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Nicolò Gatti[*], **Fabrizio Mazzonna**[*], **Raphaël Parchet**[*], **and Giovanni Pica** [†]

Abstract

This paper investigates the impact of opening the labor market to qualified immigrants who hold fully equivalent diplomas as natives and share the same mother tongue. Leveraging the 2002 opening of the Swiss labor market to qualified workers from the European Union, we show that the policy led to a large inflow of young immigrants with highly heterogeneous effects on the wages and employment status of qualified natives. While incumbent natives experienced a wage gain and a decrease in the likelihood of becoming inactive, the opposite happened for young natives entering the labor market after the policy change.

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1   Introduction

The economic and political debate on the opening of labor markets to immigrant workers has involved the majority of countries over the last decades. On the one side, qualified immigrants play a crucial role for emerging countries aiming at raising the level of human capital of the workforce, as well as for advanced economies that are increasingly relying on foreign workers to deal with population ageing and skills shortages (see Peri, 2016, for a review). On the other side, the fear of harmful consequences for native workers has led to a growing support for right-wing populist parties that contest migration and, more generally, globalization (Rodrik, 2020).

A large literature in economics has shown evidence of positive effects on natives' wages and employment when immigrants are either unskilled or experience linguistic barriers (e.g., Foged and Peri, 2016). In this framework, while immigrants are more likely to specialize in manual-intensive tasks, natives exploit their comparative advantage in communication-intensive jobs (Peri and Sparber, 2009; Manacorda et al., 2012; Ottaviano and Peri, 2012). These complementarities lead to higher total factor productivity and wages (Borjas, 1999; Peri, 2012; D'Amuri and Peri, 2014). Our paper analyzes a rather different setting. We focus on the labor market impact of qualified immigration when foreign workers speak the same mother tongue and hold fully equivalent certifications with respect to natives. To this aim, we leverage the natural experiment provided by the enactment of the Agreement on the Free Movement of Persons (AFMP) between Switzerland and the European Union in 2002. This agreement has implied the recognition of diplomas and professional qualifications of workers from EU countries, granting them access to the Swiss labor market without the need to acquire further certifications.

We investigate the effects of this reform on qualified natives' labor market outcomes in Ticino, an Italian-speaking Swiss canton where Italian workers represent on average 42% of private sector employees.[1] For identification, we rely on a difference-in-differences approach that compares the evolution of the real wages and employment status of natives employed in sectors highly exposed to the recognition of EU certifications to the evolution of the same outcomes of natives employed in less exposed sectors, before and after the policy change. We document three main effects of the AFMP. First, while the fraction of Italian employees grew in all sectors after the introduction of the AFMP, we estimate a further increase of more than 3 percentage points in treated sectors. This increase is mainly driven by young immigrants and corresponds to approximately 23% of the pre-policy share for this age group.

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[1]For comparison, over our sample period non-Swiss employees in Switzerland amount on average to 25% of the workforce.

Second, the increased competition red on qualified natives from qualified immigrants had a large and statistically significant negative impact (-7%) on the real wages of the youngest age group (18–29); an impact that turns positive for middle-aged (30–49) native employees (+5%), and fades away for older employees (50–64).

The negative effect on the youngest age group is explained by the lower entry wages of young natives who enter the labor market after the policy change, while the wages of young incumbents were mostly unaffected. As for the wage gains experienced by middle-aged incumbent employees, they accrue mostly to high-ability workers and are more likely to materialize when negotiating a new working contract with a different firm.

Third, we document a decrease in the probability of leaving the labor force for older Swiss employees after the liberalization of qualified immigration from EU countries, a result consistent with existing evidence showing that a higher income reduces the probability of early retirement (Kuhn et al., 2021). Conversely, our estimates suggest an increase in the likelihood of inactivity for young natives, although the robustness of this result depends on the adopted empirical specification.

In the absence of linguistic barriers, young qualified immigrants are likely close substitutes of young qualified natives entering the labor market with comparable diplomas and no experience. At the same time, they are complementary to middle-aged experienced natives with a deeper knowledge of the local labor market (Borjas, 2003; Ottaviano and Peri, 2012). We strengthen this interpretation showing that the real wages of incumbent, thus experienced, Italian employees have not been harmed by the inflow of new Italian workers.

We complement our findings with a descriptive analysis of the evolution of the labor market at the regional level. We show that, after the introduction of the AFMP, (*i*) the labor market in Ticino experienced a sharp expansion mainly driven by the growing number of young and middle-aged Italian employees; (*ii*) the wages of Swiss workers in the youngest age group suffered a steeper decline (as compared to the already declining pre-policy trend); (*iii*) the wages of middle-aged Swiss workers went up; (*iv*) the share of jobless young natives increased; finally, (*v*) transitions to inactivity of older Swiss employees became less frequent.

Our paper contributes to the large literature investigating the impact of immigration on natives' labor market outcomes by focusing on a setting characterized by an inflow of same-language foreign qualified workers. Language barriers have been shown to be an important factor preventing migrants to substitute natives (see, e.g., Ottaviano and Peri, 2012). We find that experienced (i.e. middle-aged and older) natives are shielded from the detrimental effects of qualified migration, even

in a context in which natives can be more easily replaced by migrants because they speak the same mother tongue. The burden of increased competition from qualified immigrants is therefore borne by young (inexperienced) natives.

Our paper is closely related to the existing studies on the opening of the Swiss labor market to immigrants from EU countries. Focusing on cross-border workers, Beerli et al. (2021) show that the AFMP allowed firms in knowledge-intensive sectors, especially in the field of high-tech manufacturing, to acquire new skills that were previously scarce. The resulting productivity growth led to an increase in the number of firms and to wage gains for highly educated natives in top managerial positions (Basten and Siegenthaler, 2019).[2]

We complement these findings by showing that the effect is heterogeneous even among skilled natives and depends crucially on workers' experience. We find that gains are concentrated among middle-aged experienced incumbents, while young new entrants face wage losses.[3] Similar findings are reported by Dustmann et al. (2017), who analyze the inflow of low-skilled Czech workers in Germany after the fall of the Berlin wall. Although their setting is different from ours, they show that the adverse effects of increased competition were borne by individuals entering the labor market after the shock, who protected *insiders* from unemployment and wage losses. Dustmann et al. (2013) also discuss how immigration negatively affects individuals at the bottom of the wage distribution, who are likely younger. Conversely, a positive effect of high-skilled immigration, which enhances technological progress, materializes at the top of natives' wage distribution (Dustmann et al., 2009).

Another branch of the existing literature on immigration deals with the role of natives' bargaining power when negotiating new contracts, arguing that wage gains arise from better outside options and, in particular, from a deeper knowledge of the local labor market (Moreno-Galbis and Tritah, 2016). In this framework, the inflow of qualified immigrants with lower reservation wages leads to positive externalities for experienced native individuals (Battisti et al., 2018), who obtain better paid job positions. On the contrary, young individuals at the beginning of their careers – who do not have any experience-led informational advantage – are more exposed to competition. For instance, Aepli and Kuhn (2021) show that Swiss employers close to the frontier have substituted young resident apprentices in need to be trained with less expensive and already qualified cross-border workers.

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[2]Relatedly, Di Carlo (2022) investigates the impact of the AFMP on Italian firms. He finds that firms' exit increases and that surviving firms become less productive and pay lower wages.

[3]Our identification strategy differs from Beerli et al. (2021) who rely on firms' distance from the border. We use instead the differential exposure of economic sectors to the recognition of EU qualifications. Such an alternative identification strategy arguably does not suffer from the potential endogeneity of firms' location choices.

The policy relevance of our research lies in its contribution to the extensive debate on the consequences of opening the labor market to qualified immigrants. Policies aiming at removing barriers for foreign workers have been at the center of the political agenda of several countries and have unleashed the fierce opposition of some parties (Dorn and Zweimüller, 2021).

The rest of the paper is organized as follows. Section 2 introduces the most relevant features of the institutional setting. Section 3 describes our data. Section 4 outlines the empirical models. Section 5 presents our main results and investigates the underlying mechanisms. Section 6 includes a descriptive analysis at regional level and illustrates a theoretical framework. Section 7 concludes.

2 Background

Switzerland and the European Union are bound by deep economic and political relations that have intensified over the last decades, implying an increasing level of integration. Apart from trade and reciprocal market access, this cooperation concerns several policy fields including education, research, security and, most of all, the free movement of people and workers. Since the beginning of the 1990s, the progressive opening of the Swiss labor market to immigrants from EU countries has been the object of a long legislative process that induced a heated debate on the potential detrimental effects on natives' labor market outcomes.

The free access to the Swiss labor market for EU workers was introduced by the AFMP, one of the seven Bilateral Agreements[4] between Switzerland and the EU signed on June 21, 1999 and approved by the Swiss electorate in a referendum in May 2000. These agreements guarantee reciprocal market access in several sectors after Swiss voters rejected membership to the European Economic Area in 1992.

The implementation of the AFMP took place gradually. Before 1999, foreign workers were subject to yearly quotas set by the Swiss federal government and to the *priority requirement*, according to which an immigrant could be hired only if an equally qualified resident worker was not available. These restrictions were quite stringent and represented an issue for industries in need of foreign skilled workers (Afonso, 2004). Since 1999, however, these restrictions were partially loosened for immigrants from the EU, triggering a transitional phase characterized by a lower degree of tightness of yearly quotas, especially when hiring cross-border workers (Beerli et al., 2021), until the AFMP was finally enacted on June 1, 2002.

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[4]The other six agreements concern barriers to trade, public procurement markets, agriculture, overland transport, civil aviation and research.

A key feature of the AFMP (Article 9) was the recognition of EU diplomas and professional certifications to encourage qualified immigration in Switzerland.[5] However, the recognition of EU certifications was not uniform across the board. It was granted only to a number of precisely listed occupations that were heavily regulated before the reform. This implies remarkable differences across sectors in the exposure to the policy, depending on the share of treated occupations in each sector. We exploit this cross-sectoral variation for identification purposes.

More in detail, before the enactment of the AFMP, foreign workers who aimed at obtaining a job in a "regulated" occupation had to acquire a further occupation-specific Swiss qualification. The liberalization of qualified immigration lifted this additional requirement. While all sectors were in principle equally affected by the abolition of quotas and priority requirements, sectors relying on a high share of previously regulated occupations were more exposed to the policy change. We exploit the differential exposure to the reform across sectors for identification and, indeed, find that sectors more intensive in occupations with now-recognized certifications experience a larger inflow of employees from EU countries relative to less exposed sectors.[6]

The AFMP has been the object of a fierce opposition by some wings of the Swiss electorate (Mazzoleni and Pilotti, 2015). Such an opposition culminated in the referendum held on February 9, 2014, when voters approved the Federal Popular Initiative *Against Mass Immigration*. This initiative aimed at reintroducing quotas for immigrants and was accepted by 50.3% of Swiss voters, a share that reached 69.2% in the canton of Ticino. However, while in 2016 the Swiss Parliament passed a law requiring employers to give priority to resident job seekers, quotas for workers from EU countries were never reintroduced. Our analysis focuses on the time window between 1992 and 2008 to avoid any potential confounding effect of the global financial crisis and of the subsequent changes to the Swiss immigration policy.

3 Data

This paper is based on Swiss administrative data released by the Institute of Social Security of the canton of Ticino (*Istituto delle Assicurazioni Sociali*). The dataset covers the quasi-universe of individuals paying contributions to the first pillar of

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[5]The full text of the agreement is available in the Swiss Publication Platform for Federal Law (*Fedlex*) at https://www.fedlex.admin.ch/eli/cc/2002/243/de.

[6]It is worth remarking that, while the AFMP implied a *mutual* recognition of qualifications, the outflow of Swiss workers was very limited due to the large negative wage gap between Switzerland and the EU countries, especially Italy (see also Beerli et al., 2021).

the Swiss social security system, namely residents older than 20[7] and active workers regardless of their residence status, therefore including cross-border workers.

We focus on Ticino, the only Italian-speaking canton in Switzerland, because of its remarkably high degree of economic and social integration with the neighboring country of Italy (Decoville and Durand, 2019). In fact, Ticino is the Swiss canton characterized by both the highest share of non-Swiss employees[8] and the highest share of cross-border workers, who exceed 30% of the labor force (Swiss Federal Statistical Office, 2021).

For each individual in a given year between 1992 and 2008, our dataset reports whether the subject is an employee, a self-employed worker, or inactive, a category that includes students, *long-term* unemployed,[9] people who choose not to enter the labor market (or who receive disability benefits), and early retirees. These subgroups are not explicitly distinguished in the data, but early retirement can be inferred from age (in Switzerland early retirement is allowed from age 58).

