). The skill-specific wage effects are more heterogeneous across sectors. For mid-skill workers, wages rise most strongly in the tradable sector and in the construction sector. For low-skill workers, the effects are stronger in the non-tradable and in the construction sector than in the tradable sector, and these differences increase from the transition to the free mobility period.

Sales and export demand Another channel is that the integration raised demand for French exports that in turn increased employment. Higher exports could not only stem from the

[35] The affected sectors were for instance manufacturing of telecoms equipment, medicines and electronic goods. See Bello and Galasso (2020, p. 1200) for details.

reduction in fixed cost of trade but also from closer economic linkages between the countries after the bilateral agreements more generally. Table 9 shows how the labor market integration impacted firms' sales (columns 1 to 5) and the export share in sales (columns 6 to 9). The data are again aggregated at the labor market and sector level. First, there is a robust increase in the sales after the reform. The effect is present in all sectors during the transition phase, and particularly strong in the construction and in the sectors classified as *other*. In contrast, there is no evidence that this increase in sales is driven by higher exports: neither when pooling all sectors (column 6), nor when focusing on firms in the tradable sector (column 7). When splitting the tradable sector by exposure to the trade reform, column 8 shows some increase in the share of exports in the exposed firms during the transition period, but the effect is not significant and vanishes in the free mobility period.

Insert Table 9 about here.

In conclusion, the employment effects do not appear to be demand-driven: First, any increase in demand for non-tradable goods did not raise employment. Second, the effect on firms' exports indicates no increase in foreign demand in the tradable sector, and neither in the sub-sectors affected by the simultaneous trade reform.[36] In addition, sales can increase because of higher prices or higher quantity or both. While it is beyond the scope of this paper, the higher sales in non-tradable sectors together with the unchanged employment at these firms suggests that price changes may be important.[37]

5.5 Discussion

The results document that after the labor market integration, wages grow in France without lowering employment. Among low-skill workers both wages and employment rise. The increase in wage growth, in re-employment wages and in labor force participation paint a consistent picture that the value of local job search increased after the labor market integration. The increase in the unemployment rate implies that the ratio of unemployed workers to vacancies increased. Because employment does not decline, the search and bargaining model suggests that the slack stems from the increase in the number of unemployed workers, rather from a decrease in the number of vacancies.

The search frictions in the labor market and the increase in the active labor force have therefore a self-correcting effect: They not only dampen the wage increase but they also dampen the negative employment effect of higher wages. First, even though higher wages lower the expected value of opening a vacancy, the higher labor supply and slacker labor market

[36]Since I do not observe exports by destination, the finding does not directly rule out higher demand from Switzerland for French products. Yet, since the share of sales in exports does not change, higher demand from Switzerland would quire firms reallocating sales across export destinations, and this may not necessarily be accompanied by a higher demand for labor.

[37]Firms can either pass on the higher labor cost to consumers (Harasztosi and Lindner, 2019), or charge higher prices in response to higher demand for non-tradable services without adjusting the quantity.

compensate for it because they increase the vacancy filling rate. Second, the flip side of higher slackness is that it lowers the finding rate for any single worker. This negatively feeds into the value of unemployment.

This mechanism may help explain why the wage effect appears small compared to the wage gains from getting a Swiss job. As the model highlights, the impact on French wages depends not only on wage differences but also on the change in the finding rate for Swiss jobs and on differences in job destruction between the two countries. To gain a sense of what wage increase we may expect from theory, in appendix D.5 I calibrate a simplified version of the model to observed transition rates and wages. The predicted wage increase is sensitive to what one assumes about workers' bargaining power: for $\alpha_1 = 0.1$, wages should increase by 7 percent; for $\alpha_1 = 0.5$, wages should increase by 1.7 percent. The empirical results fall into the lower part of this range, but the calibration fixes the finding rate for French jobs at its pre-reform level. Thus, the increased slackness in the market may help explain the small increase in wages compared to a model with fixed job finding rates.[38] [39]

In addition, the paper reveals skill differences in the impact on cross-border commuting as well as on the wages in France. But it raises the question why highly educated workers start commuting more even though there is not much evidence that their wages increase. One explanation could be that high-skill workers have more bargaining power than low-skill workers. As their wages are already close to the match productivity, an increase in the job finding rate increases their mobility but not their wage (Caldwell and Harmon, 2018). This explanation includes the possibility that high-skill workers that accept Swiss jobs in Switzerland are positively selected with respect to their potential wage growth in France. Because this downwardly biases the estimated wage effects, it is an important caveat for interpreting the estimated wage effects on high-skill workers. Another explanation could be that the match productivities of high-skill workers are more dispersed (Amior, 2021). It could explain both a higher population and more cross-border commuting of highly educated workers, but it requires that there are substantial cost to commuting.[40]

Lastly, an important role for the effects across sectors could be the demand elasticity of local output. On one hand, higher local labor cost can reduce employment more in the tradable sector because, if they are passed on to consumers, they lower quantity more than in the non-tradable sector (Harasztosi and Lindner, 2019). But a higher elasticity of demand for local output to price also implies that the price of local output is less sensitive to changes in output (Burstein et al., 2020). Both channels are present here. On one hand, tradable firms can more easily absorb the increase in the active labor force than non-tradable firms, leading to higher employment in the tradable sector. On the other hand, the wage effects on low-skill workers

[38] The calibration is suggestive because data limitations restrict me to using labor market transitions until 2001 only. The same limitation prevents me from studying the reform's effect on the job finding rate in France.

[39] An extended model where the marginal product of labor may decrease in response to an increase in employment would also lead to a dampening of the total wage effect, at least for low-skill workers where I find a significant increase in employment.

[40] Other work documents similar skill differences in commuting: Bütikofer et al. (2020), Caldwell and Danieli (2021).

are perhaps higher in the non-tradable sectors.

6 Conclusion

I study the labor market effects of an integration of local labor markets between France and Switzerland. The reform provides plausibly exogenous variation in outside options of French workers. The results indicate that the integration had a small positive effect on the wages of workers employed in France. Despite the higher labor cost, there is no evidence of lower employment among French firms, and employment increases for low-skill workers. I interpret the effects with an equilibrium search model where the better outside options increase the value of local job search that increases both wages and labor supply. The resulting slackness in the labor market means that firms do not reduce the number of posted vacancies.

The findings have two implications. First, together with the evidence in Beerli et al. (2021), they highlight that lowering matching frictions in the labor market can draw in more participants on both sides of the market, and this can increase economic activity. The fact that a higher value of job search draws in more workers into active participation may also be one reason why minimum wages tend to have small effects on employment. Second, the results suggest that local shocks can be amplified through the endogenous adjustment of labor supply: An increase in labor demand in one part of the labor market can increase labor force participation that, if strong enough, may lead to employment spillovers in the part of the labor market not directly affected by the demand shock.

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7 Tables and Figures

7.1 Tables

Table 1. Wage gap between French and Swiss jobs

	Log(hourly wage)					
	(1)	(2)	(3)	(4)	(5)	(6)
Swiss job	0.495	0.194	0.195			
	(0.014)	(0.043)	(0.047)			
Swiss job, non-tertiary educ.				0.51	0.193	0.192
				(0.018)	(0.054)	(0.055)
Swiss job, tertiary educ.				0.433	0.199	0.213
				(0.014)	(0.115)	(0.119)
Secondary educ.	0.172			0.171		
	(0.006)			(0.007)		
Tertiary educ.	0.485			0.492		
	(0.013)			(0.011)		
Labor market FE	Y	N	Y	N	Y	N
Worker FE	N	Y	Y	N	Y	Y
Tenure and industry controls	N	N	Y	N	N	Y
Observations	46620	46620	46620	46620	46620	46620
Number of years	10	10	10	10	10	10
R^2	0.427	0.928	0.928	0.427	0.928	0.928

Notes: The sample are residents in the treatment and control areas (see section 4.2.2) 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. *Labor market FE* are fixed effects for the labor market of residence. *Worker FE* are person fixed effects. *Secondary educ.* and *Tertiary educ.* are dummies for the two education levels. *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 labor market level are in parentheses. *Data: Labor Force Survey 1993–2002.*

Table 2. Balance Before and After Matching

	Controls		Treated		Overlap measures			
	Mean	(S.D.)	Mean	(S.D.)	Nor Dif	Log ratio SD	$\pi(c)$	$\pi(t)$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(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: normalized differences, 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 4.2.2 for details.

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

	Main specification				Controls			
	All (1)	Tertiary (2)	Secondary (3)	Mandatory (4)	All (5)	Tertiary (6)	Secondary (7)	Mandatory (8)
treat × *post*	0.01	0.017	0.001	0.001	0.007	0.011	0.006	0.003
	(0.003)	(0.004)	(0.002)	(0.001)	(0.003)	(0.005)	(0.003)	(0.001)
Observations	176	176	176	176	176	176	176	176
R^2	0.32	0.36	0.26	0.31	0.49	0.56	0.45	0.44
Outcome mean in 1999	0.024	0.032	0.03	0.013	0.024	0.032	0.03	0.013

Notes: Results from estimating equation (5). 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 text for details). The regressions are weighted by the cell-level resident population size in 1999. Standard errors clustered at the labor market level are in parentheses. *Data: Population census 1990–2007.*

Table 4. Impact on wages and employment

	Wage growth index				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)
$treat \times transition$	0.015	-0.002	0.018	0.013	0.019	0.019	0.012	0.038
	(0.004)	(0.006)	(0.004)	(0.003)	(0.01)	(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)	(0.01)	(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 (5). Employment is in logs, the wage growth index in levels. The wage growth index is calculated from changes in log the 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 labor market level are in parentheses; standard errors clustered at the department level are in brackets. *Data: DADS postes 1995–2007.*

Table 5. Robustness: alternative matching strategies

	Wage index				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: Not matching on pre-trends								
$treat \times transition$	0.01	-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	0.5	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	0.04
	(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	0.01	0.029	-0.016	0.071
	(0.008)	(0.01)	(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	0.02	0.01	0.01	0	0	0.01

Notes: Results from estimating equation (5). 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 labor 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 labor markets in metropolitan France. Regressions are weighted by weights that balance the matched characteristics across treated and control labor markets. *Data: DADS postes 1995–2007.*

Table 6. Impact on wages in DADS Panel

	Log(hourly wage)					
	Pooled		By skill		By mobility	
	(1)	(2)	(3)	(4)	(5)	(6)
$treat \times transition$	0.01	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)		
$treat \times transition \times low$			0.01	0.009		
			(0.004)	(0.003)		
$treat \times transition \times stayer$					0.01	0.007
					(0.003)	(0.003)
$treat \times transition \times NE$					0.018	0.023
					(0.006)	(0.006)
$treat \times transition \times EE$					0.003	0.002
					(0.009)	(0.009)
$treat \times free$	0.011	0.007				
	(0.004)	(0.003)				
$treat \times free \times high$			-0.012	-0.008		
			(0.01)	(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)		
$treat \times free \times stayer$					0.012	0.007
					(0.004)	(0.003)
$treat \times free \times NE$					0.014	0.014
					(0.008)	(0.007)
$treat \times free \times EE$					0	-0.003
					(0.007)	(0.008)
Firm fixed effects	N	Y	N	Y	N	Y
Observations	519329	519329	519329	519329	519329	519329
Number of workers	65106	65106	65106	65106	65106	65106
Number of years	13	13	13	13	13	13
R^2	0.32	0.26	0.32	0.26	0.32	0.26

Notes: Results from estimating versions of equation (7). Workers are sampled and treatment is assigned based on the labor market of the last spell before 1999. *stayer* are workers that remain employed at the same firm in t as in $t-1$. NE are new hires out of non-employment. EE are new hires from other firms. Standard errors clustered at the labor market level are in parentheses. *Data: DADS Panel 1995–2007.*

Table 7. Impact on labor supply, unemployment and employment among residents

	Active labor force (1)	Population (2)	Participation rate (3)	Employment rate (4)	Unemployment rate (5)	Unemployment counts (6)
Panel A: All Education groups						
treat × *post*	0.039	0.029	0.01	-0.013	0.125	0.164
	(0.01)	(0.008)	(0.004)	(0.007)	(0.034)	(0.03)
Observations	176	176	176	176	176	176
R^2	0.79	0.88	0.62	0.59	0.69	0.76
Panel B: Tertiary education						
treat × *post*	0.047	0.047	0	-0.004	0.094	0.14
	(0.022)	(0.021)	(0.004)	(0.005)	(0.053)	(0.05)
Observations	176	176	176	176	176	176
R^2	0.57	0.63	0.78	0.75	0.58	0.53
Panel C: Secondary education						
treat × *post*	0.009	0.002	0.007	-0.011	0.112	0.121
	(0.011)	(0.01)	(0.004)	(0.007)	(0.046)	(0.042)
Observations	176	176	176	176	176	176
R^2	0.74	0.8	0.56	0.56	0.7	0.7
Panel D: Mandatory education						
treat × *post*	0.071	0.035	0.036	0.009	0.131	0.201
	(0.014)	(0.011)	(0.008)	(0.01)	(0.036)	(0.039)
Observations	176	176	176	176	176	176
R^2	0.69	0.8	0.57	0.52	0.6	0.66

Notes: Results from estimating equation (5). Models include controls for entry and exit of the working age population and pre-existing migration (see text for details). All outcomes are in logs. Standard errors clustered at the labor market level are in parentheses. The regressions are weighted by the cell-level resident population size in 1999. The active labor 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; the unemployment rate is the number of unemployed workers relative to the participating labor force. *Data: Population census 1990–2007.*

Table 8. Employment: Effects across sectors

	All sectors (1)	Non-tradable (2)	Construction (3)	Other (4)	Tradable: All (5)	Tradable: No trade reform (6)
Panel A: All professions						
treat × *transition*	0.019	-0.002	0.008	0.023	0.022	0.048
	(0.01)	(0.011)	(0.01)	(0.012)	(0.016)	(0.021)
treat × *free*	0.015	0.004	0.009	0.043	0.008	0.029
	(0.019)	(0.013)	(0.02)	(0.013)	(0.028)	(0.034)
Observations	572	572	572	572	572	572
R^2	0.47	0.24	0.29	0.21	0.44	0.38
Panel B: High-skill professions						
treat × *transition*	0.019	-0.025	0.023	-0.008	0.047	0.023
	(0.024)	(0.017)	(0.021)	(0.044)	(0.022)	(0.019)
treat × *free*	0.021	-0.084	0.022	0.016	0.043	0.025
	(0.039)	(0.032)	(0.04)	(0.048)	(0.041)	(0.033)
Observations	572	572	572	572	572	572
R^2	0.51	0.33	0.46	0.23	0.47	0.48
Panel C: Mid-skill professions						
treat × *transition*	0.012	0.016	0.022	0.036	-0.008	0.021
	(0.013)	(0.016)	(0.011)	(0.009)	(0.022)	(0.02)
treat × *free*	-0.006	0.05	0.025	0.06	-0.058	0.01
	(0.024)	(0.02)	(0.02)	(0.01)	(0.039)	(0.032)
Observations	572	572	572	572	572	572
R^2	0.49	0.3	0.3	0.31	0.48	0.33
Panel D: Low-skill professions						
treat × *transition*	0.038	-0.006	-0.048	0.001	0.082	0.115
	(0.013)	(0.014)	(0.027)	(0.018)	(0.024)	(0.034)
treat × *free*	0.058	-0.004	-0.042	-0.002	0.131	0.07
	(0.022)	(0.016)	(0.035)	(0.023)	(0.045)	(0.054)
Observations	572	572	572	572	572	572
R^2	0.59	0.23	0.25	0.2	0.5	0.38