Our dataset includes personal information on sex, date of birth and nationality. For every calendar year, the data contain active workers' annual earnings and the working period in months associated with each job. Unfortunately, the type of work permit of foreign workers (e.g., resident foreign national vs cross-border worker) is not reported. When an individual has multiple jobs during the same year, we select the one associated with the highest annual income. We express annual income in real terms at 1998 prices, using the Consumer Price Index released by the Swiss Federal Statistical Office. Differently from social security data available for the whole country, our canton-level dataset reports the sector according to an internal classification that we link to the two-digit *Swiss General Classification of Economic Activities* (NOGA, 2002 Nomenclature).

Since our data do not include information on the level of educational attainment and on the specific occupation of each employee, we rely on the sector of the firm

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[7]Note that before January 1, 1997, residents in Switzerland without gainful employment were not subject to the obligation of contribution. Their contribution was only on a voluntary basis. The obligation introduced in 1997, however, does not affect our analysis as we focus on employed individuals and their transitions to inactivity. Reassuringly, there is no significant change in the share of employees becoming inactive in correspondence of this reform occurred in 1997 (see Section 6, Figure 6).

[8]Appendix Figure A.1 reports the share of non-Swiss employees in the sixteen Swiss large labor market regions in 1998 and 2008. The labor market area of Lugano, where the vast majority of private sector firms in the canton is located, exhibits the highest share of non-Swiss employees of the country, reaching more than 65% in 2008. These figures are computed using Business Census data (Swiss Federal Statistical Office, 2016), which reports employment rate (but no wage rate) by sector, municipality, nationality, and gender.

[9]In case of job loss, unemployment benefits can be received for at most two years. Over this period individuals are not observed in our dataset.

in which individuals are active to assign them to the treatment or control group. More specifically, in order to identify the sectors heavily exposed to the recognition of EU qualifications, we leverage additional data from the *Swiss Labor Force Survey* (SLFS), a representative survey covering the working-age (15+) resident population in Switzerland (Swiss Federal Statistical Office, 2022). For each employee, the SLFS reports the occupation and sector of activity according to, respectively, the *International Standard Classification of Occupations* (ISCO-08) and the NOGA classification. Relying on the list of regulated occupations in Switzerland (State Secretariat for Education, Research and Innovation, 2022) involved in the enactment of the AFMP, we identify the occupations (ISCO-08) affected by the recognition of qualifications released by EU countries.[10] Then, we compute the share of individuals employed in a "treated" occupation within each sector to evaluate its degree of exposure to the reform. To be consistent with the sample selected for our empirical investigation (more on this below), we focus on private sector male employees active in Ticino over the period 1996–2008.[11]

From this procedure, we obtain a bimodal distribution of shares of workers employed in treated occupations. This allows us to clearly distinguish between sectors with low and high shares (on average, 16.41% *vs.* 47.55%). Henceforth, we will refer to these two groups as, respectively, *untreated* and *treated* sectors. Appendix Table B.1 provides the full list of treated and untreated sectors in our social security data, displaying for each of them the share of employees holding treated occupations according to the SLFS, as well as the evolution over time of the share of Italian employees. Treated sectors include chemical industries, legal assistance, engineering and architecture, communication and transports, hotels and restaurants, IT and auxiliary services for trade (e.g., accounting). As robustness check, we will also investigate the role of treatment intensity to verify whether the effect of the policy is larger in sectors with a higher share of treated occupations.

Since a substantial share of Swiss females and of public sector employees work part-time, we exclude them from our analysis. In their case, indeed, the lack of information on the number of hours in our data is problematic because we cannot distinguish changes in hours worked from changes in hourly wages.[12] Additionally,

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[10]To make sectoral classifications consistent, we build a cross-walk from the SLFS classification of economic sectors (NOGA) to the classification used in our social security records.

[11]Ideally we would like to focus on the pre-reform period, but before 2002 the SLFS is not representative at canton level due to the low number of observations. Reassuringly, our results are robust to the use of a treatment definition based on private sector male employees active in Switzerland in the pre-reform period.

[12]According to our calculations based on Business Census data (Swiss Federal Statistical Office, 2016), not only the participation to the labor force of Swiss women was rather low in Ticino in 1998 ($\approx$ 48%), but roughly 25% of active women worked part-time at a rate between 50% and

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due to pervasive regulation, public sector wage dynamics are likely different from private sector dynamics.

Finally, since our data include individuals affiliated to the cantonal office that collects first pillar contributions in Ticino, we cannot observe workers who belong to other compensation offices. In particular, we are not able to cover the banking and insurance sector that represents approximately 9% of private sector male employees in 1998, a share which has largely decreased over time (*Business Census* data). At the same time, the share of Swiss employees in this sector decreased from 85% in 1998 to 80% in 2008. According to the SLFS data, the banking and insurance sector would belong to the treated group. While we cannot state a priori whether the effect of the AFMP on this sector would be homogeneous with the other treated sectors, the relatively low share of employees in this sector suggests that its inclusion should not affect our results significantly.
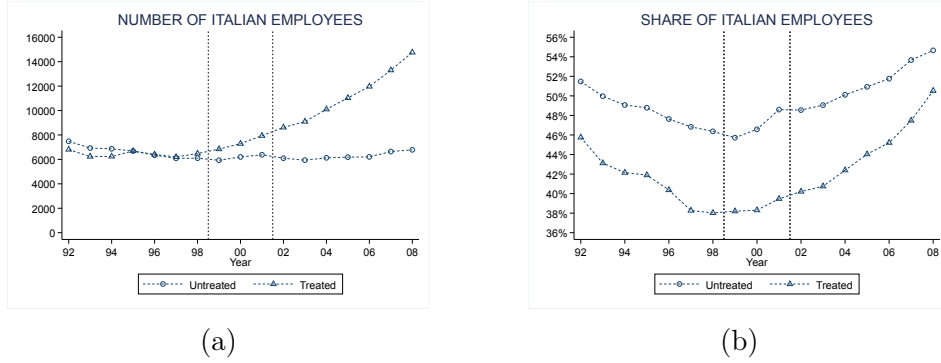

Figure 1: Evolution of Italian employees in treated *vs.* untreated sectors

Notes: This figure shows the evolution over time (1992-2008) of the absolute number (panel a) and share (panel b) of male employees of Italian nationality in private sector firms with at least two employees in the canton of Ticino. The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.

Figure 1 shows the evolution over time of the number (panel 1a) and share (panel 1b) of Italian employees for treated and untreated sectors. The number of Italian employees in treated sectors increased sharply after 1999, doubling in size in 2008 compared to 1998, while it remained constant in untreated sectors (panel 1a). The share or Italian employees in both treated and untreated sectors has sizeably grown after the AFMP was signed, reversing a previous decreasing trend (panel 1b). Because of the recognition of EU certifications, this increase has been

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90%, and almost 20% of them at a rate below 50%. On the contrary, 94% of male employees held full-time jobs. See Buchmann et al. (2010) for a review of the structural factors driving women's employment decisions in Switzerland.

far more pronounced in treated sectors, where the share of Italian employees was initially lower as a consequence of the restrictions described in Section 2. Appendix Table B.2 displays the evolution of the share of Italian employees in treated and untreated sectors by age group. It also presents the summary statistics for the main variables in our analysis (real wage, wage at new job and probability of transition to inactivity).

4 Empirical Modelling

We study the impact of the policy on labor market outcomes in Ticino adopting a difference-in-differences (DiD) approach that compares the evolution of economic sectors differentially affected by the recognition of EU qualifications.

Baseline Dynamic DiD Model

To assess the salience of the reform, we first investigate the impact of the policy on the firm-level share of Italian employees in Swiss firms located in Ticino, estimating the following model:

$$y_{ft} = \alpha_f + \sum_{k=1992}^{2008} \pi_k\, treated_f \cdot \mathbb{1}[t=k] + \chi_d + \mu_t + \epsilon_{ft} \tag{1}$$

where y_{ft} is the share of Italian employees, overall or by age group (18–29; 30–49; 50–64), working in firm f and year t.[13]

We include administrative districts fixed effects (χ_d) to account for geographical features, in particular distance from the Italian border,[14] year dummies (μ_t) that capture aggregate fluctuations in business cycles, and firm fixed effects (α_f) that control for time-invariant firm characteristics affecting the propensity to hire foreign employees and potentially correlated with the treatment status. The error term ϵ_{ft} captures unobservable time-varying shocks to firm f. Standard errors are two-way clustered, at sector and at year level.

The dummy variable $treated_f$ takes value one if firm f belongs to a treated sector and is further interacted with an indicator variable $\mathbb{1}[t=k]$, one for each year t,

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[13]When we estimate model (1) breaking down the share of Italian employees by age group, the outcome variable is the ratio of the number of Italian employees of a specific age group to the total number of employees in firm f in year t.

[14]The canton of Ticino consists of eight districts, three of which (Locarno, Lugano, Mendrisio) share borders with Italy, while the other five (Bellinzona, Blenio, Leventina, Riviera, Vallemaggia) are smaller and less populated. At the beginning of the 1990s more than 70% of firms were already located in the three districts at the border with Italy; this proportion reaches 80% in 2008.

excluding 1998 as reference year. Thus, the coefficients π_ks ($k = 1992,..., 1997, 1999,$ ..., 2008) measure the (potentially time-varying) impact of the policy. The choice of 1998 as reference year corresponds to the first year before the potential transitional effects between 1999, when the hiring of workers from neighboring EU countries started to be progressively loosened, and 2002, when the AFMP was enacted.

We next move to a worker-level analysis and investigate the effect of the policy on native (Swiss) employees' real wages. We estimate the following model:

$$w_{ist} = \alpha_i + \sum_{k=1992}^{2008} \beta_k \, treated_{it} \cdot \mathbb{1}[t = k] + \chi_d + \lambda_s + \mu_t + f(age) + \epsilon_{ist} \qquad (2)$$

in which the outcome variable w_{ist} is the (log of) the real monthly wage of employee i in sector s in year t. As discussed in Section 3, we assign each individual to the *treatment status* depending on the employing firm's sector, so $treated_{it}$ takes value one if employee i works in year t in a treated sector. We include district fixed effects (χ_d), sector fixed effects (λ_s) to account for time-invariant differences across sectors, year dummies (μ_t), and individual fixed effects (α_i) to account for time-invariant individual characteristics (e.g., ability) influencing wages and potentially correlated with the treatment status. This limits the extent of the omitted variable bias and helps interpreting β_k as the actual effect of the policy. Finally, $f(age)$ is a quadratic polynomial for age. Robust standard errors are two-way clustered at sector and at year level. To explore the potential heterogeneity of the effect, we further estimate equation (2) separately for different subsamples of native employees, depending on their age group (18-29; 30-49; 50-64) in each year t.

The key underlying assumption is that trends in the outcome of interest for treated and untreated sectors would be identical in the absence of treatment. While this assumption is not directly testable, our dynamic specification allows us to formally test the presence of parallel trends in the pre-policy period. Moreover, the unconditional comparison of the two wage series for treated and untreated sectors (see Appendix Figure A.2) suggests that the two groups are also very similar in levels, making the parallel trend assumption more credible.

"Frozen" model

To further study the heterogeneous effect of the reform, we differentiate between employees active before the policy change and those hired afterwards. Hence, we estimate a version of model (2) that focuses on incumbent employees active in 1998. In this specification, the variable $treated_{it}$ is substituted by the time-invariant vari-

able $treated_i$, which takes value one or zero depending on the sector in which the employee was active in 1998. Since movements in and out of treatment are not frequent (on average 4% of private sector Swiss male employees change treatment status every year) and do not affect our estimates (see our robustness check below), any differences from baseline results are driven by new-entrant employees rather than by having fixed incumbents' economic sector in 1998.

Static DiD model

We complement our worker-level investigation of the effects of the AFMP on native employees' wages and tudy its impact on the probability to transiting to inactivity by estimating the following *static* difference-in-differences specification:

$$y_{ist} = \alpha_i + \delta_1 treated_{it} \times transition_t + \delta_2 treated_{it} \times post2002_t$$
$$+\chi_d + \lambda_s + \mu_t + f(age) + \epsilon_{ist}$$
(3)

in which the two time dummies $transition_t$ and $post2002_t$ identify the transition phase between 1999 and 2001 and the post-policy period since 2002, respectively. In this model, the outcome variable y_{ist} can be either represented by employees' real wages - like in model (2) - or by employees' probability of becoming inactive.