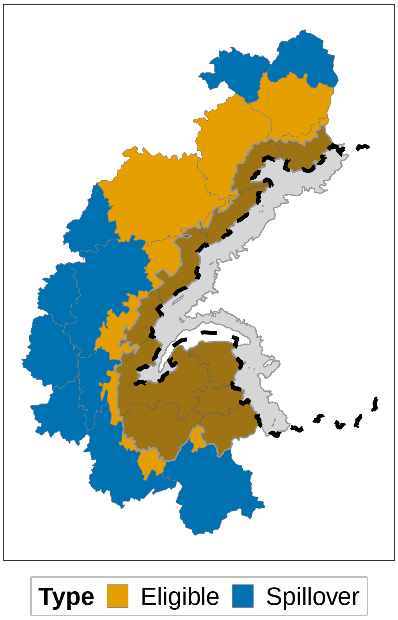
Notes: Results from estimating equation (5). The outcome is in logs. The regressions are weighted by cell-level employment in 1998. Standard errors clustered at the labor market level are in parentheses. *Data: DADS postes 1995–2007.*

Table 9. Impact on firms' sales and exports

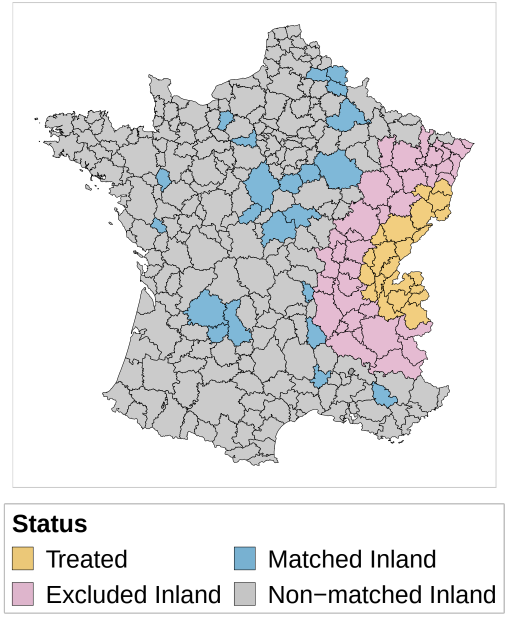
	Total sales					Share exports of sales			
	All sectors (1)	Non-tradable (2)	Cons-truction (3)	Other (4)	Tradable (5)	All sectors (6)	Tradable (7)	w/ trade reform (8)	w/o trade reform (9)
$treat \times transition$	0.037	0.028	0.042	0.051	0.029	-0.007	0.005	0.02	-0.001
	(0.009)	(0.012)	(0.013)	(0.011)	(0.015)	(0.02)	(0.019)	(0.036)	(0.02)
$treat \times free$	0.054	0.047	0.081	0.077	0.032	-0.022	0	-0.028	0.007
	(0.018)	(0.014)	(0.024)	(0.021)	(0.024)	(0.027)	(0.027)	(0.04)	(0.026)
Observations	572	572	572	572	572	572	572	572	572
R^2	0.51	0.43	0.49	0.39	0.33	0.26	0.27	0.19	0.24

Notes: Results from estimating equation (5). Outcomes in columns 8 and 9 are based only on firms in the tradable sector, either with or without trade reform. All outcomes are in logs. The regressions are weighted by sector-level employment in 1998. Standard errors clustered at the labor market level are in parentheses. *Data: DADS postes 1995–2007; Ficus 1995–2007.*

7.2 Figures



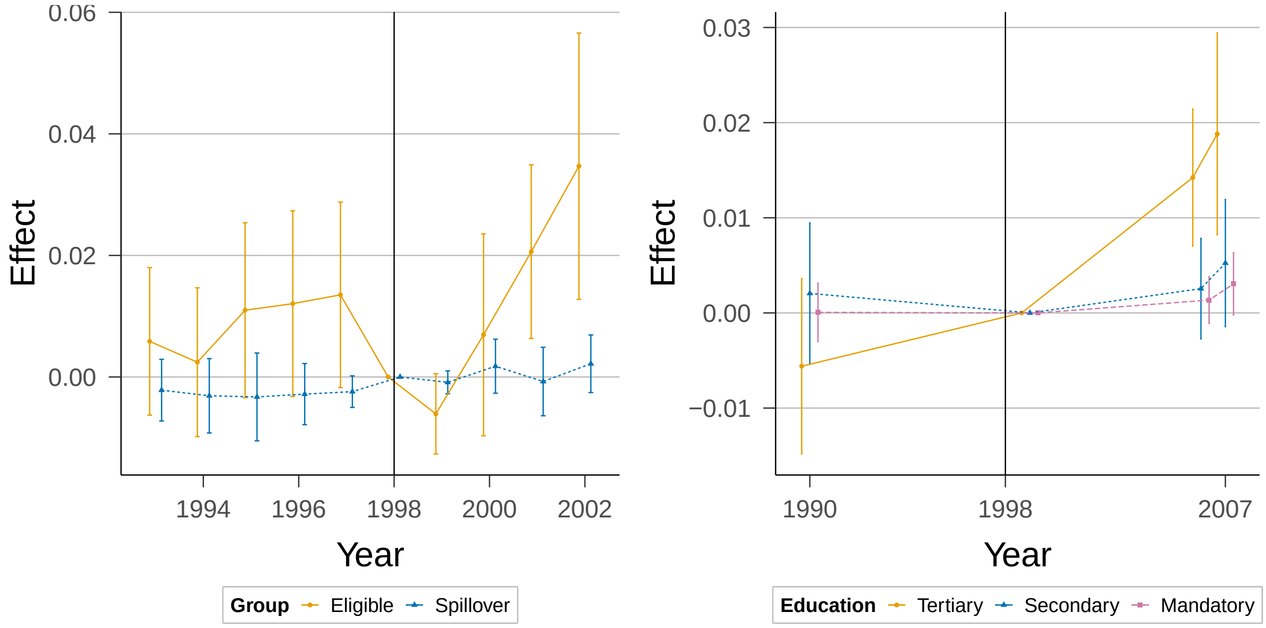
(a) Border municipalities and treated labor markets



(b) The treated and matched labor markets

Figure 1
The Swiss and French labor markets

Notes: Panel 1a shows the municipalities and labor markets along the Swiss-French border. The black dashed line is the border between France and Switzerland. The grey area are the French and Swiss border municipalities. Labor market types are colored by exposure to the integration: whether they are directly exposed to the market integration (yellow) by having at least one municipality in the border region, or by being affected by spillovers (blue).
Panel 1b shows the local labor markets in France by treatment status. *Treated* are the treated labor markets shown also in panel 1a. *Excluded inland* are the labor markets excluded from the pool of potential controls. *Non-matched Inland* inlands are labor markets from the pool of potential controls that are not matched, and *Matched Inland* are the control labor markets selected by the matching strategy.

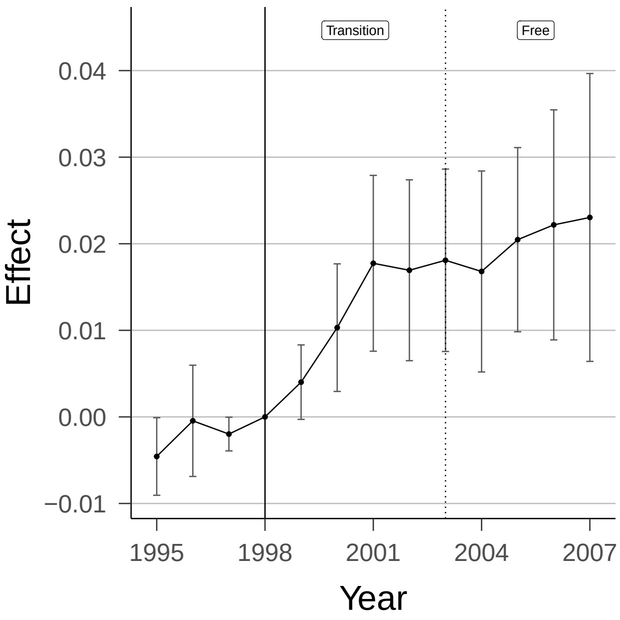


(a) Across municipalities, all workers

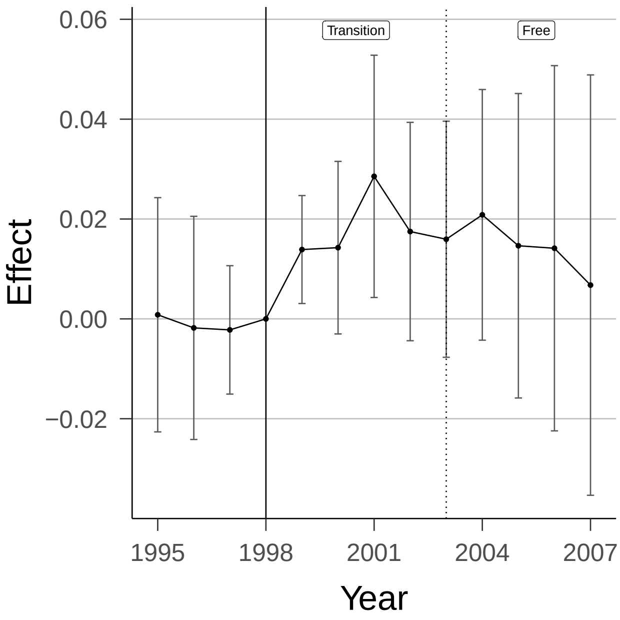
(b) Across labor markets, by education

Figure 2
Fraction of residents with a job in Switzerland

Notes: Figure 2a shows the annual point estimates from equation (3). *Eligible* are municipalities in the border region; *Spillover* are municipalities other municipalities in the treated labor markets. Figure 2b shows the point estimates from equation (4). The treatment indicator is whether the labor market is in the treatment group or not. *Data: Labor Force Survey 1993–2002; Population census 1990–2007.*



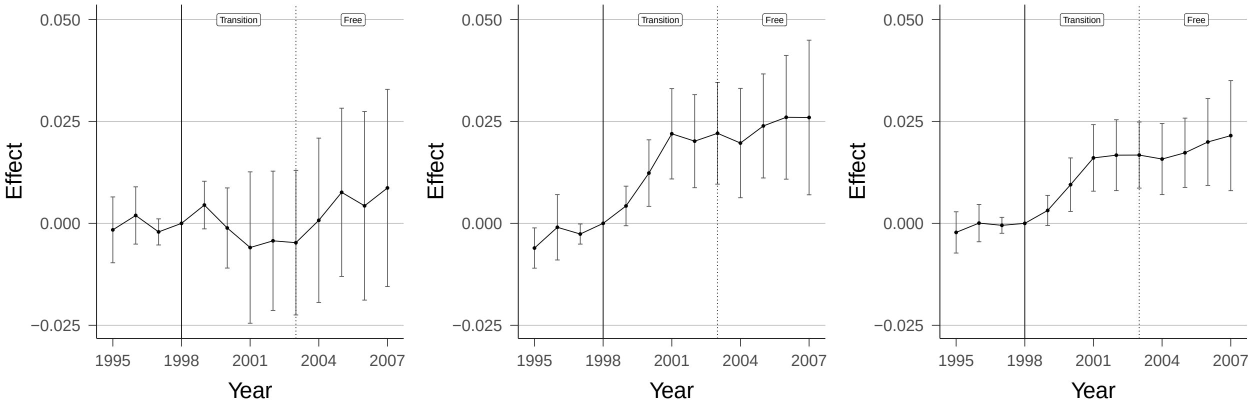
(a) Index of wage growth



(b) Employment

Figure 3
Wage and employment effects in France

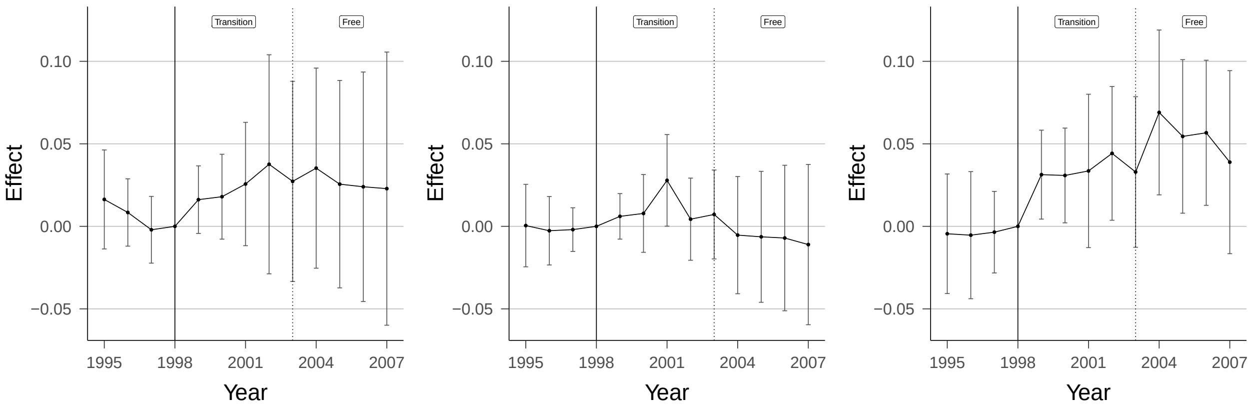
Notes: Figures 3a and 3b show the annual point estimates from equation (4). The error bars are confidence intervals clustered at the local labor market level. *Data: DADS Postes 1995–2007.*



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

Figure 4
Wage effects by skill

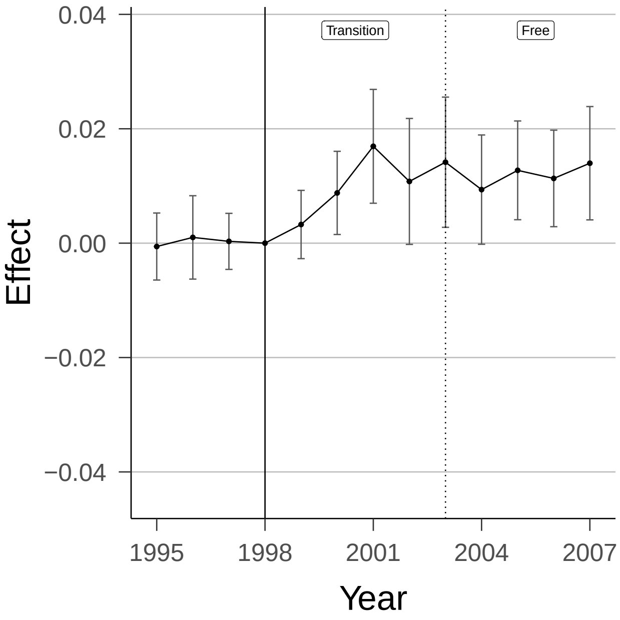
Notes: The figures show the skill-specific effects on the wage growth index from equation (4). The error bars are confidence intervals clustered at the local labor market level. *Data: DADS Postes 1995–2007.*



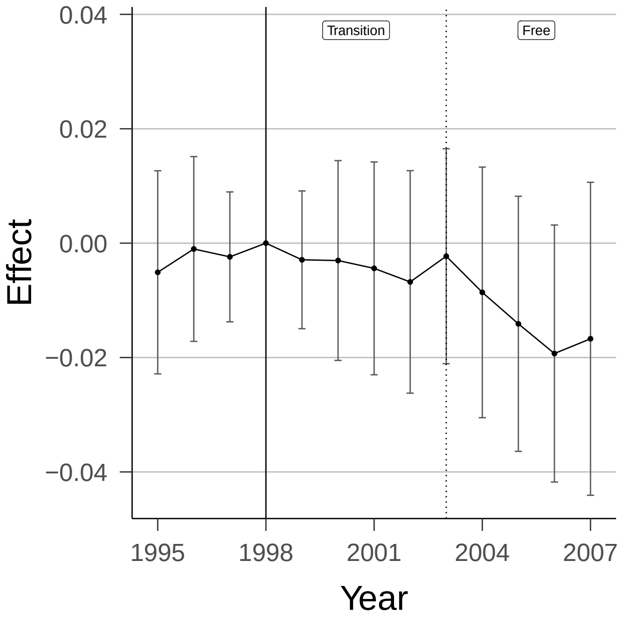
(a) High-skill professions (b) Mid-skill professions (c) Low-skill professions

Figure 5
Employment effects, by skill groups

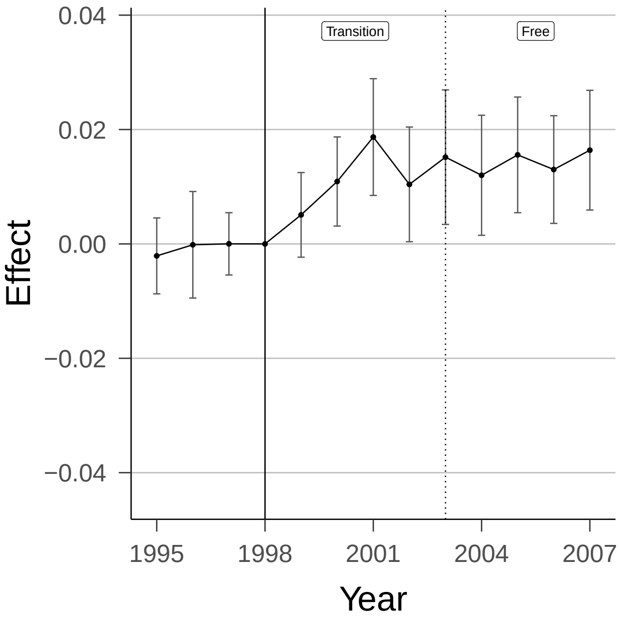
Notes: The figures show the skill-specific effects on the employment from equation (4). The error bars are confidence intervals clustered at the local labor market level. *Data: DADS Postes 1995–2007.*



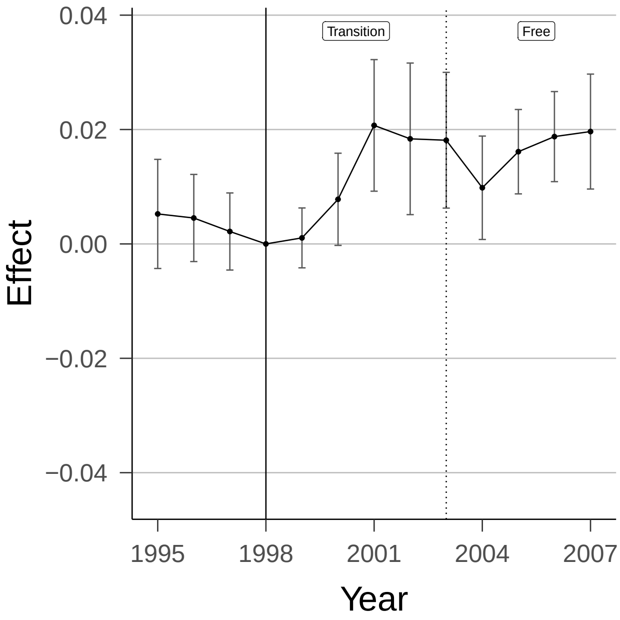
(a) All workers



(b) High-skill professions



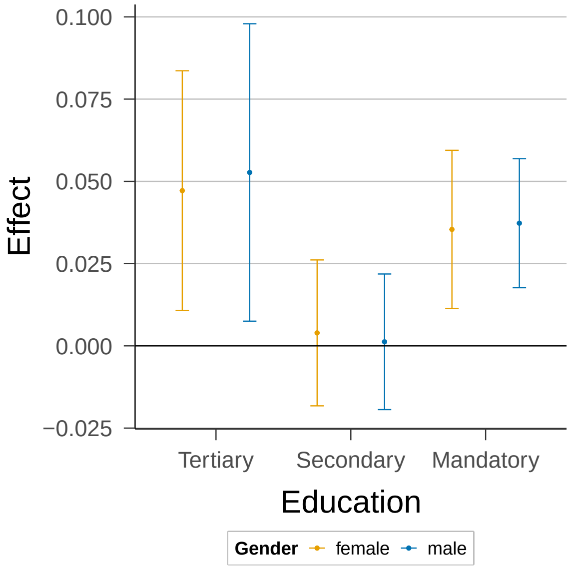
(c) Mid-skill professions



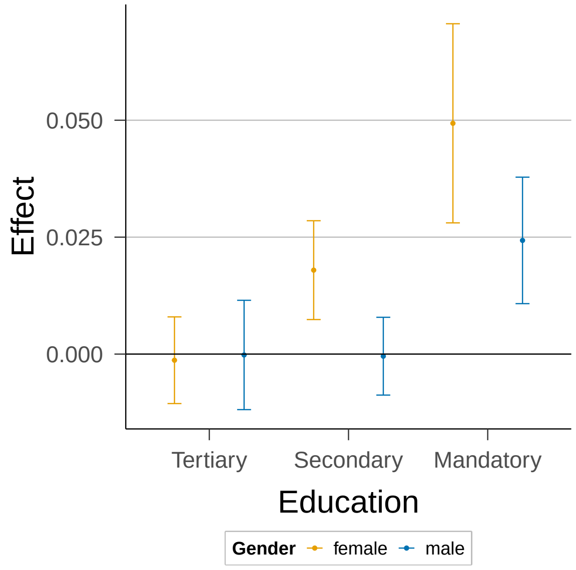
(d) Low-skill professions

Figure 6
Worker-level wage effects

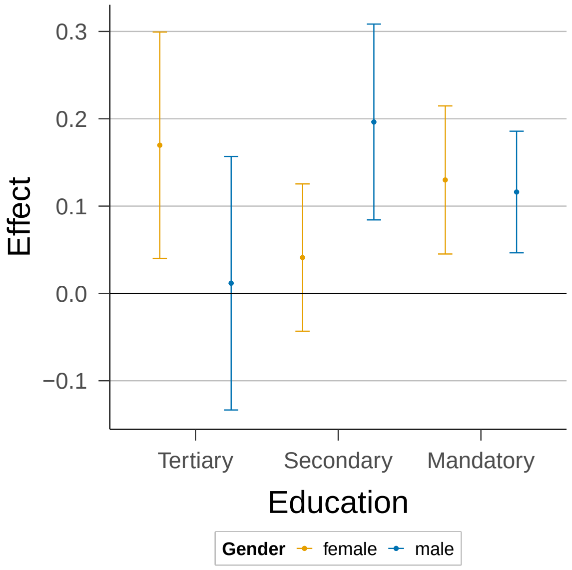
Notes: The figures show the skill-specific effects on wages from equation (6). The sample are workers employed in one of the treated or control labor markets between 1995 and 1998. Workers are assigned to labor markets and skill groups based on their last employment spell before 1999. The error bars are confidence intervals clustered at the local labor market level. *Data: DADS Panel 1995–2007.*



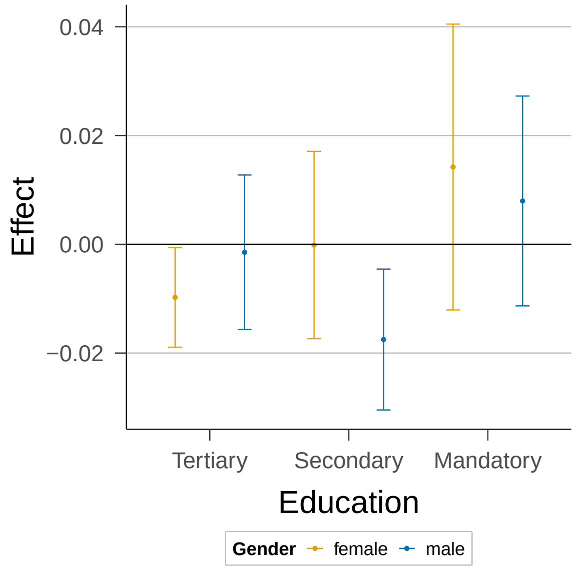
(a) Population



(b) Participation rate



(c) Unemployment rate



(d) Employment rate

Figure 7
Impact on population and labor market status by detailed demographics

Notes: Estimates from equation (5). Controls for entry and exit of the working-age population and pre-existing migration are included in the regressions (see text for details). The error bars are confidence intervals clustered at the local labor market level. *Data: Population census 1990–2007.*

Online Appendix

Appendix A Institutional Setting And Data

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.[41] 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 individualized pay rises. For instance, 75 percent of large firms (above 50 employees) granted their workers individualized pay rises in the year 1998 (Barrat et al., 2007). As the French labor market is similarly decentralized 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.

Insert Table A1 about here.

A.2.2 Other regulations for cross-border commuters

The labor 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 member states of the EU (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 that the earnings of French residents in Switzerland can be taxed in Switzerland (French and Swiss Government, 1966). This is the case in Geneva, where the canton of Geneva

[41] The majority of these agreements is at the national level.

transfers 3.5 percent 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).[42] In particular, French residents that work in these cantons pay their taxes in France, and the French authorities transfer 4.5 percent of the gross earnings of border commuters to Switzerland.

Unemployment insurance French residents that 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 countries are derived from the relative contributions to the system in either countries, both before 1999 (French and Swiss Government, 1975, Article 18) and thereafter (European Council, 2004, Article 46 2a).

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 percent 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).

A.3 Further information on the data

Where necessary, I harmonize educational levels in France and Switzerland with the ISCED-1997 classification.

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

A.3.1 DADS worker records

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. I follow the recommendation by Insee to retain the relevant workers. First, I 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; I adjust the threshold for inflation).
4. During the whole spell, the average monthly salary is at least 381 Euros (also inflation-adjusted).

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

To calculate wage growth of establishment stayers (see below) in the *DADS Postes*, I keep workers if they have a non-anecdotal spell at the same establishment in both years. I do not impose the restriction of having the main spell in both years at the same establishment as this would drop workers that 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 percent of high-skill spells, 67 percent of mid-skill spells and 55 percent of low-skill spells during the full sample period in all of metropolitan France. In the *DADS Panel* I 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, I winsorize hourly wages at the first and 99th quantiles.

Index of wage growth 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 any given year, I select all workers that 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 I can only shut down worker selection on their level of wages, but not on their wage growth over time. Second, I residualize their wages with respect to gender, age and year using a regression model estimated on a ten percent subsample of the French workforce. Third, I 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 I winsorize them at the first and 99th percentile. Fourth, I aggregate workers' wage growth. I 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 I 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 labor 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 labor 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 I find are driven by differential selection across skill groups. 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 their wages in France.

DADS Panel: distinguishing between job spells Following existing work on the French labor market (Schmutz and Sidibé, 2019), I distinguish between three types of spells: new hires from non-employment, new hires from employment (job-to-job transitions), and job stayers. A hire from non-employment is when the worker is newly hired after a period of more than 14 days without any observed employment relationship. A hire from employment is when a worker is hired with at most 14 days of non-employment, including any parallel ongoing spells (multiple job holders). A stayer spell is when the worker was employed at the firm in the preceding year. It also includes recalled workers that return to their previous employer within three months. This definition implies that a worker newly hired from non-employment in year t is a hire from non-employment in year t, and a stayer in the years after t as long as she remains employed at the same firm. The definition of stayers is therefore also consistent with the underlying sample used for the index of wage growth.

A.3.2 Balance sheets from tax records

The firm-level balance sheet data are drawn from the *FICUS*. 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[43] as well as finance and

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

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

A.3.3 Labor Force Survey

The labor 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. For this reason I only use the data from the old survey until 2002. I calculate transitions between employment states and employment in Switzerland based on the retrospective monthly diaries that workers fill out. The diaries report the labor market status, but the country of work is only reported yearly. If a new cross-border worker reported having been unemployed in one of 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 I 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, I 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 tiny, the fraction of within-municipality movers is likely small.

A.3.4 Population census

For 1990 and 1999, I use the 25% sample of the population census which reports the labor market variables relevant for the paper. Since 2006, the census is conducted on an annual rolling basis but on a smaller scale. I use the data for 2006 and 2007 which were collected in a 5-year window around the respective year. I separate unemployed from inactive persons based on the status they identify with.

A.3.5 Data on commuters: Swiss Grenzängerstatistik

It is the most accurate data source on the cross-border commuters in Swiss municipalities.[44] It reports, since 1996 and at a quarterly frequency, the number of cross-border commuters by municipality of work and gender. The data are based on commuting permits issued by Switzerland and other administrative and survey data. The reported counts are estimates and the data are available online (Federal Statistical Office, 2017).

A.4 Accounting for demographic trends in the census data

The treated and control labor markets differ in population dynamics before the labor market integration. First, the out-migration rate is lower in the treated than in the control labor

[44] The data from the Earnings Structure Survey do not report the municipality of work, while the Grenzängerstatistik does.

markets. This holds for the $1982-1990$ and for the $1990-1999$ census periods. Second, the working-age population is growing in the treated labor markets because of differences in entry to and exit from the working-age population. I account for these trends as follows. The first set of controls are the yearly in- and out-migration rate of group g between 1990 and 1999 in labor market m. I 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 relative to the population 1999. The flows are normalized to 0 in 1999. The outflows for $1990-1999$ are based on the number of workers in 1990 that are 56 to 64 years old. The inflows for $1990-1999$ are based on the workers in 1999 that are 16 to 24 years old. The numbers are normalized by the working-age population in 1999. The in- and outflows for $1999-2006/7$ are defined in the same way. The results for the models with and without these controls are in figure A11.