In the latter case, we estimate a linear probability model in which y_{ist} is a dummy variable taking value one if employee i in sector s and year t becomes inactive or leaves the dataset[15] in year $t + 1$. Differently from the model for wages, this linear probability model cannot include individual fixed effects because of the relatively low number of transitions out of employment. We also distinguish between the likelihood of becoming inactive or leaving the dataset by estimating a multinomial logit model similar to equation (3). Appendix C provides more details about this specification.

5   Results

Figure 2 shows the dynamic impact of the policy on the share of Italian employees in firms, reporting the coefficients of our multiperiod diff-in-diff model (1) with 95% confidence intervals. Panel (2a) considers the overall firm-level share of Italian employees, while panels (2b)–(2d) examine the firm-level proportion of Italian

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[15]We define the occurrence of an *exit* when an individual leaves the dataset and does not enter again within three years. Indeed, Swiss individuals who lose their job receive unemployment benefits for up to two years and are not covered by our dataset in this period. Subjects who exit are therefore those leaving Ticino, retiring at most two years before the ordinary age, and entering economic sectors not included in our dataset.

employees relative to the total workforce of the firm by age group (18-29; 30-49; 50-64).
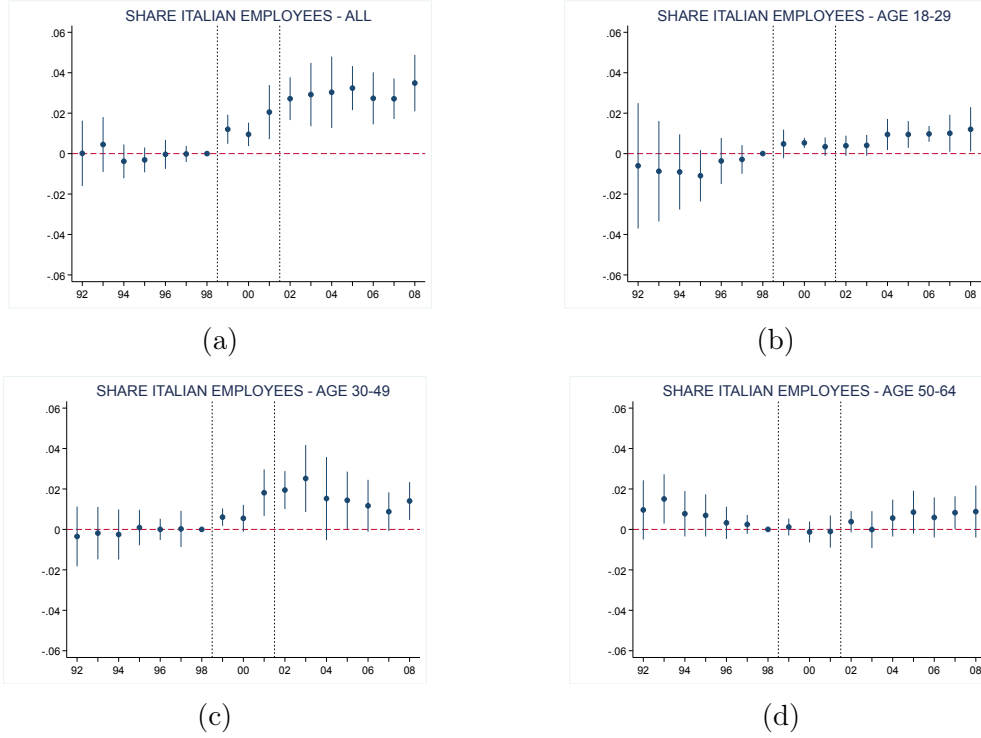

Figure 2: Share of Italian employees in firms - Dynamic DiD model

The recognition of EU qualifications led to a large increase in the share of Italian employees (panel 2a), mainly driven by young (panel 2b) and middle-aged (panel 2c) Italian employees, while the increase for age group 50–64 (panel 2d) is negligible. The coefficients in panels 2b and 2c are similar in magnitude. However, the average initial share of young Italian employees in treated firms was almost four times lower than the share of their middle-aged counterparts, as displayed in the last two rows of Table 1. Hence, the effect of the policy was far larger for the youngest age group ($\approx$ 23% of the pre-policy value). Table 1 presents the estimates from the *static* version of equation (1), confirming the large increase in the share of young and middle-aged employees (Columns 2 and 3).

Table 1: Share of Italian employees in firms (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)
treated_transition	0.014***	0.010	0.010	-0.005
	(0.004)	(0.006)	(0.006)	(0.005)
treated_post2002	0.030***	0.013**	0.017*	0.000
	(0.005)	(0.005)	(0.008)	(0.006)
N	86729	86729	86729	86729
Mean in 1998 (T)	10.49%	3.99%	18.62%	8.85%
Mean in 1998 (U)	12.80%	5.77%	19.73%	12.91%

Notes: This table shows the estimates of the difference-in-differences coefficients of a *static* version of model (1). Column (1) reports the estimates for the full sample of male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). All models include district, year, and firm fixed effects. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average shares of Italian employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

In what follows, we investigate the effect of this increased competition from qualified workers on natives' wages. Figure 3 presents the dynamic effect of the policy on the real wages of Swiss employees. Panel 3a shows that the policy had an overall positive, albeit not statistically significant, impact. This result, however, hides a remarkable heterogeneity across age groups. The effect was negative for young native employees aged 18–29 (panel 3b) while it was positive for employees aged 30–49 (panel 3c). The effect then vanished when considering older individuals above age 50 (panel 3d). It is worth noting that the coefficients in the pre-treatment period are always close to zero and never statistically significant.

As we will discuss later, the negative effect borne by young employees is driven by a reduction in the entry wages offered to young Swiss employees entering the labor market *after* 1999. This effect already materializes before the official enactment of the policy in 2002 because restrictions started to be loosened and cantonal authorities became more flexible in the hiring process of cross-border workers, especially in high-tech sectors, right after the agreement was signed in 1999 (Beerli et al., 2021).

Table 2 presents our estimates from model (3), confirming a wage loss of roughly 7 percentage points burdened by young employees aged 18–29 (Column 2) and a wage gain of more than 5 percentage points enjoyed by middle-aged (30–49) employees (Column 3). Note that the point estimates obtained from the static specification
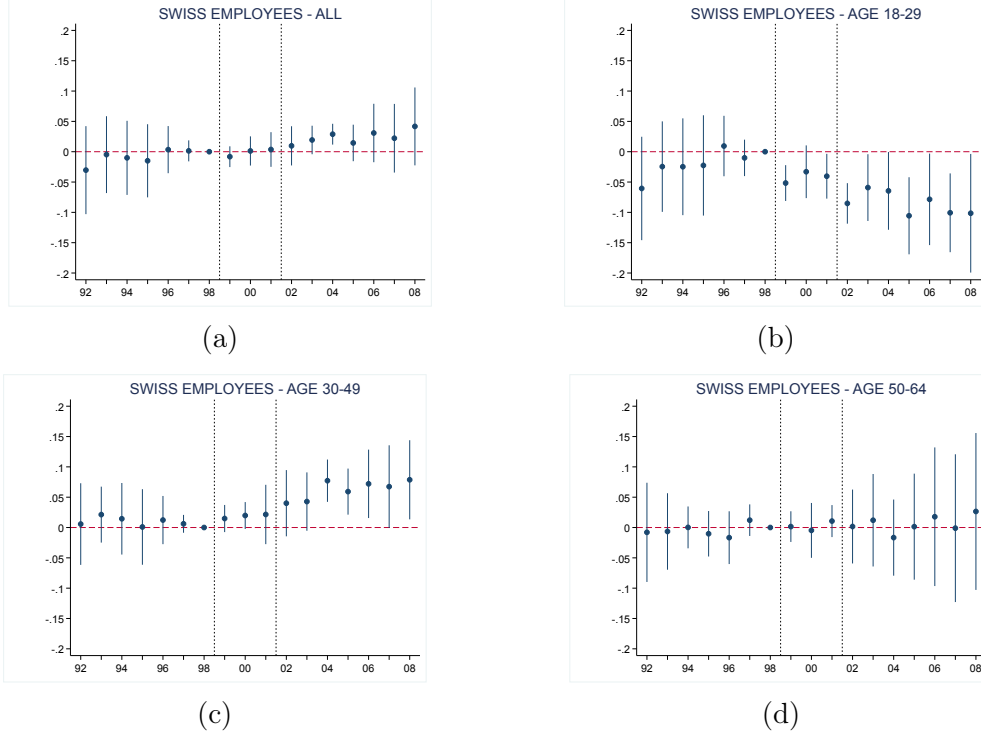
Figure 3: Swiss employees' (log) real monthly wages - Dynamic DiD model

Notes: This figure shows the estimates from the dynamic difference-in-differences model (2). Panel (a) refers to the full sample of Swiss male employees in private sector firms with at least two employees, while panels (b)–(d) refer to different age groups (18–29; 30–49; 50–64). Each graph shows the estimates of the coefficients β_k ($k = 1992,...,$ 1997, 1999, ..., 2008) with confidence intervals at the 5% significance level. The last year before the Agreement on the Free Movement of Persons was signed (i.e., 1998) is the omitted year. All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.

summarize well the estimated effects in the dynamic specification, but standard errors tend to be larger. This is likely the result of the different reference periods, namely the whole 1992–1998 pre-policy period in the static model instead of year 1998 only in the dynamic specification.

In Table 3 we focus on the impact of the policy on the probability of becoming inactive or leaving the dataset, reporting the estimates from our linear probability model (3). According to the negative coefficient displayed in Column 4, the AFMP has led Swiss employees aged 50-64 to be less likely to become inactive or leave the dataset. On the contrary, although the positive coefficient in Column 2 lacks statistical significance, we find an opposite effect for young native employees, who have experienced an increase in their likelihood to leave the labor market.

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Table 2: Swiss employees' (log) real monthly wages (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)
treated_transition	0.005	-0.031	0.012	0.005
	(0.026)	(0.032)	(0.025)	(0.024)
treated_post2002	0.029	-0.070*	0.052	0.006
	(0.034)	(0.035)	(0.037)	(0.049)
N	249392	70539	125332	48890
Mean in 1998 (T)	3.50	3.12	3.66	3.69
Mean in 1998 (U)	3.61	3.22	3.78	3.85

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) for real wages. Column (1) reports the estimates for the full sample of Swiss male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average (log) real monthly wages of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively.
Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Incumbent vs. new-entrant native employees

As anticipated in Section 4, our definition of treatment does not preclude self-selection into or out of it. To address this concern, we turn to our 'frozen' specification and estimate a version of model (3) that fixes employees' treatment status and age group in 1998, focusing on individuals already active in the local labor market before the reform. Table 4 presents the results for real monthly wages (Panel A) and for the probability of inactivity (Panel B).[16] The coefficients reported in Panel A broadly confirm the findings presented in Figure 3 and Table 2. There is however one remarkable exception for young employees, as the negative effect disappears and even turns positive (although not statistically significant, see Column 2).

Since the difference from the baseline model lies in the exclusion of employees entering the labor market after 1998, this result suggests that the adverse consequences of the policy change have been borne by young native new entrants.[17] Moreover, the estimates from our linear probability model reported in Panel B suggest that young incumbents have also benefited from a reduction in the likelihood of inactivity.

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[16]Appendix Figure A.3 shows the estimates from the 'frozen' version of model (2) for Swiss employees' (log) real monthly wages.

[17]Appendix Figure A.5 shows a reduction in the average entry wages of young native new entrants in treated sectors after 1999, when the effects of the policy started to materialize.

Table 3: Swiss employees' probability of inactivity (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)
treated_transition	-0.001	0.013	-0.006	-0.003
	(0.006)	(0.010)	(0.007)	(0.008)
treated_post2002	-0.001	0.017	-0.001	-0.010**
	(0.003)	(0.010)	(0.005)	(0.004)
N	238663	67030	122301	49332
Mean in 1998 (T)	9.04%	11.16%	6.76%	11.95%
Mean in 1998 (U)	7.21%	7.46%	5.58%	10.75%

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) for the probability of becoming inactive or leaving the dataset. Column (1) reports the estimates for the full sample of Swiss male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). All models include sector, district, and year fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average shares of Swiss employees becoming inactive (or leaving the dataset) by age group in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

To further test the hypothesis of the incumbent advantage, we repeat the analysis for incumbent Italian employees (see results in Appendix Table B.3 and Appendix Figure A.4). The results suggest that the inflow of new Italian employees has not harmed the wages of incumbent immigrants. This is not surprising because incumbents could take advantage of previously acquired experience, and because they are likely to be highly positively selected since before the policy change they were required to obtain an additional Swiss qualification to access treated sectors.