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

Appendix B Treatment Group And Matching

The border municipalities were all French municipalities that are within 10km from the French-Swiss border as well as 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).

B.1 Defining the treated labor markets

Labor markets consist of municipalities. Denote the municipalities of labor market i as j_i, $j_i \in \{1, ...J_i\}$. Define the set of border municipalities B_F.[45] A labor 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 labor markets and denote this set as L_E. Assign to each labor 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 labor market is in the treatment group if $d_i \leq \bar{d}$. In the present case I have $\bar{d} = 84km$.

B.2 Balance before and after matching

Figure A4 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 labor 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.

Insert Figure A4 about here.

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

Appendix C Additional Results

C.1 Further evidence on commuting

I document here the timing and the magnitude of the commuting flow from France to Switzerland using the annual counts of commuters in Switzerland, which are based on administrative records and publicly available (Federal Statistical Office, 2017).

In a first step, I closely follow Beerli et al. (2021, figure 2, panel A), but I use a different data set[46] and I 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.[47] 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.[48]

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.

Insert Figure A2 about here.

In a second step, I estimate the annual impact of the integration on the number of French commuters in Swiss municipalities. The sample consists of Swiss municipalities that are either in the Swiss border zone next to France[49], or they are not in any of the border regions in Switzerland. I then estimate the following regressions:

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

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

[47]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.

[48]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.

[49]I dropped municipalities from the cantons of Basel because they can be residing in either Germany or France.

where m indicates municipality, t indicates the year. y_{mt} is the number of border-commuters in the municipality relative to employment in 1998. $treat_m$ is an indicator for border municipalities.

The estimated coefficients with associated confidence intervals clustered at the commuting zone are presented in figure A3. The figure shows a break in the trend of the number of commuters after 1999, consistent with the evidence from France in the main text. The number of commuters steadily increases, and by 2007 the number of commuters relative to employment in 1998 is around eight percentage points higher in the treated municipalities as compared to the control municipalities. The standard errors are progressively increasing because of spatial heterogeneity within the treatment group; the increase in commuting was most concentrated closest to the border as documented in figure A2a.

Insert Figure A3 about here.

C.2 Alternative matching strategies

I use two alternative matching strategies. In the first, I 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, I use entropy balancing (Hainmueller, 2012); this matching approach calculates weights for all potential control unit 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. I 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. I 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 percent of the sum of weights among the control units.

The following figures compare the results from the main estimation strategy reported in the paper to the two alternative matching strategies: the plots for all workers are in figure A7, and the skill-specific wage effects are in figures A8 and the employment effects in A9.

Insert Figure A7 about here.

Insert Figure A8 about here.

Insert Figure A9 about here.

C.3 Effect on hours worked

Insert Table A3 about here.

C.4 Annual effects for other census outcomes

Insert Figure A11 about here.

C.5 Effects across space

Here I discuss detailed results from estimating differential treatment effects by the labor market's exposure to the reform. Specifically, I estimate a modified version of equation (5):

$$\begin{aligned} y^g_{mt} =& \alpha^g_m + \alpha^g_{t,elig} + \alpha^g_{t,spillover} + \beta^g_{\text{transition,elig}} elig_m \times 1[1999 \leq t < 2004] \\ & + \beta^g_{\text{transition,spillover}} spillover_m \times 1[1999 \leq t < 2004] \\ & + \beta^g_{\text{free,elig}} elig_m \times 1[2004 \leq t \leq 2007] \\ & + \beta^g_{\text{free,spillover}} spillover_m \times 1[2004 \leq t \leq 2007] + \gamma^g X^g_{mt} + v^g_{mt}. \end{aligned} \tag{A.2}$$

In this equation, I estimate effects separately by the unit's exposure to the labor market integration: *elig* refers to labor markets whose residents became eligible to commute, *spillover* refers to the spillover labor markets. The control labor markets are assigned to the same group as the group of their matched treated labor market. I account for exposure-specific year fixed effects with $\alpha^g_{t,elig}$ and $\alpha^g_{t,spillover}$. The interest is in the β coefficients. For the wage results, I focus on the results in the full-count data because of the larger underlying number of observations.

C.5.1 Wages and employment

Figure A12 shows the annual effects by exposure for total employment and wages.

Insert Figure A12 about here.

Table A6 contains the main results from equation 5 in panel A, and the results by exposure from equation A.2 in panel B. Column 1 shows positive wage effects both in the eligible and in the spillover labor markets. In the free mobility period, wages in the eligible labor markets are 2.4 percent higher than in the period before the reform, while they are 1.9 percent higher in the spillover labor 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 labor markets, but still positive and significant in the spillover labor markets. For high-skill workers, wages do not change during the transition phase neither in the eligible nor in the spillover labor markets. Their wages grow, however, by 1.5 percent in the spillover markets during the free mobility phase, while the point estimate for the eligible labor markets is zero.

Insert Table A6 about here.

Columns 5 to 8 show the estimated effects on employment in the two groups of labor 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 labor markets; in the free mobility period, the effect is larger and statistically significant in the spillover labor markets, while the point estimate for eligible labor markets is -1 percent (se: 2.2). The effects across skill groups show, first, that the negative employment effect arises from a decline in mid-skill employment of around 4.5 percent. The positive employment effect in the spillover labor 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 labor market integration having the largest impact in the eligible labor markets, but the results reveal important spillover effects on wages in neighboring, non-eligible labor markets. The documented employment effects across space reveal heterogeneity by exposure: a robust increase in employment in the spillover labor markets, and an imprecise decline in employment in the eligible labor markets. I will discuss these findings further after assessing the effects on labor supply across space.

C.5.2 Labor supply

In figure A13 I present the estimated impact on population and on labor supply by education group and by the labor market's exposure to the reform. The population effects are similar in both types of labor markets. The labor force participation effects are stronger in the eligible markets than in the spillover markets—and this holds also within education groups—, but the point estimates do not rule out the same effect in both labor market types.

Insert Figure A13 about here.

C.5.3 Discussion

All effects indicate important spillovers to non-eligible labor markets. Even though the effects on the wage and on labor force participation suggest a slightly stronger impact in eligible labor 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 A12: 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 labor market turnover in the eligible markets. If turnover has a negative impact on firm performance, then this may dampen the absorption of the increased labor 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 labor markets may be driven by unobservables that may be correlated with whether the labor market is in the groups of spillover or eligible markets.

C.6 Labor force participation: annual effects in labor force survey

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

$$y_{imt} = \alpha_m + \alpha_t + \sum_{\tau \neq 1998} \beta_\tau^g treat_m \times 1[t = \tau] + \gamma^g X_{mt}^g + v_{mt}^g. \tag{A.3}$$

m is as in equation (4) the labor market (Zone emploi). y_{imt} is an indicator variable that is 1 if the worker is in the labor force (employed or unemployed) and 0 if she is out of the labor 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 I add a trend adjustment: I 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 A14. 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 gets rid of 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.

Insert Figure A14 about here.

Appendix D Equilibrium Search And Bargaining Model

This section studies the effects of the labor market integration through the lens of an equilibrium search model with bargaining, drawing on Flinn (2006), Flinn (2011), and partly on the multi-region search model in Schmutz and Sidibé (2019).

D.1 Setup with exogenous contact rates

Time is continuous and I focus on a stationary environment which means that the value functions of a worker in a given labor market state are constant. Residents in the French-Swiss border region can work in two labor markets $m \in \{1, 2\}$, where 1 is for France and 2 for Switzerland. All parameters are from the point of view of workers residing in market 1, and to ease notation I omit the subscripts denoting residence. An exception are the stocks and rates of unemployed workers that are indexed by residence. The productivity of potential matches in market m is distributed according to the exogenous cumulative density function $G_m(\theta)$. The match productivity θ is observed by both the worker and the employer when they meet. Then they split the surplus according to Nash bargaining.

D.1.1 Workers

To start, I fix workers' participation decision, and so a worker is either employed or unemployed. The flow value of unemployment is b; the job destruction rate in market m is η_m; workers' discount rate is ρ. Unemployed French workers can receive job offers from either market at rate λ_m.[50] I assume that there are no commuting costs associated with any job. Preferences for shorter commutes could be incorporated in the contact rates λ_m, as for instance in Manning (2003). For now, I assume that these job offer arrival rates from both markets are exogenous, but relax it below.

Employed workers In a time interval of length ε, the flow value of employment in France is

$$V_{e,1}(w_1(\theta)) = \frac{1}{1+\rho\varepsilon}\Big[w_1(\theta)\epsilon + \eta_1\varepsilon V_n + (1-\eta_1\varepsilon)V_{e,1}(w_1(\theta)) + o(\varepsilon)\Big] \tag{A.4}$$

where $\frac{1}{1+\rho\varepsilon}$ is the discount factor. $w_1(\theta)$ is the value of a job with with productivity θ; with probability $\eta_1\varepsilon$, the worker loses her job, $(1-\eta_1\varepsilon)$ the worker keeps her job. There are other "multiple" events that could occur during time interval ε (such as being laid off and finding a new job again). The flow value of these events (that is their probability and value) are captured in $o(\varepsilon)$. The probability that more than one event occurs is decreasing as ε gets shorter, and I assume

$$\lim_{\varepsilon\to 0}\frac{o(\varepsilon)}{\varepsilon} = 0 \tag{A.5}$$

This assumption implies that for arbitrarily small ε, the probability that more than one event occurs goes to zero. Rearranging and taking the limit $\varepsilon \to 0$ yields

$$V_{e,1}(w(\theta)) = \frac{w_1(\theta) + \eta_1 V_n}{\rho + \eta_1}. \tag{A.6}$$

[50] I abstract from search on the job. If workers would also find Swiss jobs while employed, the sign of the change in the value of unemployment depends on whether search on or off the job becomes more effective. The evidence I present suggests the latter. On-the-job search would also complicate the analysis (see also Flinn (2006, section 2.3)).

Unemployed workers Unemployed workers receive a flow payoff b, and receive job offers from France ($m = 1$) or Switzerland ($m = 2$) at rate λ_m. Thus, the value of unemployment is

$$\begin{aligned} V_n = & \frac{1}{1+\rho\epsilon}\Big[b\varepsilon + \lambda_1\varepsilon \int \max\{V_n, V_{e,1}(w_1(\theta))\} dG_1(\theta) \\ & + \lambda_2\varepsilon \int \max\{V_n, V_{e,2}(w_2(\theta))\} dG_2(\theta) \\ & + (1-\lambda_1\varepsilon)(1-\lambda_2\varepsilon)V_n + o(\varepsilon)\Big] \end{aligned} \tag{A.7}$$

The expression $\max\{V_n, V_{e,m}(w_m(\theta))\}$ can be rewritten as follows:

$$\begin{aligned} \max\{V_n, V_{e,m}(w_m(\theta))\} &= \max(V_n, \frac{w_m(\theta)+\eta_m V_n}{\rho+\eta_m}) \\ &= \frac{1}{\rho+\eta_m}\max((\rho+\eta_m)V_n, w_m(\theta)+\eta_m V_n) + \frac{\eta_m V_n}{\rho+\eta_m} - \frac{\eta_m V_n}{\rho+\eta_m} \\ &= \frac{\eta_m V_n}{\rho+\eta_m} + \frac{1}{\rho+\eta_m}\max(\rho V_n, w_m(\theta)) + \frac{\rho V_n}{\rho+\eta_m} - \frac{\rho V_n}{\rho+\eta_m} \\ &= V_n + \frac{1}{\rho+\eta_m}\max(0, w_m(\theta)-\rho V_n) \end{aligned} \tag{A.8}$$

Replacing $\max\{V_n, V_{e,m}(w_m(\theta))\}$ for $m \in \{1,2\}$ and simplifying gives

$$\begin{aligned} V_n = & \frac{1}{1+\rho\epsilon}\Big[b\varepsilon + \lambda_1\varepsilon \int [V_n + \frac{\max(0, w_1(\theta)-\rho V_n)}{\eta_1+\rho}] dG_1(\theta) \\ & + \lambda_2\varepsilon \int [V_n + \frac{\max(0, w_2(\theta)-\rho V_n)}{\eta_2+\rho}] dG_2(\theta) \\ & + (1-\lambda_1\varepsilon-\lambda_2\varepsilon+\lambda_1\lambda_2\varepsilon^2)V_n + o(\varepsilon)\Big] \\ & \Leftrightarrow \\ V_n(\rho\varepsilon - \lambda_1\lambda_2\varepsilon^2) = & b\varepsilon \\ & + \frac{\lambda_1\varepsilon}{\rho+\eta_1}\int_{\rho V_n} (w_1(\theta)-\rho V_n) dG_1(\theta) \\ & + \frac{\lambda_2\varepsilon}{\rho+\eta_2}\int_{\rho V_n} (w_2(\theta)-\rho V_n) dG_2(\theta) \\ & + o(\varepsilon) \end{aligned} \tag{A.9}$$

(I have left the term $\lambda_1\lambda_2\varepsilon^2$ explicit, although it could be captured in $o(\varepsilon)$.) Dividing by ε and letting $\varepsilon \to 0$, I get

$$\rho V_n = b + \frac{\lambda_1}{\rho+\eta_1}\int_{\rho V_n} [w_1(\theta)-\rho V_n] dG_1(\theta) + \frac{\lambda_2}{\rho+\eta_2}\int_{\rho V_n} [w_2(\theta)-\rho V_n] dG_2(\theta) \tag{A.10}$$

When bargaining with the employer, the worker's outside option is the value of unemployment. Thus, her surplus of a match θ is

$$V_{e,m}(w_m(\theta)) - V_n = \frac{w_m(\theta)+\eta_m V_n}{\rho+\eta_m} - V_n = \frac{w_m(\theta)-\rho V_n}{\rho+\eta_m} \tag{A.11}$$

D.1.2 Firms

For an employer, the flow value of a filled vacancy is $\theta - w_m$. Thus, the ex-post value of a filled vacancy that lasts t is $\int_0^t (\theta - w_m)e^{-\rho u}du = \frac{\theta - w_m}{\rho}(1 - e^{-\rho t})$. If we assume that employment durations are distributed according to the negative binomial distribution, their probability density function is $\eta_m e^{-\eta_m t}$. Thus, the expected value of an employment contract $\{\theta, w_m\}$ is

$$V_F(w_m, \theta) = E_t\Big[\frac{\theta - w_m}{\rho}(1 - e^{-\rho t})\Big] = \frac{\theta - w_m}{\rho}\int_0^\infty (1 - e^{-\rho t})\eta_m e^{-\eta_m t}dt = \frac{\theta - w_m}{\rho + \eta_m} \tag{A.12}$$

A free entry condition among firms implies that firms create vacancies until the expected value of an open vacancy is zero.

D.1.3 Bargaining

The generalized Nash bargaining solution gives the outcome of workers' and firms' bargaining:

$$w_m(\theta, V_n) = \arg\max_{w_m} \Big(V_{e,m}(w_m(\theta)) - V_n\Big)^{\alpha_m}\Big(V_F(\theta, w_m) - 0\Big)^{1-\alpha_m} \tag{A.13}$$

where α_m is worker's bargaining power in market m. The firm's outside option is zero because of the free entry condition.

Combining (A.12) and (A.11) the Nash wage is defined as follows:

$$\begin{aligned} w_m(\theta, V_n) &= \arg\max_{w(\theta)} \Big(\frac{w_m(\theta) - \rho V_n}{\rho + \eta_m}\Big)^{\alpha_m}\Big(\frac{\theta - w_m(\theta)}{\rho + \eta_m}\Big)^{1-\alpha_m} \\ &= \alpha_m\theta + (1 - \alpha_m)\rho V_n \end{aligned} \tag{A.14}$$

Plugging in (A.14) into (A.10) and simplifying, the value of unemployment can be expressed as follows:

$$\rho V_n = b + \alpha_1 \frac{\lambda_1}{\rho + \eta_1}\int_{\rho V_n}[\theta - \rho V_n]dG_1(\theta) + \alpha_2\frac{\lambda_2}{\rho + \eta_2}\int_{\rho V_n}[\theta - \rho V_n]dG_2(\theta) \tag{A.15}$$

For future reference, note that matches $\theta < \rho V_n$ do not form: The worker accepts any wage that makes her indifferent to staying unemployed, which has value ρV_n. For any $\theta < \rho V_n$, the resulting wage is $\alpha\theta + (1 - \alpha)\rho V_n < \rho V_n$. Thus, $\theta^* \equiv \rho V_n$ is the reservation match value.

D.2 Matching and endogenous labor supply

Labor force participation I incorporate the decision to participate in the labor market as follows. When workers are out of the labor force, they have utility ρV_o, which is distributed according to some continuous distribution function $Q(\rho V_o)$. Since newly participating workers start off as unemployed, and their utility the value of unemployment in (A.15). Thus, any worker whose reservation utility is $\rho V_o < \rho V_n$ participates in the labor market, and the participation rate is $Q(\rho V_n)$.

Matching If a worker enters the labor market, she is unemployed. The two labor markets have one common matching function denoted by $M(\tilde{u}_1 + \gamma_u \tilde{u}_2, v_1 + \gamma_v v_2)$. $\tilde{u}_m$ is the number of unemployed job seekers residing in market m. v_m is the number of vacancies in market m. γ_v is the visibility of Swiss vacancies to French workers, relative to French vacancies. γ_u is the visibility of unemployed Swiss workers to French firms, relative to unemployed French workers.[51] In principle, the labor market integration increased both γ_v and γ_u; but since Swiss workers had few incentives of working in France, I abstract from γ_u and assume the labor market integration only increased γ_v.

$M()$ is concave, increasing in both arguments and has constant returns to scale. Therefore, a vacancy is filled at the rate $M(\tilde{u}_1 + \gamma_u \tilde{u}_2, v_1 + \gamma_v v_2)/(v_1 + \gamma_v v_2) = M(\frac{\tilde{u}_1+\gamma_u\tilde{u}_2}{v_1+\gamma_v v_2}, 1) \equiv q(k)$, with $k = \frac{\tilde{u}_1+\gamma_u\tilde{u}_2}{v_1+\gamma_v v_2}$, which is the market tightness from the firms' point of view (and the inverse market tightness from the point of view of workers). Given the property of M, $q(k)$ is concave in k. A French job searcher finds a vacancy at the rate $M(\tilde{u}_1 + \gamma_u \tilde{u}_2, v_1 + \gamma_v v_2)/(\tilde{u}_1 + \gamma_u \tilde{u}_2) = q(k)/k$. These job offers originate from France with probability $\pi_1 = \frac{v_1}{v_1+\gamma_v v_2}$ and from Switzerland with probability $\pi_2 = \frac{\gamma_v v_2}{v_1+\gamma_v v_2}$.

Vacancy creation by firms The probability that a random encounter between a firm and a worker is accepted is $\overline{G}_m(\rho V_n)$, where $\overline{G}_m()$ is the survivor function $1 - G_m()$. The expected value of creating a vacancy in market m, $V_{v,m}$, is therefore

$$\rho V_{v,m} = -\psi + q(k)\overline{G}_m(\rho V_n)(J_m - V_{v,m}). \tag{A.16}$$

where $q(k)\overline{G}_m(\rho V_n)$ is the vacancy filling rate, i.e. the probability of a match $q(k)$ multiplied by the probability that the match is acceptable to the firm and the worker. J_m is the expected value of a filled vacancy with respect to the distribution of acceptable matches $\theta \geq \rho V_n$. Under free entry, firms enter or exit until the expected value of opening a vacancy is 0:

$$0 = -\psi + q(k)\overline{G}_m(\rho V_n)J_m \Leftrightarrow J_m = \frac{\psi}{q(k)\overline{G}_m(\rho V_n)} \tag{A.17}$$

D.3 Equilibrium

Unemployment rate Denote by s_m^1 and s_m^2 the fraction of residents in market m employed in market 1 and 2. In a steady state, the fraction of French workers in both labor markets is constant over time. This implies that, for market 1, worker inflows from unemployment equal the worker outflows from employment to unemployment:

$$\lambda_1\overline{G}_1(\rho V_n)u_m = s_m^1\eta_m \Leftrightarrow s_m^1 = \frac{u_m\lambda_1\overline{G}_1(\rho V_n)}{\eta_1} \tag{A.18}$$

By definition, the unemployment rate is $1 - s_m^1 - s_m^2$. Plugging in s_m^1, s_m^2, using the definition of the job finding rate above, and solving for u_m yields the unemployment rate among French

[51] This approach is taken from Meghir et al. (2015, section 5).

residents:

$$u_m = \frac{\eta_1\eta_2}{\eta_1\eta_2 + \eta_2\pi_1(q(k)/k)\overline{G}_1(\rho V_n) + \eta_1\pi_2(q(k)/k)\overline{G}_2(\rho V_n)} \tag{A.19}$$

Expected value of a filled vacancy The number of vacancies through the expected value of a filled vacancy is

$$E\Big(\frac{\theta - w_m}{\rho + \eta_m}|\theta \geq \rho V_n\Big) = J_m = \frac{\psi}{q(k)\overline{G}_m(\rho V_n)} \tag{A.20}$$

Equilibrium An equilibrium is then given by the value of unemployment (A.15), the size of the participating labor force $l = l(\rho V_n) = Q(\rho V_n)$, the unemployment rate in (A.19) and the implied number of unemployed workers $\tilde{u}$, and the number of vacancies defined through (A.20).

Employment in France To understand the impact of the labor market integration on employment in France, it is helpful to dissect the steady-state employment in France N_1. It is given by

$$N_1 = m_1^1 Q(\rho V_n)P_1 = u_1\frac{\pi_1(q(k)/k)}{\eta_1}\overline{G}_1(\rho V_n)Q(\rho V_n)P_1 \tag{A.21}$$

where P_1 is the size of the population and I have assumed no Swiss workers find any French jobs. Employment increases in the value of unemployment through participation and population (for instance in an extended model with a migration decision as in Schmutz and Sidibé (2019).) Employment decreases in the value of unemployment through a decrease in labor demand around the match productivity distribution $\overline{G}_1(\rho V_n)$. This is because matches with $\theta < \rho V_n$ do not form—the worker is always better off by continuing to search. A higher value of unemployment also affects employment through the equilibrium adjustment in inverse labor market tightness k through $u_1 q(k)/k$, and therefore depends on the elasticity of the matching function. Holding the other elements fixed, an increase in k always lowers employment. To see this, define $\psi = q(k)/k$ and write the relevant parts in logarithms as follows:

$$\begin{aligned}
\frac{d\log N_1}{d\psi} &= \frac{d\log\psi}{d\psi} + \frac{d\log u_m}{d\psi} \\
&= \frac{1}{\psi} - \frac{\eta_2\pi_1\overline{G}_1(\rho V_n) + \eta_1\pi_2\overline{G}_2(\rho V_n)}{\eta_1\eta_2 + \eta_2\pi_1\overline{G}_1(\rho V_n) + \eta_1\pi_2\overline{G}_2(\rho V_n)} \\
&= \frac{\psi\eta_1\eta_2}{\psi\left(\eta_1\eta_2 + \eta_2\pi_1\overline{G}_1(\rho V_n) + \eta_1\pi_2\overline{G}_2(\rho V_n)\right)} \\
&> 0
\end{aligned} \tag{A.22}$$

where the third equality comes from expanding the second line to reach the denominator in the third line and collecting terms. Therefore, since ψ is decreasing in k because of concavity of $q()$, an increase in k lowers employment. Intuitively, a higher number of unemployed workers lowers the job finding rate of other unemployed workers. A higher number of vacancies increases the job finding rate of unemployed workers, which leads to higher employment. Therefore, the term dampens the impact of changes in labor supply and amplifies changes in labor demand through its effect on the probability of workers finding a job.

D.4 Impact on French labor markets

The labor market integration increases the relative visibility of Swiss vacancies to French workers. Using the endogenous contact rates, the value of unemployment is

$$\rho V_n = b + \alpha_1 \frac{\pi_1}{\rho + \eta_1} \frac{q(k)}{k} \int_{\rho V_n} [\theta - \rho V_n] dG_1(\theta) + \alpha_2 \frac{\pi_2}{\rho + \eta_2} \frac{q(k)}{k} \int_{\rho V_n} [\theta - \rho V_n] dG_2(\theta) \tag{A.23}$$

Given the parametrization of the job finding rates, the value of unemployment in (A.23) is a weighted average between the French and Swiss wages, where the weights depend on the job finding rates. As a result, the integration increases the weight on the high-wage Swiss jobs, which increases the value of unemployment and therefore wages as long as the two countries have similar job destruction rates.[52]

Given an increase in the value of unemployment, the impact on French employment is ex-ante unclear, as can be seen in equation (A.21). First the higher visibility of Swiss jobs mechanically lowers the visibility of French jobs, lowering π_1. Second, since matches with $\theta < \rho V_n$ do not form—the worker is always better off by continuing to search—, some low-productivity matches in France are not formed anymore, lowering $\overline{G}_1(\rho V_n)$. But, third, the higher value of unemployment may also draw more workers into the labor force, increasing $Q(\rho V_n)$. The relative magnitudes of these two effects depends on the local densities of $\overline{G}_1(\rho V_n)$—the labor demand elasticity—, and of the distribution function $Q(\rho V_o)$—the labor supply elasticity around the current ρV_n. The impact on employment further depends on the equilibrium adjustment in inverse labor market tightness k through $u_1 q(k)/k$, and therefore also on the elasticity of the matching function. Holding the other elements fixed, an increase in k always lowers employment. A higher number of unemployed workers lowers the job finding rate of other unemployed workers. A higher number of vacancies increases the job finding rate of unemployed workers, which leads to higher employment. Therefore, the term dampens the impact of changes in labor supply and amplifies changes in labor demand through its effect on the probability of workers finding a job.

Depending on the distribution of match productivity and job destruction rates in the two countries, an increase in γ_v can directly increase or decrease the unemployment rate. But given the documented wage differences, it appears plausible that the direct impact is to lower the unemployment rate. Specifically, if high wage differences are not driven by higher bargaining power in Switzerland, they must be driven by a dominating match productivity distribution in Switzerland. For instance, this could stem from exchange rate differences. In this case, the higher visibility of Swiss jobs lowers the unemployment rate in France because the increase in the finding rate for Swiss jobs is higher than the decrease in the finding rate for French jobs. If the labor market integration increased the unemployment rate, it may then be used to infer the change in $\eta_2(q(k)/k)\overline{G}_1(\rho V_n)$: The unemployment rate can increase both from a decline in vacancy posting of firms—induced through the truncation of the match productivity

[52] In the most standard model, the Nash rule holds continuously in an on-going job, so that wages also grow for job stayers. This would not hold for instance in Pissarides (2009).

distribution—, and through increased participation which decreases $q(k)/k$. But while the former channels predicts a decline in employment levels, the latter does not. As a result, the direction of the change in the unemployment rate, in the number of unemployed workers, and in French employment levels are suggestive of the relative size of the labor supply and labor demand adjustments.

D.5 Calibration with exogenous job finding rates

Assuming job finding rates are fixed in for French jobs, I can calculate the change in the wage predicted by the model, using observed transition rates and wages. The exercise is similar in spirit to Jäger et al. (2020); to do it I need to make the simplifying assumption that there is no uncertainty about the match productivity in either France or Switzerland. This implies that all workers in a given labor market earn the same wage—empirically, the average wage—and that all workers accept the job when they find a match, so that $w_1 > \rho V_n$ and $w_2 > \rho V_n$. This implies that the observed job finding rates correspond to the job offer arrival rates. I start from (A.15), restated here for reference:

$$\rho V_n = b + \alpha_1 \frac{\lambda_1}{\rho + \eta_1} \int_{\rho V_n} [\theta - \rho V_n] dG_1(\theta) + \alpha_2 \frac{\lambda_2}{\rho + \eta_2} \int_{\rho V_n} [\theta - \rho V_n] dG_2(\theta)$$

With the previously stated assumptions, this becomes

$$\rho V_n = b + \frac{\lambda_1}{\rho + \eta_1} w_1 + \frac{\lambda_2}{\rho + \eta_2} w_2 - \rho V_n \left(\frac{\lambda_1}{\rho + \eta_1} + \frac{\lambda_2}{\rho + \eta_2} \right)$$

Collecting terms yields

$$\rho V_n \frac{\kappa}{(\rho + \eta_1)(\rho + \eta_2)} = b + \frac{\lambda_1}{\rho + \eta_1} w_1 + \frac{\lambda_2}{\rho + \eta_2} w_2$$

with $\kappa = (\rho + \eta_1)(\rho + \eta_2) + \lambda_1(\rho + \eta_2) + \lambda_2(\rho + \eta_1)$. Therefore

$$\rho V_n = b \frac{(\rho + \eta_1)(\rho + \eta_2)}{\kappa} + \frac{\lambda_1(\rho + \eta_2)}{\kappa} w_1 + \frac{\lambda_2(\rho + \eta_1)}{\kappa} w_2$$

Since the wage in France is $w_1 = \alpha_1 \theta_1 + (1 - \alpha_1) \rho V_n$, the change in the wage in response to a change in the finding rate for Swiss jobs is

$$\frac{dw_1}{d\lambda_2} = (1 - \alpha) \left(\frac{\lambda_1(\rho + \eta_2)}{\kappa} \frac{dw_1}{d\lambda_2} + \frac{(\rho + \eta_1)}{\kappa} w_2 \right)$$

where I assume that $\frac{db}{d\lambda_2} = \frac{dw_2}{d\lambda_2} = \frac{d\theta_1}{d\lambda_2} = 0$. The first assumption is natural and the second is also made in the main analysis. The third is more problematic; to the extent that the increase in λ_2 truncates the distribution of match productivity from below, assuming $\frac{d\theta_1}{d\lambda_2} = 0$ implies a lower bound on the impact on French wages.