The role of individual ability and firm-to-firm movers

To shed further light on the mechanisms behind the wage gains experienced by native incumbent employees, we investigate more in detail the role of ability.

For Swiss employees active in 1998, we first estimate individual fixed effects from a regression of (log) real wages on sector, year, district, and individual fixed effects, plus a quadratic age term. Individual fixed effects are derived separately for each age group (conditional on age in 1998) over the pre-policy period (1992–1998).

For each age group, we define as high-ability employees those belonging to the top quintile of the fixed effects distribution.[18]

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[18]This should approximately capture the fraction of the Swiss population with tertiary-level de-

Table 4: Incumbent Swiss employees' labor market outcomes (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)
Panel A: (Log) real monthly wages				
treated_transition	0.011	0.012	0.014	0.018
	(0.024)	(0.038)	(0.026)	(0.025)
treated_post2002	0.036	0.052	0.041	0.036
	(0.032)	(0.035)	(0.033)	(0.057)
N	151786	40098	82432	29256
Mean in 1998 (T)	3.50	3.12	3.66	3.69
Mean in 1998 (U)	3.61	3.22	3.78	3.85
Panel B: Probability of inactivity				
treated_transition	-0.016**	-0.019*	-0.011	-0.012***
	(0.006)	(0.010)	(0.007)	(0.001)
treated_post2002	-0.016*	-0.012*	-0.011	-0.011
	(0.009)	(0.006)	(0.009)	(0.013)
N	165373	43136	88883	33354
Mean in 1998 (T)	9.04%	11.16%	6.76%	11.95%
Mean in 1998 (U)	7.21%	7.46%	5.57%	10.75%

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) when treatment status and age are fixed in 1998 ("frozen" model). Column (1) reports the estimates for the full sample of Swiss male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). Panel A refers to wages, while panel B to the probability of becoming inactive or leaving the dataset. All models include sector, district, year, and (only for wages) individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows of Panel A display the average (log) real monthly wages of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. The last two rows of Panel B display the average shares of Swiss employees becoming inactive (or leaving the dataset). Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

We then estimate a triple interaction version of equation (3) adding a further interaction with a dummy variable for high ability to differentiate the effect of the policy by type of worker. Table 5 shows that statistically significant and economically relevant wage gains are concentrated among middle-aged and, to a lesser extent,

gree or professional qualification as, according to Census data, in year 2000, about 22% of the Swiss population had either tertiary education or a professional qualification. More details are available at: https://www.bfs.admin.ch/bfs/en/home/basics/census.assetdetail.1021397.html.

young incumbent native employees with high ability.[19] On the contrary, the wages of Swiss employees with a low level of ability have remained substantially unaffected.

Table 5: Incumbent Swiss employees' (log) real monthly wages by ability (1992-2008)

	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)
treated_post_1999	-0.013	0.012	0.010
	(0.051)	(0.023)	(0.028)
treated_post_1999 × high	0.021	0.127**	0.078
	(0.049)	(0.051)	(0.106)
treated_post_2002	0.004	0.041	0.063
	(0.037)	(0.048)	(0.075)
treated_post_2002 × high	0.149*	0.130***	-0.038
	(0.070)	(0.045)	(0.058)
N	34412	78167	28190
Mean in 1998 (T)	3.12	3.66	3.69
Mean in 1998 (U)	3.22	3.78	3.85

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) when treatment status and age are fixed in 1998 ("frozen" model). In these models we control for high ability by considering the top quintile of the predicted distribution of individual fixed effects (between 1992 and 1998) for Swiss employees active in 1998. Columns (1)-(3) report the estimates for Swiss male employees in private sector firms with at least two employees, distinguishing between different age groups (18–29; 30–49; 50–64), fixed in 1998. All models include sector, district, and year fixed effects, plus a linear and a quadratic age term and a dummy for high ability. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average (log) real monthly wages of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

We also explore whether the wage effects of the policy differ between incumbent native employees who have changed firm and those who have not. Appendix Table B.5 suggests that, while there are no statistically significant wage effects for employees remaining at the same firm where they were active in 1998, the policy has led to sizeable gains for firm-to-firm "movers" aged 30–49 and 50–64, namely those with more experience in the local labor market. This positive effect may also reflect, at least partially, a higher degree of screening by firms, as increased competition might induce to select the most skilled and productive native employees.

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[19]Appendix Table B.4 shows that estimates do not change when high-ability employees are defined as those belonging to the top tercile of the predicted distribution of individual fixed effects.

Robustness checks and extensions

As a first robustness check, we estimate equation (2) excluding employees who change treatment status. The coefficients displayed in Appendix Figure A.6 are consistent with those reported in Figure 3, although sometimes less precisely estimated. Our baseline results are therefore not driven by employees self-selecting into treated sectors.

Then, we further divide the treatment group into two subgroups, according to treatment intensity. We define as more intensively treated all workers employed in sectors in which the share of treated occupations is larger than 55%, and less intensively treated all those employed in sectors in which the share of treated occupations lies between 36% and 55% (see Appendix Table B.1). Reassuringly, results in Appendix Figure A.7 show a stronger effect for employees in sectors with a high share of treated occupations compared to employees in sectors with a medium share of treated occupations. Note that a positive pre-trend emerges for young employees and for employees aged 50–64 in the high-intensity treatment sectors. This is not particularly worrying as, right after the policy, the pre-trend flattens out (50–64 age group) or even turns negative (18–29 age group).

Next, we change our main specification and estimate equation (2) including firm (instead of sector) fixed effects. Results in Appendix Figure A.8 largely confirm our findings, in particular the wage losses borne by young native employees and the wage gains obtained by their middle-aged counterparts.

To shed further light on the mechanism, we estimate equation (2) on Swiss employees' total annual earnings rather than on the monthly wage associated to the main job. Despite the additional noise potentially introduced by including short contracts and intermittent jobs, results in Appendix Figure A.9 and in Panel A of Appendix Table B.6 are consistent with our main findings (in Figure 3 and in Table 2). In Panel B of Appendix Table B.6, we also estimate the impact of the policy change on native employees' likelihood of holding more than one job in private sector firms. We find an increase in the probability of having simultaneous contracts for middle-aged employees, while we do not find any statistically significant effect for younger and older individuals. For young natives, therefore, the wage loss associated to their main job is not accompanied by an increase in the likelihood of holding more part-time occupations at the same time.

To reinforce our experience-based interpretation of the differences in the wage effects of the policy across age groups, we estimate equation (3) splitting the sample of employees according to the years of experience in Ticino rather than according

to age.[20]   Appendix Table B.7 confirms that the gains are concentrated among Swiss and Italian experienced employees, while the wage losses are borne by less experienced employees.

As for the effect of the AFMP on native employees' labor market status, Appendix Table B.8 reports estimates from a multinomial logit model that studies the probability of remaining employed, moving to inactivity, or leaving the dataset (see Appendix C). Results are consistent with those obtained from the OLS model presented in Table 3. The only remarkable difference is that we now estimate for young native employees a statistically significant reduction in the probability of remaining employed, driven by an increase both in the likelihood of inactivity and, to a larger extent, in the likelihood of leaving the dataset as a result of out-migration.[21]

Finally, we strengthen our evidence on the channel through which Swiss employees enjoy wage gains and estimate equation (3) on entry wages. Results in Appendix Table B.9 are consistent with those in Appendix Table B.5 and document that the entry wages of middle-aged natives employed in treated sectors increase after the reform relative to the entry wages of those employed in untreated sectors.[22]

6   Discussion

The macro trends

To provide a more comprehensive interpretation of our results, this section presents descriptive macro evidence of the labor market trends in Ticino over the period in which the Bilateral Agreements were enacted. We first show how the reform affected the size and nationality composition of the workforce. We then discuss the behaviour of real wages and of the share of employees becoming inactive by age group.

Figure 4 shows the evolution of the number of Swiss and Italian employees in Ticino (irrespective of treatment status). After a decreasing trend until 1999, the number of Italian employees increased sharply, while for Swiss employees the initial upward trend stops and becomes flat in 2000 (panel 4a). The breakdown by age group shows that not only the number of young Italian employees aged 18–29 exhibits sizeable growth (panel 4b), but there is an even steeper increase in the number of Italians aged 30–49, while the number of Swiss employees rises before 1999 and then flattens out (panel 4c). Finally, there are no visible effects among older employees

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[20]Experience is measured counting the years in which an employee is recorded in our dataset.
[21]Notice that, by splitting age groups 50–57 and 58–64, we can attribute the reduced likelihood of inactivity to a lower propensity of opting for early retirement in the latter group.
[22]Notice that, since the model includes individual fixed effects, the coefficient is identified on the subsample of employees that change firm at least twice.
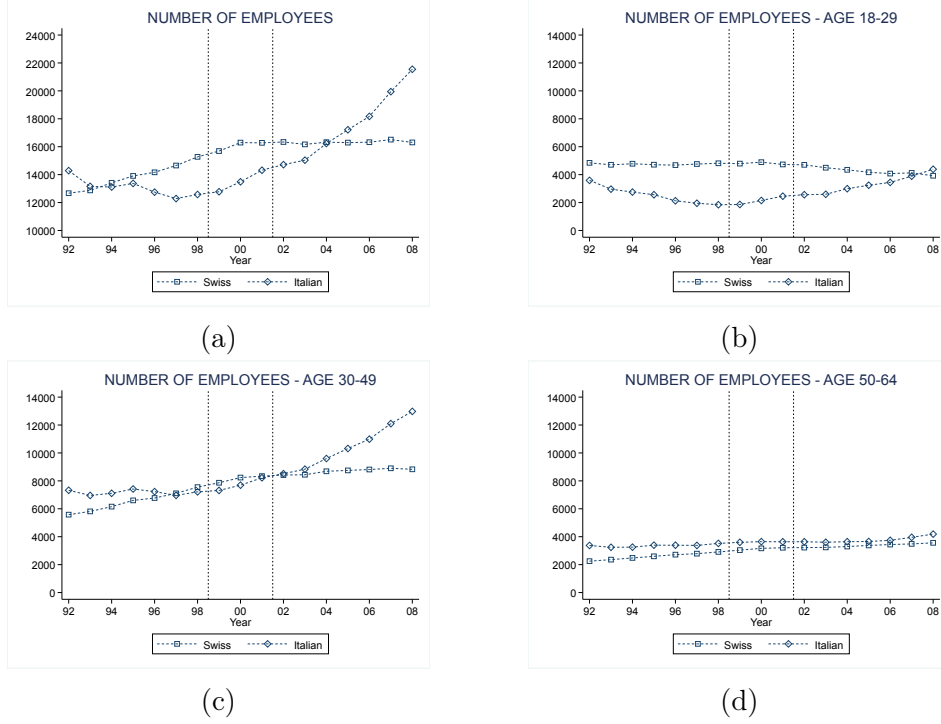
Figure 4: Number of employees by nationality and age group

(panel 4d). All in all, Figure 4 suggests that the policy change may have contributed to an expansion of the labor market. While the total number of employees was already slightly increasing before 1999 as the result of the rising number of Swiss employees, a subsequent steeper growth took place, driven by Italian immigrants.

Next, Figure 5 focuses on the average real wages of Swiss and Italian employees by age group. In general, we observe a small overall increase in the average wages of Swiss employees after 2002 (panel 5a). However, for young natives (panel 5b) the initial decreasing trend becomes steeper after 1999. We observe the opposite pattern for middle-aged Swiss employees, with a clear increase in their wages after 1999 (panel 5c),[23] while there is no relevant change for older employees (panel 5d).