Since in steady state wages do not change, we can solve for $\frac{dw_1}{d\lambda_2}$:

$$\frac{dw_1}{d\lambda_2} = (1-\alpha)\frac{\rho+\eta_1}{\kappa-(1-\alpha)\lambda_1(\rho+\eta_2)}w_2 \tag{A.24}$$

I use the following parameter values, based on estimates from the Labor Force Survey in the pre- and post periods and from the estimated wage gap between French and Swiss jobs: $d\lambda_2 = 0.012$, $\lambda_1 = 0.37$, $\lambda_2 = 0.015$, $\eta_1 = 0.077$, $\eta_2 = 0.12$ $w_1 = 10$, $w_2 = 1.19w_1$, $\rho = 0$ and $\alpha = 0.1$. The assumption on α_1 and ρ is as in Jäger et al. (2020), the wage for France w_1 is the average wage (in constant Euros) in the labor force survey from 1993 to 1998 of residents in the treated region and employed in France, and the Swiss wage w_1 is taken from the estimated wage differences in table 1.

This calibration predicts that hourly wages should increase by 0.67 Euros or 6.7 percent. But it is sensitive to the assumed bargaining power of workers. For instance, setting $\alpha_1 = 0.5$—a common calibration in the macro literature—yields a wage increase of 1.7 percent, in line with the empirical results.

D.6 Extensions

Here I sketch the idea behind possible generalizations of the framework.

Allowing for internal migration Following Schmutz and Sidibé (2019), one can extend the framework to multiple markets between which workers can relocate with some migration cost. The higher value of local job search in the border area will then increase the local population: as job search in the treated location becomes more profitable, this either lowers outflow of residents from the treated area or increases inflows of residents from other areas.

More general production function The simple framework assumes a linear production function. To incorporate a more general production function, following Chassamboulli and Palivos (2014), one can assume that the local economy produces a final good with diminishing marginal product to labor and whose price p is competitively set at the marginal product. The productivity of a match is then $p\theta$, and because changes in aggregate employment impact the price of the final good, they also impact the reservation match value θ^*. Consider then for instance the impact of an increase in labor force participation: Compared to a linear production function, it directly increases the reservation match productivity and therefore results in a smaller increase in total employment and lowers wages. The strength of these adjustments then depends not only on the elasticity of the distribution of match productivity around θ^*, but also on the curvature of the aggregate production function. The production function could also be extended to allow for imperfect substitutability between workers in different skill groups.

Spatial spillovers The empirical results also show that the labor market integration led to spillovers to labor market whose residents were not eligible to commute to Switzerland. Similar to the previous discussion, the spillover increases the value of unemployment in non-eligible markets. Concretely, I again use two connected labor markets, where 1 are the spillover labor markets and 2 are the eligible labor markets. The value of unemployment for residents in market 1 increases as follows. Given the specification of the contact rate, residents in the eligible labor markets find fewer French jobs. Holding constant the number of vacancies, this increases the probability that a resident from the eligible labor market finds a vacancy in the eligible labor market. The mechanism is then the same as before.[53]

[53] In Manning and Petrongolo (2017, pp. 2884), the labor market integration may be thought of as increasing the probability that an application to a Swiss vacancy is successful. As a result, the expected utility of applying to a Swiss vacancy increases, which lowers the number of applications a resident in the eligible French area sends to vacancies in that area. In response, this raises the probability that an application from the spillover area to the eligible area in France is successful, increasing the number of applications sent by residents in the spillover areas to vacancies in eligible areas.

8 Tables And Figures For Online Appendix

8.1 Tables

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

Agreement	Change	Effects
Free movement of people	Access to labor markets without restrictions	Expansion of local labor 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).*

Table A2. Robustness: other specifications

	Wage index				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)	(0.01)	(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)	(0.01)	(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)	(0.02)	(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	0.022	0.019	0.008	0.03	-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	0.1	0.01	0.01	0.01	0.02

Notes: Results from estimating equation (5). 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 the baseline estimated as reported in table 4. In panel B, the regressions control for the labor 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 results in panel B are estimated on the full set of potential control labor markets in metropolitan France. The regressions are weighted by cell-level employment in 1998. *Data: DADS postes 1995–2007.*

Table A3. Impact on hours worked

	Hours worked			
	All professions (1)	High skill (2)	Mid skill (3)	Low skill (4)
$treat \times transition$	0.017	0.023	0.007	0.042
	(0.011)	(0.024)	(0.013)	(0.014)
	[0.01]	[0.023]	[0.011]	[0.016]
$treat \times free$	0.013	0.017	-0.013	0.074
	(0.02)	(0.038)	(0.025)	(0.024)
	[0.02]	[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 (5). The outcome is in logs. The regressions are weighted by cell-level employment in 1998. Standard errors clustered at the labor market level are in parentheses, and clustered by department in brackets. *Data: DADS postes 1995–2007.*

Table A4. Impact on labor cost

	Labor cost				
	All sectors (1)	Non-tradable (2)	Construction (3)	Other (4)	Tradable (5)
$treat \times transition$	0.028	0.032	0.018	0.031	0.031
	(0.01)	(0.014)	(0.011)	(0.012)	(0.016)
$treat \times free$	0.039	0.059	0.033	0.046	0.041
	(0.02)	(0.018)	(0.021)	(0.021)	(0.026)
Observations	572	572	572	572	572
R^2	0.54	0.49	0.46	0.31	0.5

Notes: Results from estimating equation (5). All outcomes are in logs. The regressions are weighted by sector-level employment in 1998. Standard errors clustered at the labor market level are in parentheses. *Data: DADS postes 1995–2007; Ficus 1995–2007.*

Table A5. Wage index: Effects across sectors

	All sectors	Non-tradable	Construction	Other	Tradable: All	Tradable: No trade reform
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All professions						
$treat \times transition$	0.015	0.014	0.022	0.008	0.017	0.019
	(0.004)	(0.007)	(0.008)	(0.004)	(0.005)	(0.005)
$treat \times free$	0.022	0.025	0.026	0.02	0.021	0.024
	(0.006)	(0.014)	(0.015)	(0.004)	(0.007)	(0.008)
Observations	572	572	572	572	572	572
R^2	0.48	0.48	0.36	0.53	0.36	0.39
Panel B: High-skill professions						
$treat \times transition$	-0.002	-0.003	0.004	0.004	-0.008	0.014
	(0.006)	(0.009)	(0.007)	(0.004)	(0.011)	(0.011)
$treat \times free$	0.006	-0.026	0.001	0.025	-0.003	0.036
	(0.01)	(0.013)	(0.014)	(0.007)	(0.017)	(0.014)
Observations	572	572	572	572	572	572
R^2	0.41	0.38	0.4	0.52	0.39	0.45
Panel C: Mid-skill professions						
$treat \times transition$	0.018	0.009	0.025	0.01	0.022	0.021
	(0.004)	(0.008)	(0.009)	(0.004)	(0.006)	(0.006)
$treat \times free$	0.026	0.016	0.03	0.022	0.028	0.025
	(0.007)	(0.016)	(0.016)	(0.005)	(0.008)	(0.01)
Observations	572	572	572	572	572	572
R^2	0.47	0.42	0.37	0.56	0.38	0.39
Panel D: Low-skill professions						
$treat \times transition$	0.013	0.02	0.016	0.006	0.01	0.015
	(0.003)	(0.007)	(0.009)	(0.006)	(0.005)	(0.005)
$treat \times free$	0.019	0.039	0.024	0.016	0.005	0.011
	(0.005)	(0.014)	(0.015)	(0.009)	(0.006)	(0.009)
Observations	572	572	572	572	572	572
R^2	0.47	0.51	0.37	0.4	0.36	0.33

Notes: Results from estimating equation (5). The outcome is in levels. The wage 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 labor market level are in parentheses. *Data: DADS postes 1995–2007.*

Table A6. Impact on wages and employment by exposure

	Wage growth index				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 × *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)	(0.01)	(0.024)	(0.013)	(0.013)
	[0.004]	[0.005]	[0.004]	[0.003]	[0.009]	[0.023]	[0.011]	[0.013]
treat × *free*	0.022	0.006	0.026	0.019	0.015	0.021	-0.006	0.058
	(0.006)	(0.01)	(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 × *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 × *transition*	0.012	0.002	0.013	0.01	0.021	0.03	0.02	0.022
	(0.003)	(0.005)	(0.003)	(0.005)	(0.017)	(0.019)	(0.019)	(0.02)
eligible × *free*	0.025	-0.001	0.031	0.022	-0.014	-0.011	-0.047	0.057
	(0.01)	(0.015)	(0.011)	(0.007)	(0.023)	(0.053)	(0.028)	(0.034)
spillover × *free*	0.018	0.017	0.019	0.015	0.06	0.075	0.056	0.06
	(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	0.6

Notes: Results from estimating equations (5) (panel A) and (A.2) (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 labor market level are in parentheses; standard errors clustered at the department level are in brackets. *Data: DADS postes 1995–2007.*

Table A7. Impact on wages in DADS Panel by transition type and skill

	Log(hourly wage) By mobility and skill	
	(1)	(2)
Transition, stayer		
$treat \times transition \times high \times stayer$	-0.003	-0.005
	(0.007)	(0.006)
$treat \times transition \times mid \times stayer$	0.012	0.008
	(0.003)	(0.003)
$treat \times transition \times low \times stayer$	0.01	0.009
	(0.003)	(0.003)
Transition, NE		
$treat \times transition \times high \times NE$	0.029	0.045
	(0.017)	(0.017)
$treat \times transition \times mid \times NE$	0.024	0.027
	(0.006)	(0.005)
$treat \times transition \times low \times NE$	0.006	0.011
	(0.009)	(0.007)
Transition, EE		
$treat \times transition \times high \times EE$	-0.008	-0.003
	(0.02)	(0.02)
$treat \times transition \times mid \times EE$	0.006	0.005
	(0.009)	(0.01)
$treat \times transition \times low \times EE$	0.003	0
	(0.009)	(0.009)
Free, stayer		
$treat \times free \times high \times stayer$	-0.006	-0.008
	(0.01)	(0.009)
$treat \times free \times mid \times stayer$	0.015	0.008
	(0.004)	(0.004)
$treat \times free \times low \times stayer$	0.013	0.012
	(0.003)	(0.003)
Free, NE		
$treat \times free \times high \times NE$	-0.023	0.019
	(0.02)	(0.019)
$treat \times free \times mid \times NE$	0.017	0.014
	(0.009)	(0.009)
$treat \times free \times low \times NE$	0.014	0.014
	(0.007)	(0.007)
Free, EE		
$treat \times free \times high \times EE$	-0.043	-0.029
	(0.021)	(0.019)
$treat \times free \times mid \times EE$	0.009	0.002
	(0.009)	(0.009)
$treat \times free \times low \times EE$	-0.005	-0.001
	(0.009)	(0.007)
Firm fixed effects	N	Y
Observations	519329	519329
Number of workers	65106	65106
Number of years	13	13
R^2	0.32	0.26

Notes: Results from estimating a version of equation (7) with separate parameters for each transition type and skill. Workers are sampled and treatment is assigned based on the labor market of the last spell before 1999. *stayer* are workers that remain employed at the same firm in t as in $t-1$. NE are new hires out of non-employment. EE are new hires from other firms. Standard errors clustered at the labor market level are in parentheses. One column refers to a single regression, but for readability the different types of transitions and treatment periods are separated by lines. *Data: DADS Panel 1995–2007.*

8.2 Figures

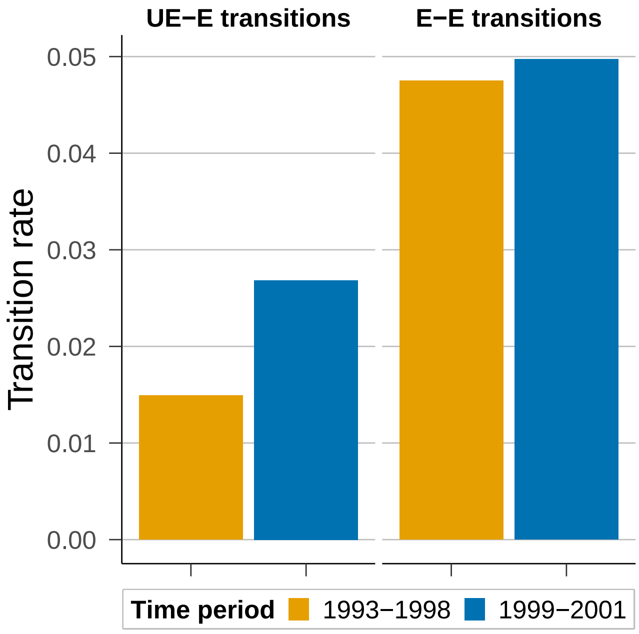
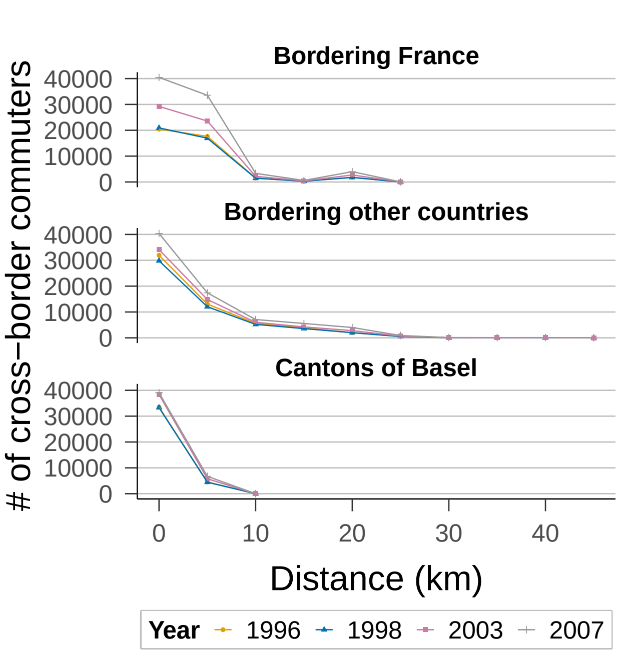
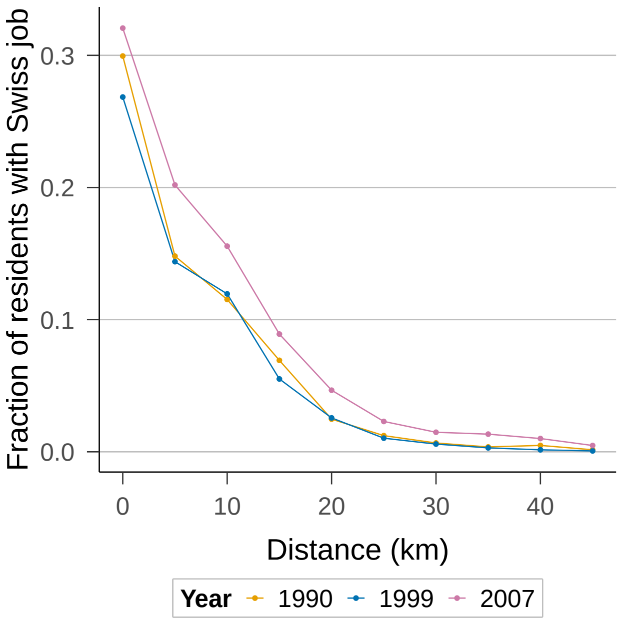


Figure A1
Finding rates for Swiss jobs among residents in the treated labor markets

Notes: The figure shows the average annual transition rates of residents in the French-Swiss border area to Switzerland. *UE-E transitions* are transitions from unemployment in France to employment in Switzerland. *E-E transitions* are transitions from employment in France to employment in Switzerland. The statistics are calculated from residents in the treated labor markets that live in the same municipality in two consecutive years. Observations are weighted by the survey weights. *Data: Labor Force Survey 1993–2002.*



(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) 1990–2007.*

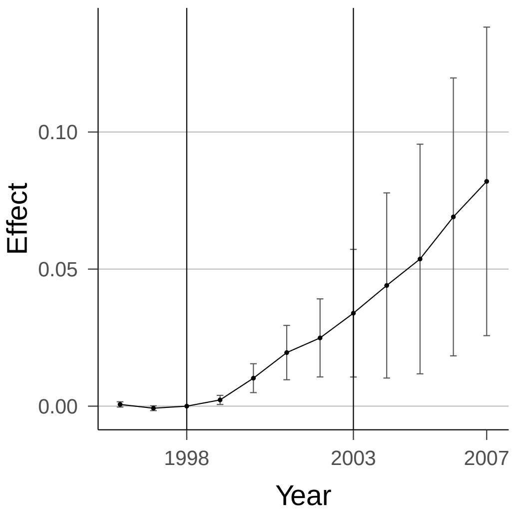
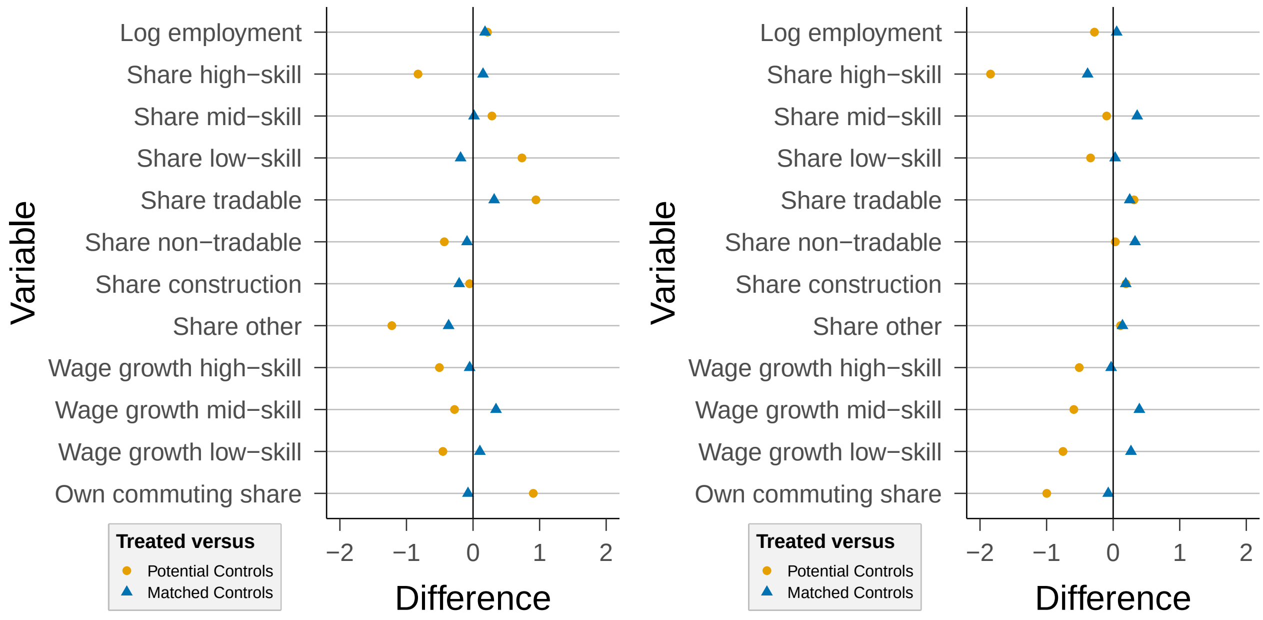


Figure A3
Commuting Flows from France to Switzerland

Notes: The Figure shows estimated impacts from estimating equation (A.1). The coefficients estimate the impact of the labor market integration on the presence of French commuters in Switzerland relative to employment in the municipality in 1998. The error bars are calculated from standard errors clustered at the commuting zone level. *Data: BFS.*

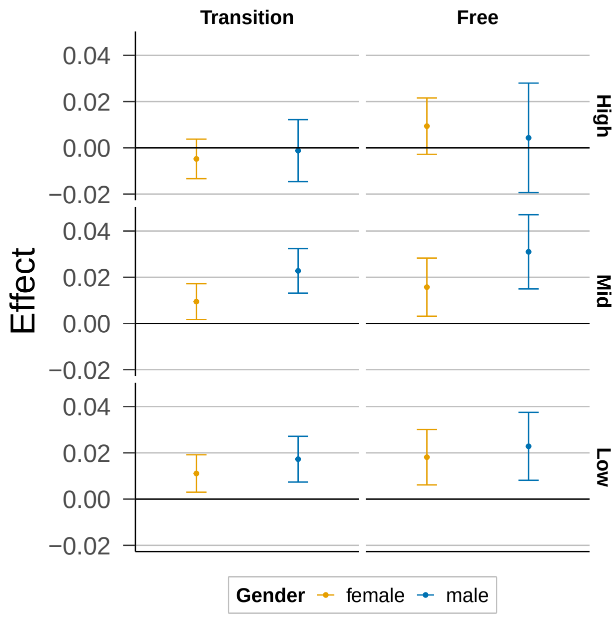


(a) Normalized Differences

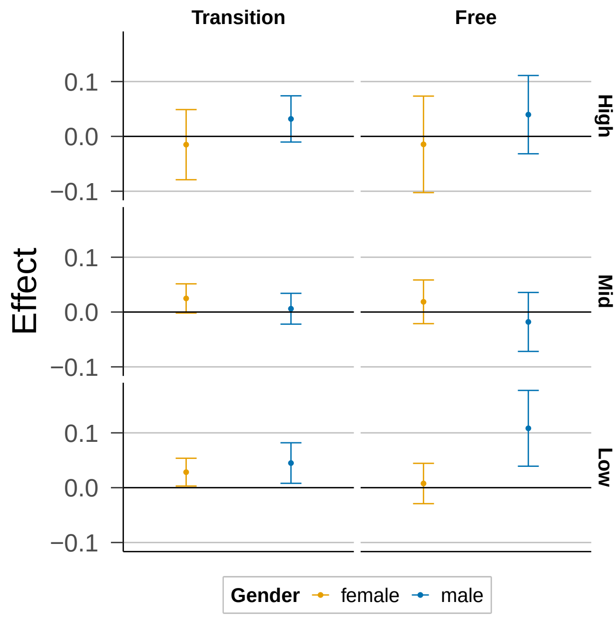
(b) Log Ratio of S.D.

Figure A4
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 labor market that also live in that market in 1998. See the Table 2 and text for details.



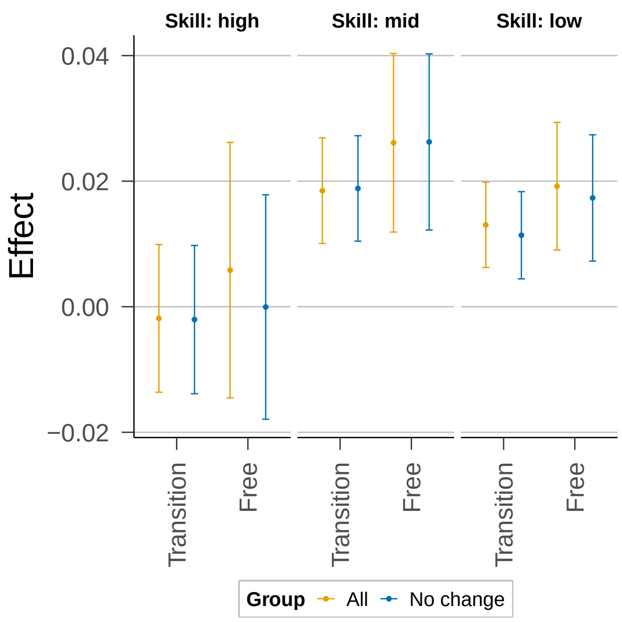
(a) Wage growth index



(b) Employment

Figure A5
Wage and employment effect by detailed demographics

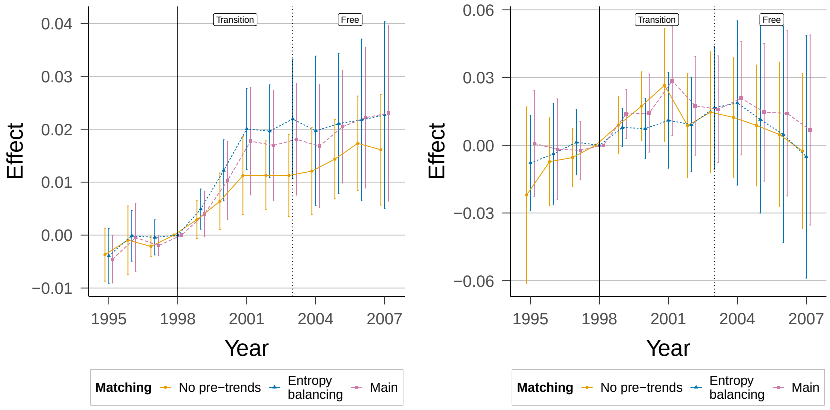
Notes: The figures show the estimated impact of the labor market integration by detailed demographics, using equation (5). The columns refer to the transition and to the free mobility period. The rows refer to the three skill groups. The colors refer to women (yellow) and men (blue). The error bars are 95% confidence intervals clustered at the local labor market level. *Data: DADS Postes 1995–2007.*



(a) Wages

Figure A6
Wage effects: dropping workers that change the skill between consecutive years

Notes: The figure shows the estimated coefficients from equation 5, 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 labor market level. *Data: DADS Postes 1995–2007.*

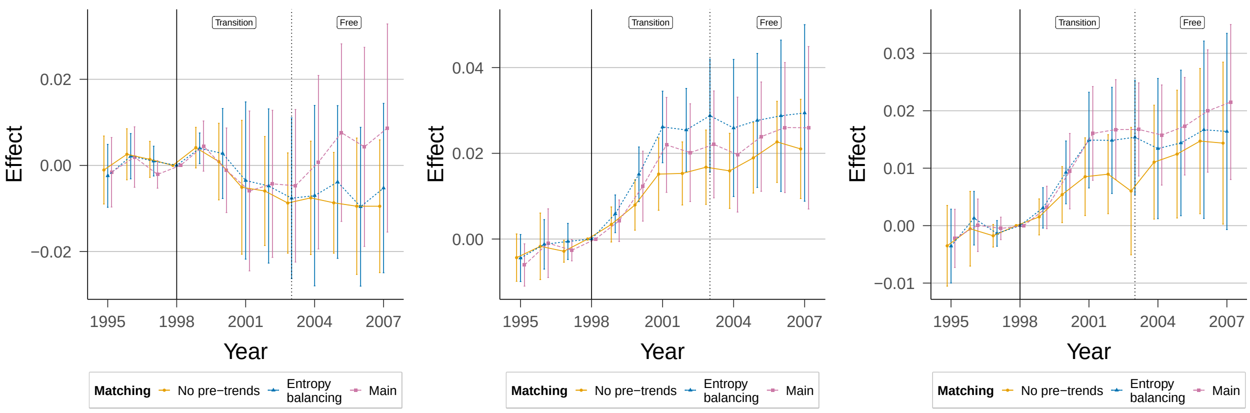


(a) Wages

(b) Employment

Figure A7
Alternative matching strategies, all workers

Notes: The figures show effects on the employment and wages from equation (4). The coefficients and confidence intervals refer to different matching approaches: *No pre-trends* is from matching one control labor market to each treated labor market without using pre-existing trends in wage growth as features for matching. *Entropy balancing* uses all control labor 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 labor market level. *Data: DADS Postes 1995–2007.*



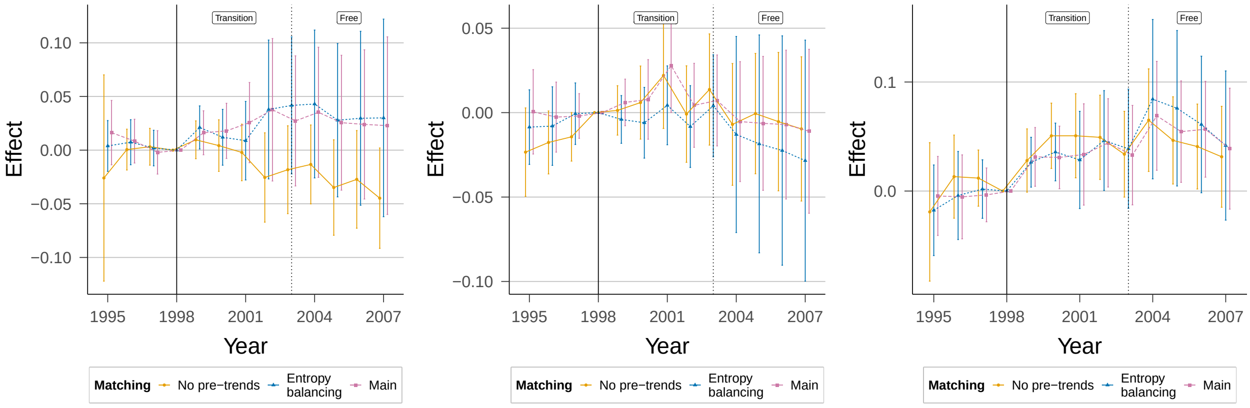
(a) High-skill professions

(b) Mid-skill professions

(c) Low-skill professions

Figure A8
Alternative matching strategies, wages by skill group

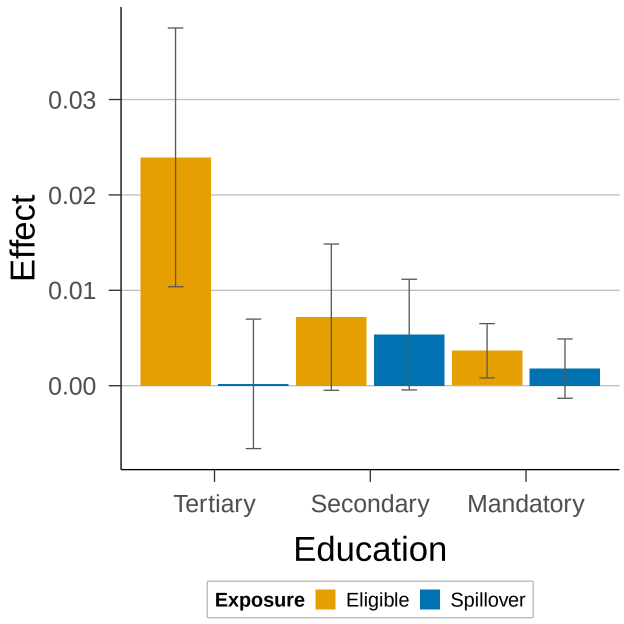
Notes: The figures show the effects on wages by skill from equation (4). The coefficients and confidence intervals refer to different matching approaches: *No pre-trends* is from matching one control labor market to each treated labor market without using pre-existing trends in wage growth as features for matching. *Entropy balancing* uses all control labor 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 labor market level. *Data: DADS Postes 1995–2007.*