Finally, Figure 6 reports the evolution of the average shares of Swiss employees in different age groups who leave the labor force. Consistently with our micro

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[23]The decrease in middle-aged Swiss employees' average wages during the second half of the 1990s, instead, is likely driven by the reintegration in the labor market of previously unemployed individuals during the 1991-94 Swiss recession.
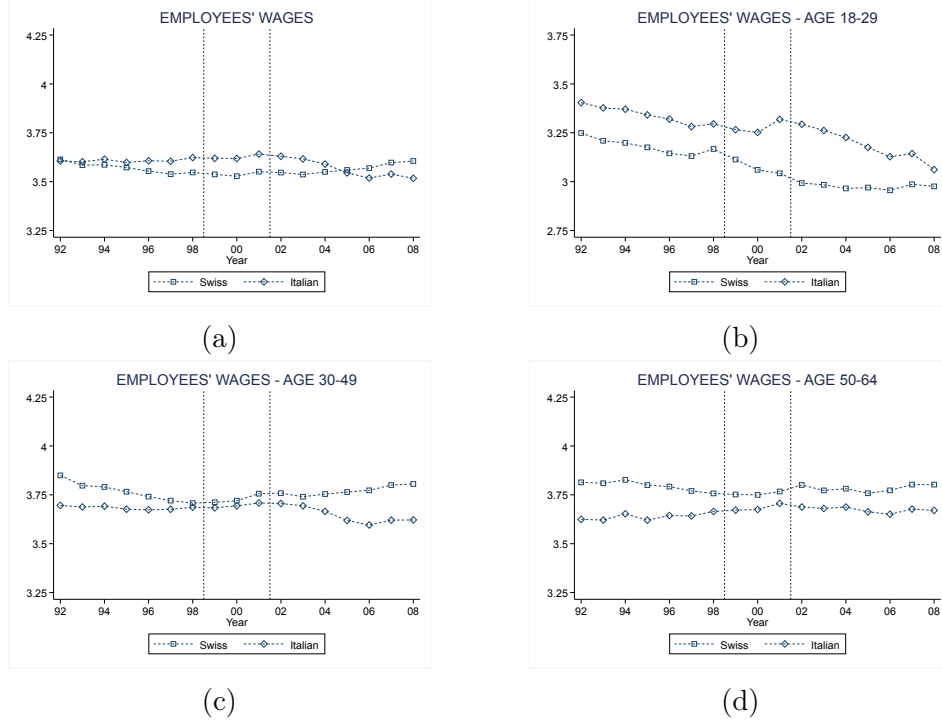
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Figure 5: Employees' (log) real wages by nationality and age group

<u>Notes:</u> This figure shows the evolution over time (1992-2008) of the average (log) real monthly wage of male employees in private sector firms with at least two employees. Each panel compares the evolution of wages for Swiss and Italian employees. Panel (a) refers to the whole sample, while panels (b)–(d) refer to specific age groups (18–29; 30–49; 50–64). The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.

empirical results, the share of Swiss employees who become inactive is characterized by a growing tendency after 1999 (panel 6a). This pattern is driven by a sizeable increase for young employees (panel 6b), while we do not observe any relevant change for their middle-aged counterparts (panel 6c). On the contrary, the average share of older people becoming inactive decreases more sharply after the policy change (panel 6d), mirroring a likely reduction in the share of early retirees.

Theory-based interpretation

According to a standard model of demand and supply in a competitive labor market, a massive inflow of qualified immigrant workers would lead to a decrease in the wages and employment opportunities for same-language natives holding comparable certifications.

Our empirical results however point to an opposite effect: the recognition of EU diplomas introduced by the AFMP did lead to a massive inflow of young qualified
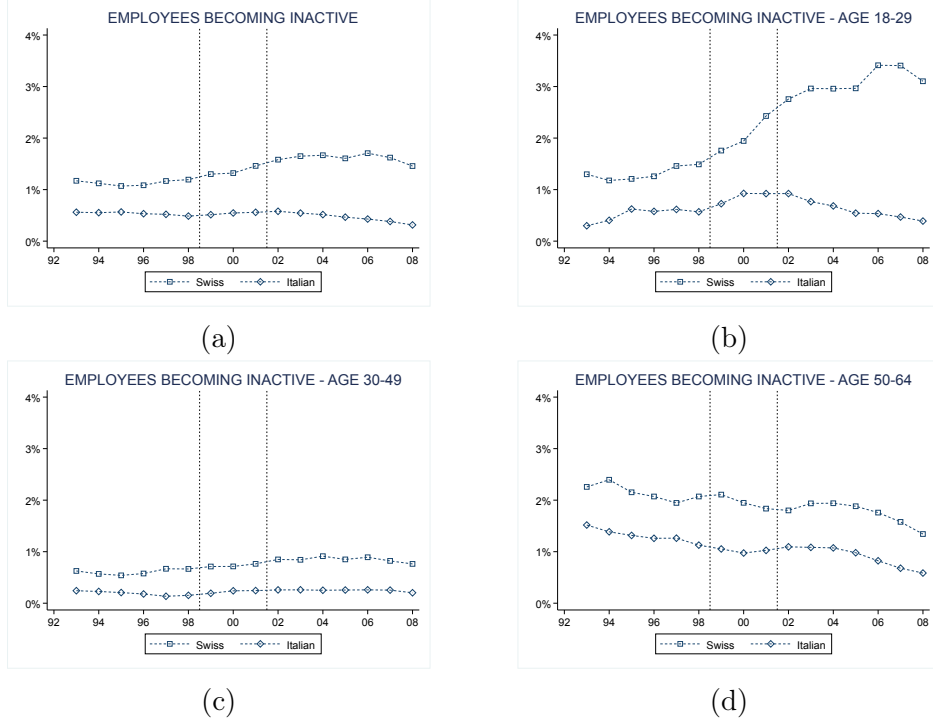
Figure 6: Share of employees becoming inactive by nationality and age group

Italian workers in Ticino, but had an almost negligible aggregate effect on native employees' labor market outcomes.

This null result masks however an important heterogeneity across age (i.e., experience) groups. While incumbent middle-aged and older experienced employees enjoyed a wage gain and a lower likelihood of becoming inactive, the opposite happened for young inexperienced natives entering the labor market after the reform. We further show that wage gains were mostly concentrated among high-ability middle-aged incumbents changing employer.

These results can be interpreted within a theoretical framework in which native workers are heterogeneous and exhibit different patterns of complementarity and substitutability with immigrants (see, e.g., Borjas, 2003; Ottaviano and Peri, 2012; Gentili and Mazzonna, 2017).

In this framework, the AFMP should negatively affect the wage (i.e., marginal product of labor) and probability of employment of native workers with characteris-

tics that are similar to those of competing immigrants, who are close substitutes for them. On the contrary, native workers with characteristics that are complementary to those of immigrants should experience a wage gain and a higher likelihood of being employed.

In our case, the policy led to a disproportionate increase in the number of young qualified immigrant workers sharing the same linguistic background with natives. These immigrants, however, lack experience of the local labor market (as in, e.g., Chiswick, 1978). Young Italian immigrants are therefore likely to substitute young Swiss workers entering the labor market after the recognition of EU qualifications, while they are complementary to experienced incumbents. The concentration of wage gains among high-ability incumbents is consistent with the fact that experienced workers with high ability are not only complementary to immigrants, but are also likely to exhibit higher complementarity with physical capital.[24]

While this framework allows us to interpret the heterogeneity across age groups of our empirical results, it does not per se explain why we do not find an overall negative effect. One potential explanation, also argued by Beerli et al. (2021), lies in the sharp expansion of the labor market and the decrease in its degree of tightness thanks to the attraction of previously scarce skills (Pissarides, 2000). In this setting, the overall effect on wages and employment is positive if the production function exhibits increasing returns to education, especially when combined with experience, because of the positive externalities induced by qualified workers.

7 Conclusions

This paper contributes to the extensive economic literature and policy debate on the labor market effects of immigration by investigating the consequences of an inflow of qualified foreign workers who hold fully equivalent certifications with respect to natives and do not experience any linguistic barrier.

To this aim, we leverage the natural experiment represented by the opening of the Swiss labor market to workers from EU countries by recognizing their qualifications. Our analysis focuses on Ticino, an Italian-speaking Swiss canton, where Italian workers represent a high share of the labor force. Using a difference-in-differences empirical strategy to compare over time economic sectors differently affected by the recognition of EU diplomas, we first estimate a large increase in the share of young Italian workers in firms after the policy.

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[24]High-skilled workers are in general complementary to physical capital (Lewis and Peri, 2015), but, conditional on being high-skilled, employees with more experience exhibit a higher degree of complementarity with capital in comparison to their younger inexperienced counterparts.

Considering natives' labor market outcomes, we show that the almost negligible average effect of the AFMP masks a substantial heterogeneity across age groups. While we provide evidence of a wage gain for middle-aged (30–49) employees, the impact of the policy turns out to be negative for younger (18–29) employees. More specifically, the former effect is driven by high-ability employees and is more likely to materialize when moving to a different firm, whereas the latter effect is explained by a decrease in the entry wages earned by young employees entering the labor market after the policy change.

According to our estimates, the reform is also associated with an increase in the probability of inactivity for young new entrants, while middle-aged and older incumbents have become less likely to experience long-term unemployed or, more generally, to exit the labor force.

Interpreting age as a proxy for the amount of labor market experience of the individual, our findings suggest that young Italian immigrants are complementary to incumbent Swiss employees, but are close substitutes for native new entrants with equivalent qualifications and the same linguistic background. This interpretation is strengthened by the absence of any negative effect for Italian employees already active in Switzerland before the policy change.

Our results also open the path for future lines of research. First, while our analysis focuses on the impact of the policy on individual labor market outcomes, more attention may be devoted to study firms' choices and outcomes when the pool of available workers enlarges and there are different patterns of complementarity and substitutability between natives and immigrants. Second, the disparities in the effects between native workers belonging to different generations ask for a deeper understanding of social welfare implications of the policy and for an evaluation of the most adequate policy interventions to compensate potential arising inequalities.

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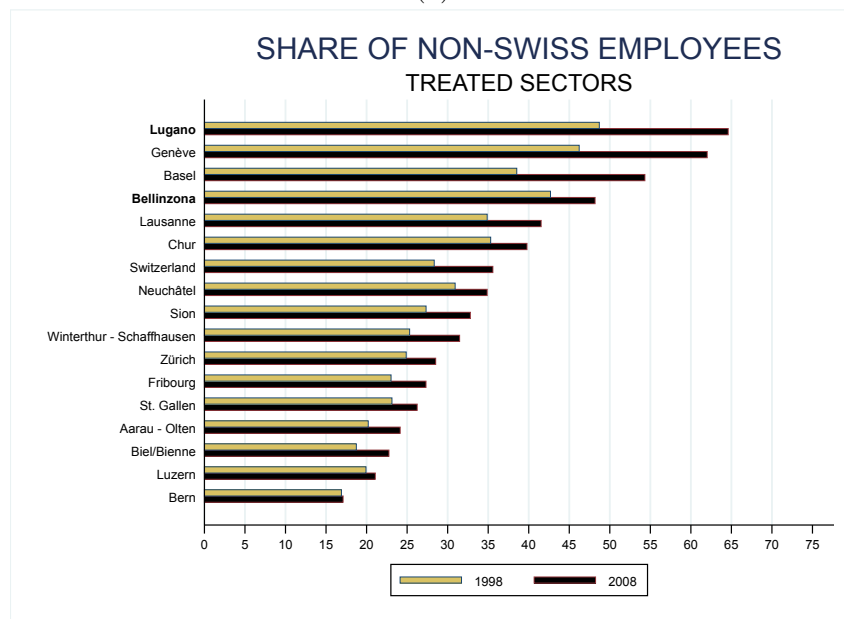
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Appendix A Additional Figures
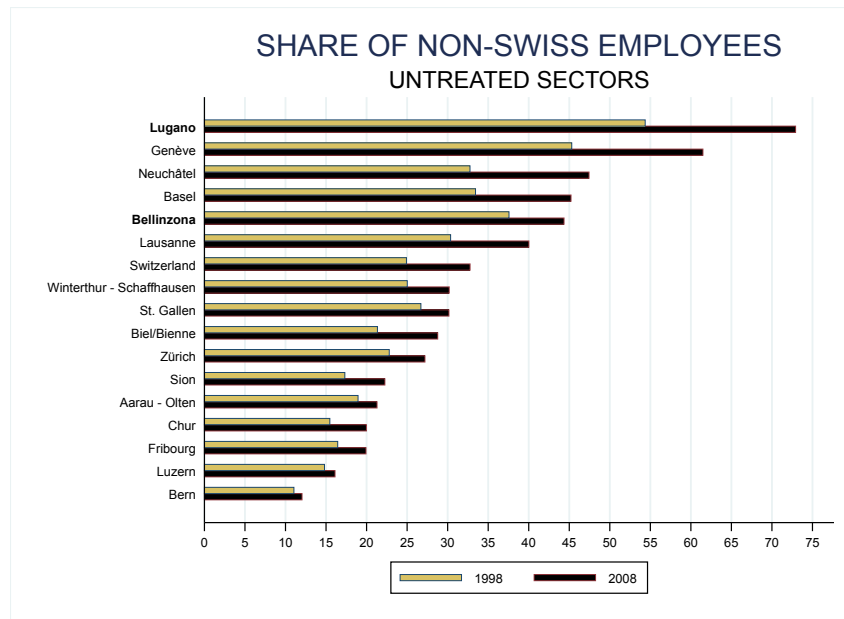
(a)