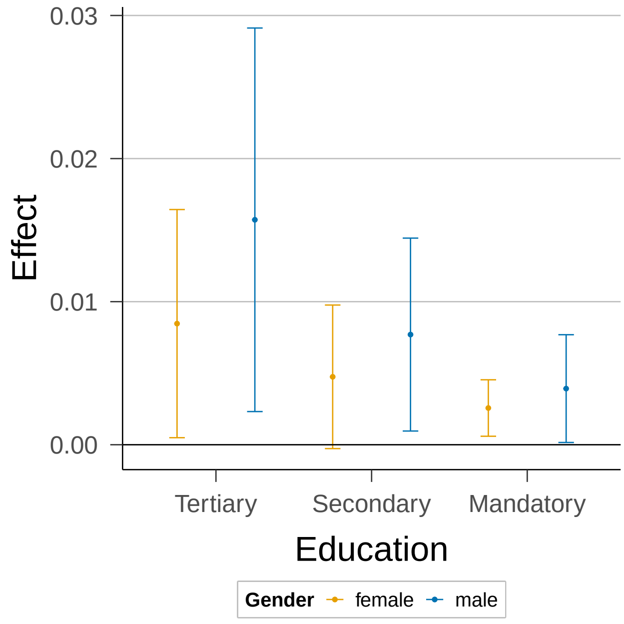
(a) High-skill professions (b) Mid-skill professions (c) Low-skill professions

Figure A9
Alternative matching strategies, employment by skill group

Notes: The figures show the effects on employment by skill from equation (4). The coefficients and confidence intervals refer to different matching approaches: *No pre-trends* is from matching one control labor market to each treated labor market without using pre-existing trends in wage growth as features for matching. *Entropy balancing* uses all control labor 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 labor market level. *Data: DADS Postes 1995–2007.*



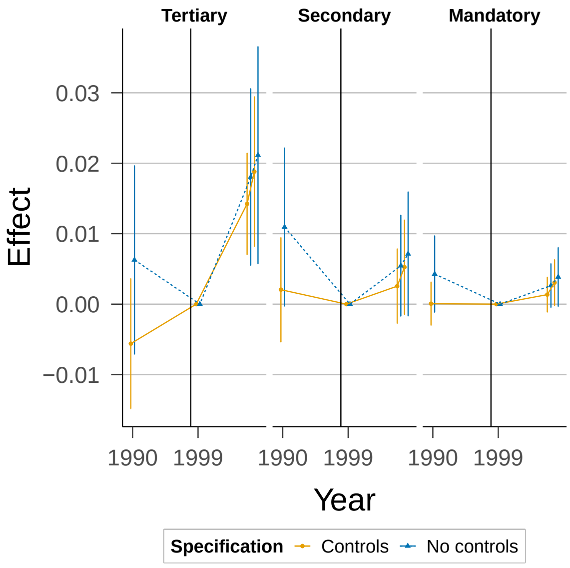
(a) By labor market exposure



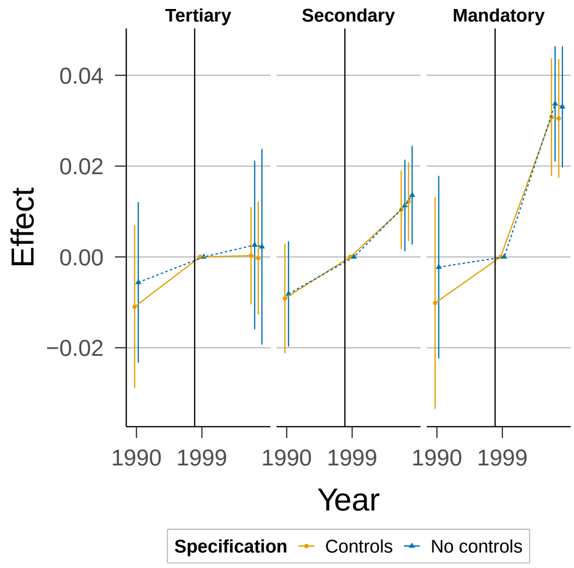
(b) By education and gender

Figure A10
Heterogeneous impact on commuting propensity

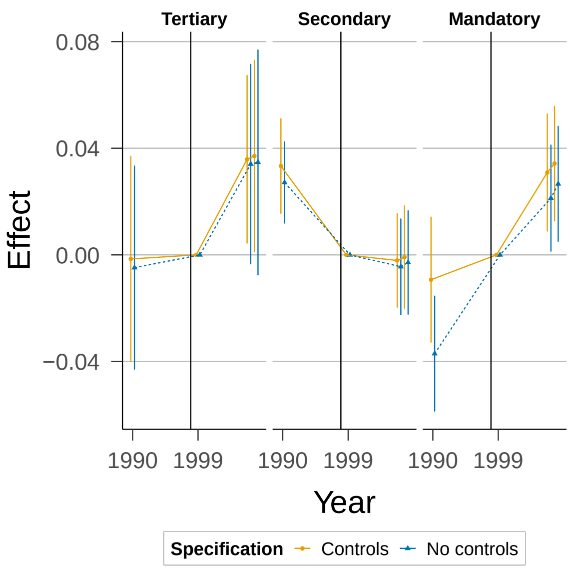
Notes: Figure A10a shows the estimated impact of the labor market integration by education group (columns) and by exposure of the labor market (color), using equation (A.2). Figure A10b shows the estimated impact of the labor market integration by education group (columns) and by gender (color), using equation (5). The error bars are 95% confidence intervals clustered at the local labor market level. The estimates are adjusted for the change in the outcome from 1990 to 1999. *Data: DADS Postes 1995–2007.*



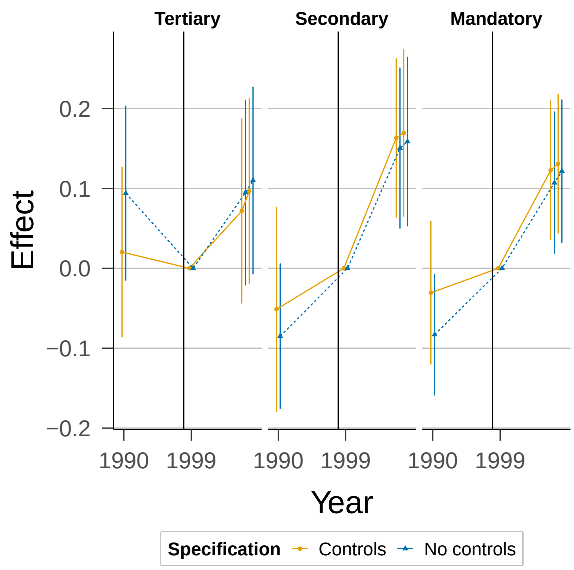
(a) Commuting propensity



(b) Participation rate



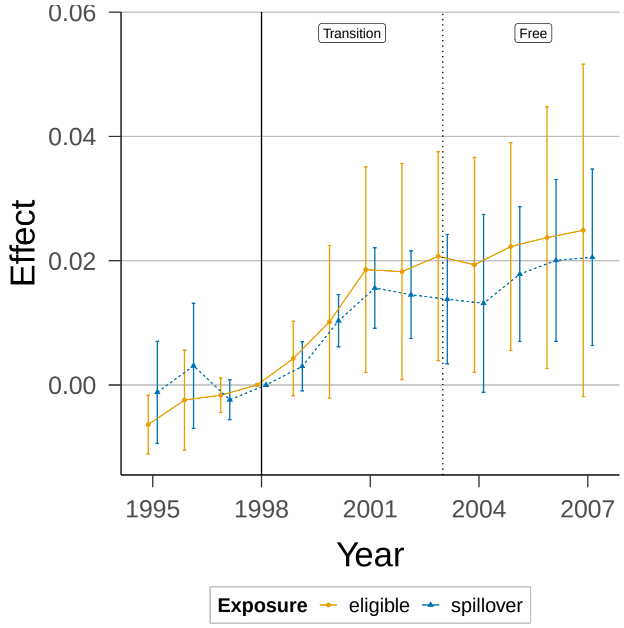
(c) Population



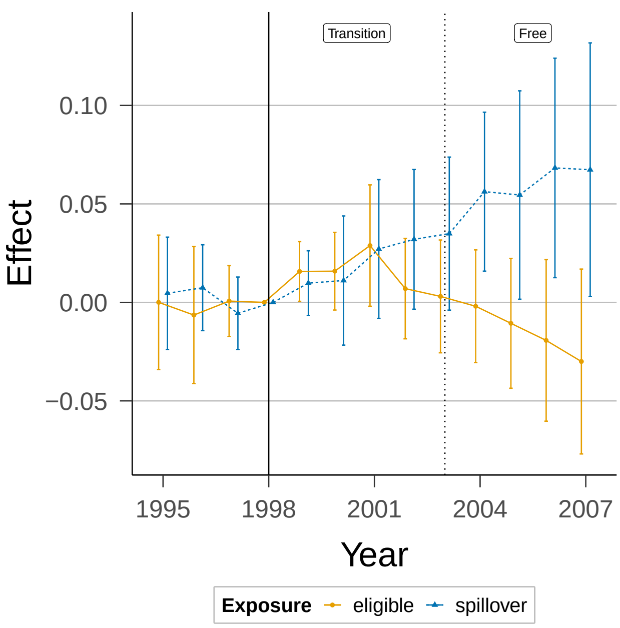
(d) Unemployment rate

Figure A11
Yearly effect on outcomes in census

Notes: Estimates from equation (5). *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 in the main text. *No controls* are coefficients estimated without these controls. The error bars are 95% confidence intervals clustered at the local labor market level. *Data: Population census 1990–2007.*



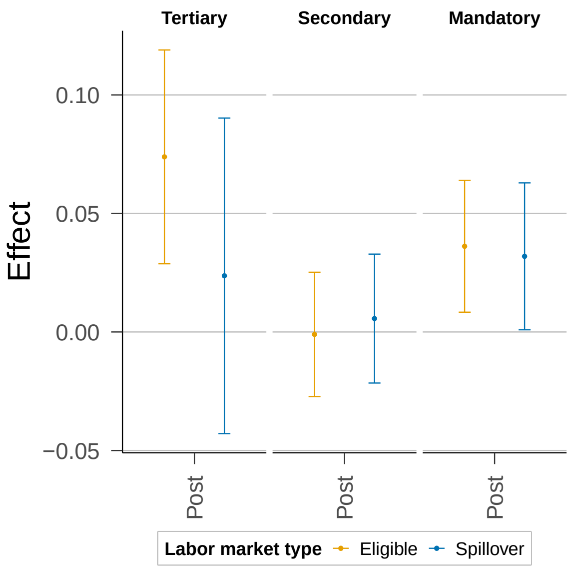
(a) Wage growth index



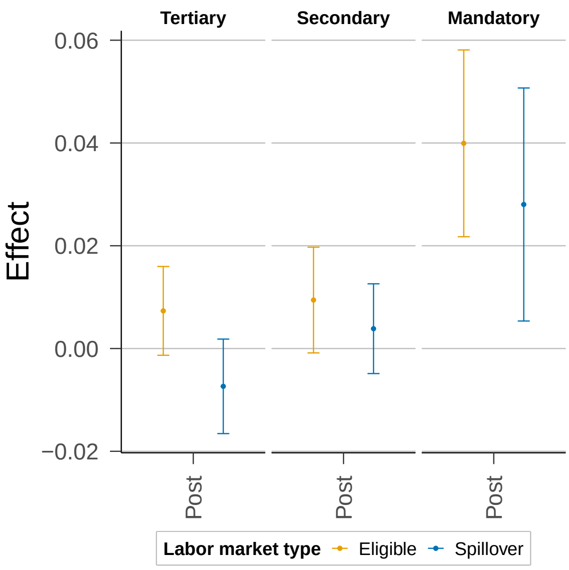
(b) Employment

Figure A12
Wage and employment effects across space

Notes: The figures show the annual effects on eligible and spillover labor markets, using equation (A.2). The error bars are 95% confidence intervals clustered at the local labor market level. *Data: DADS Postes 1995–2007.*



(a) Population



(b) Participation rate

Figure A13
Impact on labor market supply across space

Notes: Estimates from equation (A.2). Controls for entry and exit of the working-age population and pre-existing migration are included in the regressions (see text for details). The error bars are confidence intervals clustered at the local labor market level. *Data: Population census 1990–2007.*

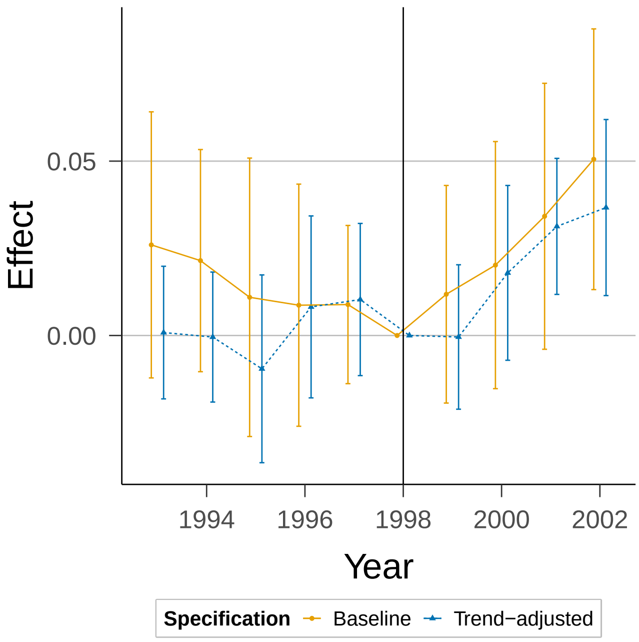


Figure A14
Labor force participation of women with mandatory education

Notes: Estimates from equation (A.3). In contrast to the *Baseline* specification, *Trend-adjusted* includes as controls the department-level change in the labor 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 labor market level. *Data: Labor Force Survey 1993–2002.*