(b)

Figure A.1: Non-Swiss employees by labor market region

Notes: This figure represents the share of non-Swiss employees in private sector firms with at least two employees in the sixteen Swiss large labor market regions (Swiss Federal Statistical Office, 2000) in 1998 and 2008. Our dataset covers the regions of Lugano (which accounts for almost 80% of private sector firms in the canton of Ticino in 2008) and Bellinzona. Panels (a) and (b) refer to untreated and treated sectors, respectively.
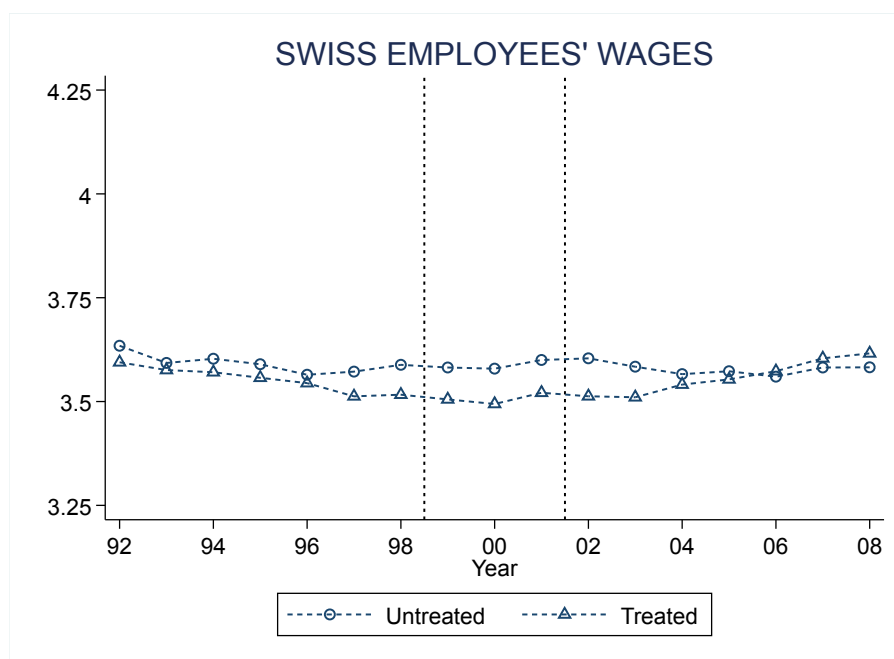Source: Our calculations on Business Census data.

Figure A.2: Swiss employees' average (log) real monthly wages by

Figure A.3: Incumbent Swiss employees' (log) real monthly wages -
Dynamic DiD model

Figure A.4: Incumbent Italian employees' (log) real monthly wages -
Dynamic DiD model

Figure A.5: Young Swiss employees' average entry (log) real monthly wages

Notes: This descriptive figure shows the evolution over time (1993–2008) of the average value of the (log) first real monthly wage earned by young (18–29) new entrant Swiss male employees in private sector firms with at least two employees, comparing treated and untreated sectors. The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.
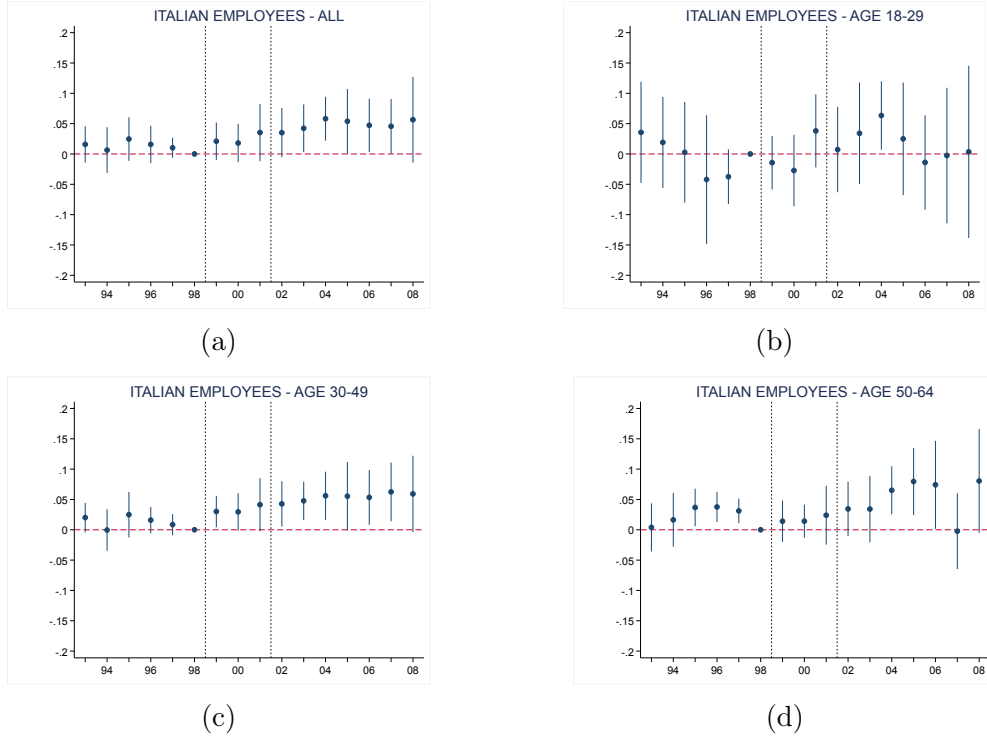
Figure A.6: Swiss employees' (log) real monthly wages - Dynamic DiD for employees who did not change treatment status

(a)   (b)

(c)   (d)

Figure A.7: Swiss employees' (log) real monthly wage - Dynamic DiD for employees by treatment intensity

Notes: This figure shows the estimates from an alternative version of the dynamic difference-in-differences model (2), in which the dummy variable for each year is interacted with both a dummy for sectors treated with a medium intensity (i.e., in which between 36% and 55% of employees hold a treated occupation) and sectors treated with a high intensity (i.e., in which more than 55% of employees hold a treated occupation). Panel (a) refers to the full sample of Swiss male employees in private sector firms with at least two employees, while panels (b)–(d) focus on different age groups (18–29; 30–49; 50–64). Each graph shows the estimates of the coefficients β_k ($k = 1992,...,$ 1997, 1999, ..., 2008) with the corresponding confidence intervals at the 5% significance level. The last year before the Agreement on the Free Movement of Persons was signed (i.e., 1998) is the omitted year. All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.
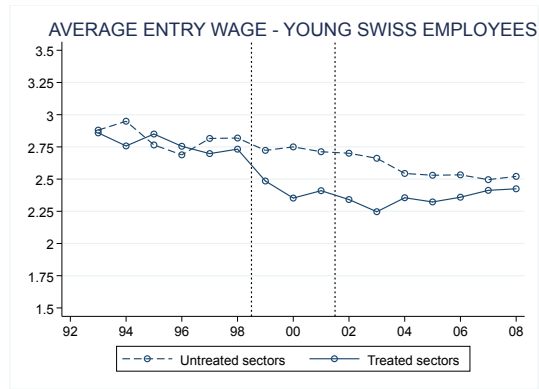
Figure A.8: Swiss employees' (log) real monthly wages - Dynamic DiD model
with firm fixed effects

<u>Notes:</u> This figure shows the estimates from the dynamic difference-in-differences model (2). Panel (a) refers to the full sample of Swiss male employees in private sector firms with at least two employees, while panels (b)–(d) focus on different age groups (18–29; 30–49; 50–64). Each graph shows the estimates of the coefficients β_k ($k = 1992,...,$ 1997, 1999, ..., 2008) with the corresponding confidence intervals at the 5% significance level. The last year before the Agreement on the Free Movement of Persons was signed (i.e., 1998) is the omitted year. All models include firm (instead of sector), district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.
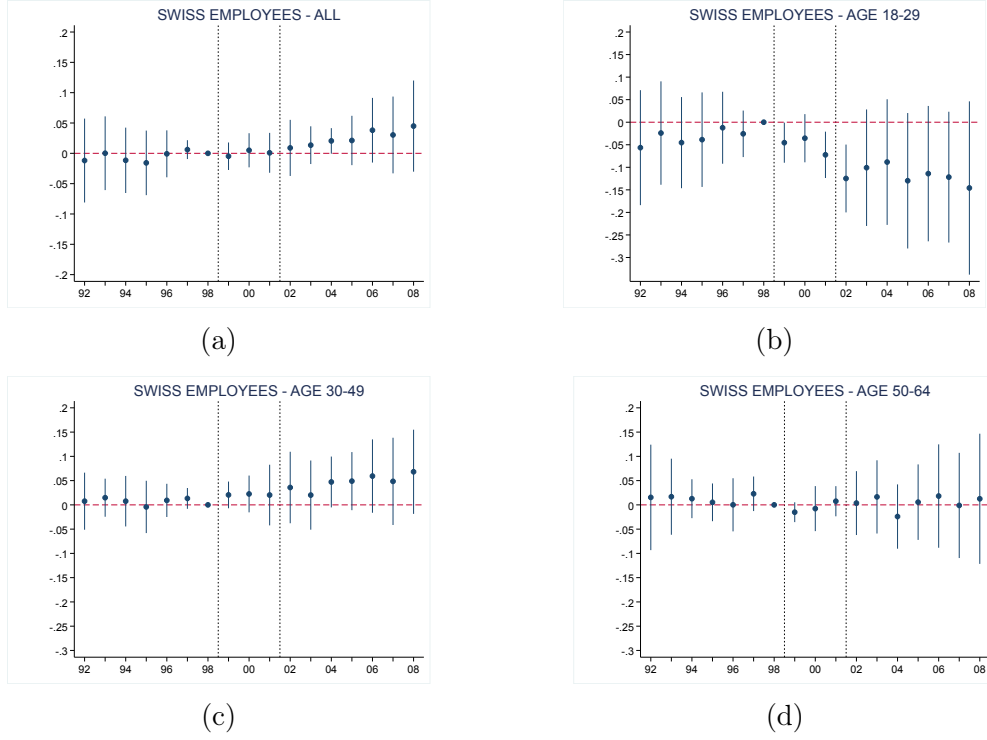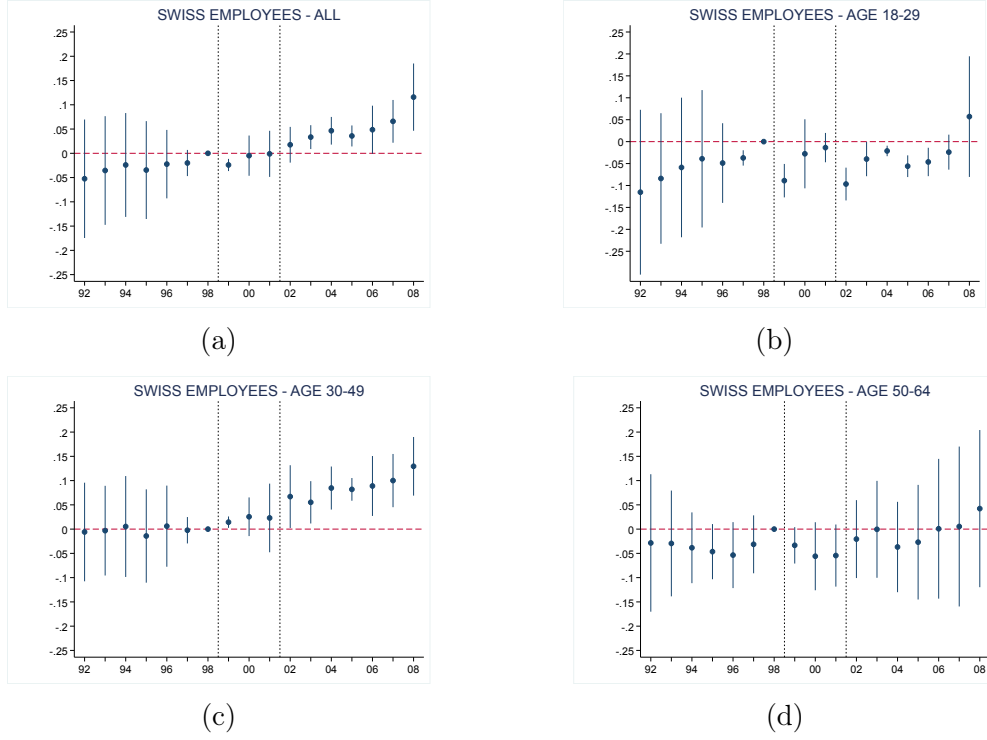
Figure A.9: Swiss employees' (log) real annual earnings - Dynamic DiD model

<u>Notes:</u> This figure shows the estimates from the dynamic difference-in-differences model (2), when the outcome variable is the logarithm of real total annual earnings. Panel (a) refers to the full sample of Swiss male employees in private sector firms with at least two employees, while panels (b)–(d) focus on different age groups (18–29; 30–49; 50–64). Each graph shows the estimates of the coefficients β_k (k = 1992,..., 1997, 1999, ..., 2008) with the corresponding confidence intervals at the 5% significance level. The last year before the Agreement on the Free Movement of Persons was signed (i.e., 1998) is the omitted year. All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The first vertical dashed line (between 1998 and 1999) indicates the beginning of the transitional phase related to the announcement of the policy, while the second line (between 2001 and 2002) identifies the period characterized by its full enactment.
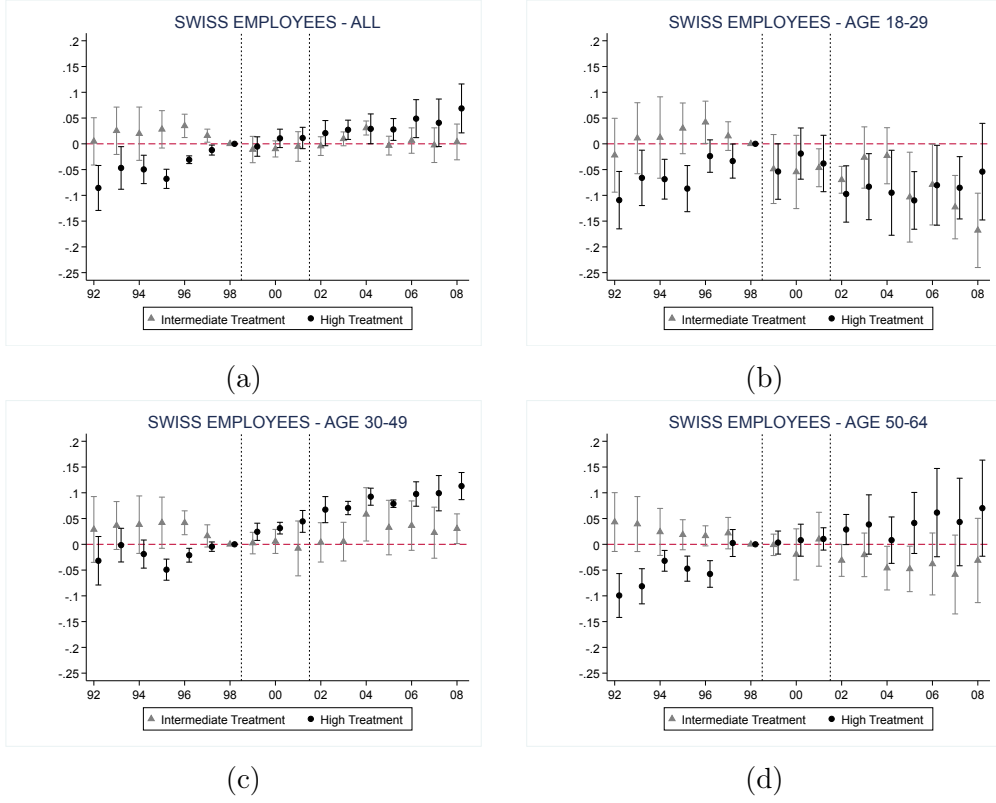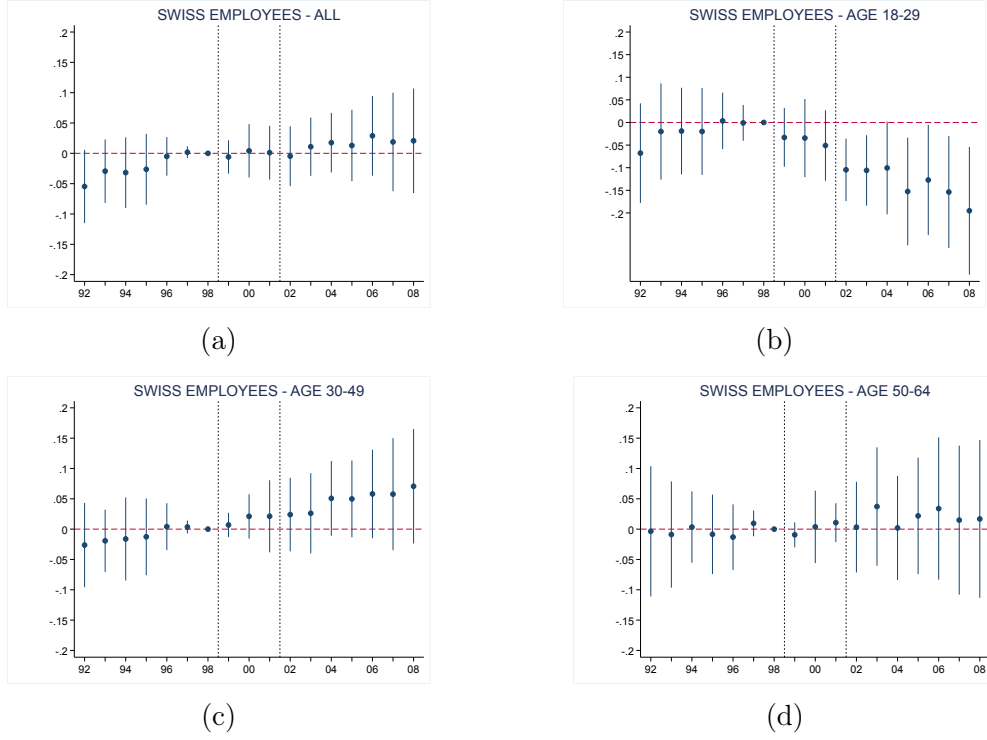
Appendix B   Additional Tables

Table B.1: Treated and untreated sectors

	Share treated occupations	Share of Italian employees			
		1992	1998	2002	2008
Panel A: Treated Sectors					
Information Technology and Auxiliary to Trade	78.05%	33.13%	32.36%	34.80%	51.34%
Leather Industry	65.97%	66.67%	52.44%	66.67%	52.94%
Legal Assistance	64.64%	9.02%	8.97%	9.52%	13.01%
Hotels, restaurants	59.90%	30.40%	24.59%	33.82%	41.68%
Art, Theater, Entertainment	50.33%	28.78%	26.17%	32.28%	53.72%
Chemical Industry	48.01%	45.96%	45.81%	54.05%	61.40%
Communication and Transports	43.61%	42.94%	38.97%	41.61%	41.15%
Construction, Engineering and Architecture	36.19%	55.83%	48.96%	51.34%	52.86%
Panel B: Untreated Sectors					
Wholesale Trade	23.94%	32.35%	39.87%	42.33%	48.36%
Textile Industry	22.02%	63.04%	64.73%	63.53%	74.67%
Jewelry Industry	21.43%	48.00%	43.12%	42.27%	50.23%
Minerary Industry	20.15%	54.98%	48.32%	51.51%	58.34%
Metallurgic Industry	19.67%	54.09%	47.74%	52.21%	57.00%
Graphic Industry	18.92%	32.08%	31.15%	25.83%	33.03%
Retail Trade	8.64%	45.23%	41.12%	42.18%	50.21%
Domestic Services	5.74%	39.00%	45.35%	40.86%	40.98%
Wood Industry	1.26%	47.62%	36.88%	35.52%	33.12%
Wine and Drinks Industry	0.00%	48.15%	58.06%	55.56%	35.71%

Notes: This table reports the share of employees in treated occupations in each sector according to data from the Swiss Labor Force Survey (first column) and the share of male employees of Italian nationality working in private sector firms with at least two employees in Ticino in 1992, 1998, 2002, and 2008. Panel A refers to treated economic sectors, namely those which were affected by the mutual recognition of diplomas and qualifications implied by the Agreement on the Free Movement of Persons between Switzerland and the European Union (2002), while Panel B refers to untreated sectors. *Source:* Our calculations on data from *SLFS* and *Istituto delle Assicurazioni Sociali.*

Table B.2: Descriptive statistics (1992-2008)

	All Pre 1998	All 1999-2001	All Post 2002	Age 18-29 Pre 1998	Age 18-29 1999-2001	Age 18-29 Post 2002	Age 30-49 Pre 1998	Age 30-49 1999-2001	Age 30-49 Post 2002	Age 50-64 Pre 1998	Age 50-64 1999-2001	Age 50-64 Post 2002
PANEL A: TREATED SECTORS												
Swiss Employees												
Share	50.25%	52.91%	44.79%	63.27%	65.17%	48.88%	46.24%	49.90%	42.33%	44.08%	47.25%	47.06%
(Log) Real Monthly Wage	3.53 (1.03)	3.50 (1.18)	3.54 (1.18)	3.14 (0.95)	2.99 (1.20)	2.91 (1.19)	3.72 (0.96)	3.70 (1.06)	3.76 (1.04)	3.73 (1.13)	3.71 (1.24)	3.75 (1.22)
(Log) Entry Wage at New Job	3.43 (0.97)	3.45 (1.02)	3.40 (1.07)	3.14 (0.92)	3.16 (1.00)	2.99 (1.06)	3.64 (0.90)	3.63 (0.95)	3.64 (0.96)	3.64 (1.15)	3.60 (1.15)	3.55 (1.26)
Transitions to Inactivity	1.62%	1.77%	2.12%	2.12%	3.21%	4.82%	0.85%	0.82%	1.04%	2.82%	2.41%	2.05%
Italian Employees												
Share	41.25%	38.68%	44.73%	28.30%	26.73%	38.41%	43.31%	40.37%	47.06%	52.14%	47.40%	45.51%
(Log) Real Monthly Wage	3.60 (0.69)	3.62 (0.80)	3.54 (0.89)	3.34 (0.76)	3.24 (0.87)	3.12 (0.91)	3.68 (0.61)	3.71 (0.75)	3.63 (0.85)	3.62 (0.75)	3.67 (0.81)	3.68 (0.86)
(Log) Entry Wage at New Job	3.54 (0.70)	3.59 (0.79)	3.49 (0.80)	3.26 (0.80)	3.29 (0.80)	3.21 (0.78)	3.63 (0.61)	3.66 (0.74)	3.58 (0.76)	3.59 (0.73)	3.66 (0.83)	3.54 (0.88)
Transitions to Inactivity	0.83%	0.81%	0.69%	0.89%	1.61%	0.94%	0.29%	0.33%	0.40%	1.95%	1.40%	1.35%
PANEL B: UNTREATED SECTORS												
Swiss Employees												
Share Swiss	44.02%	45.86%	41.11%	56.72%	60.94%	50.92%	39.11%	41.63%	38.15%	39.02%	40.16%	38.90%
(Log) Real Monthly Wage	3.61 (0.81)	3.61 (0.85)	3.63 (0.88)	3.22 (0.78)	3.20 (0.82)	3.12 (0.88)	3.82 (0.68)	3.78 (0.73)	3.81 (0.75)	3.87 (0.87)	3.84 (0.92)	3.86 (0.91)
(Log) Entry Wage at New Job	3.42 (0.77)	3.42 (0.82)	3.41 (0.87)	3.24 (0.71)	3.27 (0.70)	3.17 (0.77)	3.63 (0.69)	3.58 (0.83)	3.59 (0.88)	3.47 (1.05)	3.31 (1.09)	3.58 (1.01)
Transitions to Inactivity	1.06%	1.26%	1.48%	1.22%	1.48%	2.57%	0.56%	0.85%	0.79%	1.98%	1.94%	1.92%
Italian Employees												
Share	48.65%	46.96%	51.25%	36.18%	30.97%	38.21%	52.09%	50.04%	54.31%	56.86%	56.29%	56.37%
(Log) Real Monthly Wage	3.61 (0.53)	3.63 (0.54)	3.60 (0.64)	3.36 (0.57)	3.34 (0.62)	3.27 (0.71)	3.68 (0.44)	3.68 (0.46)	3.66 (0.57)	3.66 (0.59)	3.70 (0.60)	3.67 (0.70)
(Log) Entry Wage at New Job	3.49 (0.58)	3.57 (0.57)	3.51 (0.61)	3.28 (0.67)	3.30 (0.66)	3.28 (0.67)	3.57 (0.49)	3.67 (0.46)	3.58 (0.54)	3.59 (0.60)	3.54 (0.67)	3.59 (0.67)
Transitions to Inactivity	0.45%	0.44%	0.28%	0.21%	0.60%	0.38%	0.16%	0.21%	0.11%	1.32%	0.84%	0.62%

Notes: This table shows descriptive statistics for our sample of private sector male employees in firms with at least two employees. Panels A and B focus on treated and untreated sectors, respectively, and compare for every single age group three periods (before 1998, between 1999 and 2001, after 2002). Standard deviations in parentheses.

Source: Our calculations on data from Istituto delle Assicurazioni Sociali.

Table B.3: Incumbent Italian employees' labor market outcomes (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)

Panel A: (Log) real monthly wages

	All	Age 18-29	Age 30-49	Age 50-64
treated_transition	0.014	0.005	0.024	-0.001
	(0.026)	(0.043)	(0.023)	(0.025)
treated_post2002	0.037	0.025	0.043	0.030
	(0.031)	(0.055)	(0.030)	(0.032)
N	137671	17271	85033	35366
Mean in 1998 (T)	3.61	3.26	3.69	3.64
Mean in 1998 (U)	3.63	3.33	3.68	3.69

Panel B: Probability of inactivity

	All	Age 18-29	Age 30-49	Age 50-64
treated_transition	-0.006	-0.013	-0.001	-0.007
	(0.007)	(0.015)	(0.008)	(0.010)
treated_post2002	0.006	-0.004	0.004	0.035*
	(0.009)	(0.021)	(0.008)	(0.017)
N	143891	17945	87302	38643
Mean in 1998 (T)	11.54%	14.32%	9.01%	15.41%
Mean in 1998 (U)	7.51%	6.57%	5.39%	12.23%

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) when treatment status and age are fixed in 1998 ("frozen" model). Column (1) reports the estimates for the full sample of Italian male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). Panel A refers to wages, while panel B to the probability of becoming inactive or leaving the dataset. All models include sector, district, year, and (only for wages) individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows of Panel A display the average (log) real monthly wages of Italian employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. The last two rows of Panel B display the average shares of Italian employees becoming inactive (or leaving the dataset). Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Table B.4: Incumbent Swiss employees' (log) real monthly wages by ability (1992-2008)

	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)
treated_post_1999	-0.012	-0.010	0.004
	(0.046)	(0.013)	(0.026)
treated_post_1999 × high	0.002	0.114**	0.072
	(0.050)	(0.046)	(0.072)
treated_post_2002	-0.026	0.040	0.093
	(0.037)	(0.046)	(0.081)
treated_post_2002 × high	0.161**	0.082*	-0.076
	(0.058)	(0.041)	(0.063)
N	34412	78167	28190
Mean in 1998 (T)	3.12	3.66	3.69
Mean in 1998 (U)	3.22	3.78	3.85

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) when treatment status and age are fixed in 1998 ("frozen" model). In these models we control for high ability by considering the top tercile of the predicted distribution of individual fixed effects (between 1992 and 1998) for Swiss employees active in 1998. Columns (1)-(3) report the estimates for Swiss male employees in private sector firms with at least two employees, distinguishing between different age groups (18–29; 30–49; 50–64), fixed in 1998. All models include sector, district, and year fixed effects, plus a linear and a quadratic age term and a dummy for high ability. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average (log) real monthly wages of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively.

Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Table B.5: Incumbent Swiss employees' (log) real monthly wages (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)
Panel A: At same firm as 1998				
treated_post_1999	0.000	-0.008	0.014	-0.012
	(0.028)	(0.040)	(0.028)	(0.027)
treated_post_2002	0.027	0.037	0.026	0.031
	(0.050)	(0.067)	(0.044)	(0.066)
N	83938	15565	46319	22054
Panel B: Changing employer				
treated_post_1999	0.025	0.010	0.024	0.135***
	(0.022)	(0.037)	(0.030)	(0.037)
treated_post_2002	0.061***	0.046	0.084***	0.114**
	(0.020)	(0.037)	(0.028)	(0.048)
N	67848	24533	36113	7202
Mean in 1998 (T)	3.50	3.12	3.66	3.69
Mean in 1998 (U)	3.61	3.22	3.78	3.85

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) when treatment status and age are fixed in 1998 ("frozen" model). Column (1) reports the estimates for the full sample of Swiss male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). Panel A refers to the subsample of employees who always remained at the same firm where they were active in 1998, while panel B refers to the subsample of employees who changed employer over time. All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average (log) real monthly wages of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Table B.6: Swiss employees' (log) real annual earnings and number of contracts (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)

Panel A: (Log) real annual earnings

treated_post_1999	0.014	-0.006	0.023	-0.019
	(0.043)	(0.045)	(0.041)	(0.042)
treated_post_2002	0.071	-0.012	0.083	0.019
	(0.048)	(0.032)	(0.049)	(0.071)
N	248972	70455	125075	48795
Mean in 1998 (T)	5.69	5.09	5.91	6.05
Mean in 1998 (U)	5.86	5.32	6.10	6.21

Panel B: Probability of having multiple contracts

treated_post_1999	0.000	-0.011	0.006	0.006
	(0.003)	(0.010)	(0.006)	(0.011)
treated_post_2002	0.015**	0.006	0.021***	0.016
	(0.007)	(0.018)	(0.007)	(0.021)
N	248972	70455	125075	48795
Mean in 1998 (T)	10.75%	11.89%	10.60%	9.29%
Mean in 1998 (U)	9.43%	11.98%	8.92%	6.28%

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3). Column (1) reports the estimates for the full sample of Swiss male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). Panel A refers to Swiss employees' (log) real total annual earnings, while panel B refers to their probability of having more than one working contract with private sector firms at the same time. All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows of Panel A display the average (log) real total annual earnings of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. The last two rows of Panel B display the average shares of Swiss employees by age group having more than one contract at the same time in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \le p < 0.05$; * $0.05 \le p < 0.10$.

Table B.7: Employees' real monthly wages by years of experience (1992-2008)

	Swiss			Italian		
	All	1-4 years	5+ years	All	1-4 years	5+ years
	(1)	(2)	(3)	(4)	(5)	(6)
treated_post_1999	-0.002	-0.065**	0.016	0.008	-0.027	0.022
	(0.017)	(0.026)	(0.014)	(0.016)	(0.026)	(0.014)
treated_post_2002	0.001	-0.025	0.015***	0.021*	0.016***	0.019
	(0.018)	(0.022)	(0.005)	(0.011)	(0.002)	(0.012)
N	198855	89950	104744	186768	85867	96563
Mean in 1998 (T)	3.41	3.14	3.73	3.59	3.46	3.69
Mean in 1998 (U)	3.52	3.26	3.76	3.58	3.43	3.66

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) when considering acquired experience rather than age. Columns (1)-(3) refer to Swiss male employees in private sector firms with at least two employees, while Columns (4)-(6) refer to Italian male employees. All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic term for experience. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average (log) real monthly wages of Swiss and Italian employees by experience group in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Table B.8: Swiss employees' probability of changing labor market status
(1992-2008)

	Age 18-29	Age 30-39	Age 40-49	Age 50-57	Age 58-64
	(1)	(2)	(3)	(4)	(5)

Panel A: Employee

treated_transition	-0.004	0.001	-0.000	0.004	0.035
	(0.010)	(0.007)	(0.007)	(0.006)	(0.020)
treated_post2002	-0.027***	0.005	0.007*	0.013***	0.065***
	(0.006)	(0.003)	(0.004)	(0.004)	(0.013)
Mean in 1998 (T)	88.84%	93.39%	92.99%	92.71%	79.58%
Mean in 1998 (U)	92.54%	93.85%	95.38%	95.49%	79.03%

Panel B: Inactive

treated_transition	0.002	-0.001	-0.004***	-0.004*	-0.006
	(0.004)	(0.001)	(0.001)	(0.002)	(0.006)
treated_post2002	0.009***	-0.001	-0.003***	-0.007***	-0.019***
	(0.003)	(0.001)	(0.001)	(0.002)	(0.004)
Mean in 1998 (T)	2.65%	0.75%	1.50%	0.86%	4.71%
Mean in 1998 (U)	1.21%	0.59%	0.77%	0.85%	4.61%

Panel C: Exit

treated_transition	0.002	0.000	0.004	-0.001	-0.029*
	(0.009)	(0.006)	(0.007)	(0.006)	(0.016)
treated_post2002	0.018***	-0.004	-0.004	-0.006	-0.045***
	(0.005)	(0.003)	(0.004)	(0.004)	(0.011)
Mean in 1998 (T)	8.51%	5.85%	5.51%	6.43%	15.71%
Mean in 1998 (U)	6.25%	5.57%	3.85%	3.66%	16.36%

Notes: This table shows the estimates of the marginal effects of the difference-in-differences coefficients of the multinomial logit model (4) (see Appendix C) for the probability of changing labor market status for Swiss male employees in private sector firms with at least two employees ($N = 238,663$). According to this model specification, an employee can remain employed, become inactive, or leave the dataset. The model includes sector, district, and year fixed effects. Robust standard errors are two-way clustered at sector and year level. The last two rows of each panel display the shares of employees remaining employed (Panel A), becoming inactive (Panel B), or leaving the dataset (Panel C) in 1998 by age group in treated (T) and untreated (U) sectors, respectively.
Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Table B.9: Swiss employees' entry (log) real monthly wages at new job (1992-2008)

	All	Age 18-29	Age 30-49	Age 50-64
	(1)	(2)	(3)	(4)
treated_transition	0.042	0.003	0.092	0.062
	(0.040)	(0.050)	(0.070)	(0.084)
treated_post2002	0.089	-0.004	0.154***	-0.024
	(0.056)	(0.076)	(0.039)	(0.075)
N	12614	4602	5433	997
Mean in 1998 (T)	3.44	3.15	3.60	3.66
Mean in 1998 (U)	3.43	3.31	3.62	3.32

Notes: This table shows the estimates of the difference-in-differences coefficients of model (3) for the first entry wage earned by Swiss employees who are hired by a new firm. Column (1) reports the estimates for the full sample of Swiss male employees in private sector firms with at least two employees, while Columns (2)-(4) focus on different age groups (18–29; 30–49; 50–64). All models include sector, district, year, and individual fixed effects, plus a linear and a quadratic age term. Robust standard errors are two-way clustered at sector and year level. The last two rows display the average (log) real monthly entry wages of Swiss employees by age group in 1998 in treated (T) and untreated (U) sectors, respectively. Significance levels: *** $p < 0.01$; ** $0.01 \leq p < 0.05$; * $0.05 \leq p < 0.10$.

Appendix C   The multinomial logit model

In order to study the impact of the policy on employees' likelihood of changing labor market status, we estimate the following multinomial logit model for the probability of staying employed, becoming inactive[25], or leaving the dataset (i.e., exit):

$$
\begin{aligned}
S_{iast} = \alpha + \sum_{a=0}^{4} \eta_{1,a} treated_{it} \times transition_t \times age_a + \\
\sum_{a=0}^{4} \eta_{2,a} treated_{it} \times post2002_t \times age_a + \chi_d + \lambda_s + \mu_t + \epsilon_{iast}
\end{aligned}
\tag{4}
$$

The outcome variable S_{iast} is the labor market status in year $t+1$ (employed, inactive, exit) of employee i in age group a (18–29; 30–39; 40–49; 50–57; 58+) and economic sector s in year t. This specification is similar to model (3), except for the exclusion of individual fixed effects. Hence, it only includes sector (λ_s), year (μ_t), and district (χ_d) fixed effects. Moreover, the relatively low number of annual transitions to inactivity or exit in every single age group prevents us from splitting the sample by age. We therefore explore the potential heterogeneity across this dimension by further interacting $treated_{it} \times transition_t$ and $treated_{it} \times post2002_t$ with dummy variables for age groups.

We are interested in the age group-specific coefficients $\eta_{1,a}$ and $\eta_{2,a}$, which capture the impact of the policy on the probability of moving to a certain status for an employee belonging to age group a. We compute marginal effects to interpret results.

The constraint represented by the relatively low number of annual transitions by age group also prevents us from estimating a reliable version of model (4) which "freezes" employees' economic sector in 1998, neglecting employees entering the labor market after the policy change and further reducing the sample size.

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[25]This category includes inactive subjects, long-term unemployed, and early retirees.