The Market for Part-Time Work and Maternal Participation in the Workforce

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Abstract

Women are over-represented in industries that feature shorter hours. This paper sheds light on the labor demand forces that give rise to this sorting. We study an immigration reform that markedly expanded the pool of commuting full-time workers in a pre-defined set of Swiss border localities. Using social security registers and business census data covering the universe of establishments in a difference-in-differences design, we find that mothers — a group that predominantly works part-time — exit the workforce following the reform. Fathers and prime-age men and women without children remain unaffected. We provide evidence that maternal dropout is driven by a firm-side restructuring towards positions with longer hours: local employment shifts toward full-time positions, and job postings exhibit reduced demand for part-time work. Taken together, these findings suggest that firms may dynamically adjust non-monetary aspects of jobs in response to supply, with reduced hours constituting an amenity that on average is costly to provide.

Keywords: Maternal Labor Supply, Non-wage amenities, Labor Demand, Part-time jobs
JEL: J16, J22, J23, J32

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In many countries, positions that do not require overly long working hours are particularly widespread among women: Across OECD countries, 23% of employed women work less than 30 hours per week compared to 8% of men. Jobs with lower average working hours also tend to cluster in industries that are generally female dominated. Recent empirical work has documented that women's time constraints as mothers give rise to such sorting on the labor supply side, thus underlining the importance of these types of jobs in integrating maternal talent in the labor market (Wasserman, 2023; Ciasullo and Uccioli, 2023). However, to date we lack an understanding of the forces on the labor demand side that may either reinforce or weaken such gender-based sorting across industries. In particular, we have little insight into whether assigning tasks performed in a full-time job across more than one worker is costly to a firm, such that employers may prefer to hire full-time talent rather than mothers who work fewer hours.

Understanding potential constraints that may prevent firms from such restructuring is essential: If firms face costs to coordinate between workers — essentially making production technologies convex in hours worked in the spirit of Goldin (2014) — then demand side regulation that ignores such costs may have unintended productivity consequences. However, shedding light on firms' preferences for how to structure jobs, and documenting how these preferences interact with maternal sorting in a real world setting is challenging empirically as it requires plausibly exogenous shifts in labor demand and supply.

In this paper, we use a large-scale but highly localized immigration shock of full-time workers in Switzerland to trace out both the supply and demand response in local labor markets. Relaxed regulations for cross-border workers (CBW) drastically increased the supply of full-time workers from neighboring countries in Swiss border municipalities in the early 2000s. Using social security registers and a difference-in-differences design, we document that this reform leads to a stark drop in workforce participation among mothers, a group that primarily works part-time when returning to the labor market after childbirth. In contrast, women without children and fathers remain largely unaffected. Adding data covering the universe of Swiss establishments and a representative sample of job ads, we present multiple pieces of evidence that suggest that the main mechanism behind maternal dropout is reduced demand for part-time workers from the firm side. Mothers are substituted out primarily due to being the main group in the labor market that works part-time, rather than other characteristics of motherhood that may make these workers less desirable from an employer perspective.

Our findings, consistent with prior work, thus underline the importance of lower hours jobs in facilitating maternal participation in the workforce. Importantly, though, because we are able to document that firms substitute away from part-time workers when full-time labor supply expands, our results provide novel empirical evidence of a broader tension: Integrating maternal talent into the economy may not align with firms' preferences for "greedy jobs", and this tension is relevant for larger parts of the labor market beyond the top-earning occupations highlighted in Goldin (2014). While we study the substitutability of worker-hours in the context of motherhood, these findings

also provide important insights into the black box of how firms structure jobs that has mostly been approached taking demand as fixed (see, e.g., Lachowska et al., 2023), and the allocative implications thereof.

We study these questions in Switzerland, a country with relatively conservative gender norms and one of the largest "child penalties" in earnings that arises mostly due to part-time work, defined as working less than 90% of a full-time equivalent (FTE) (BFS, 2016). Swiss mothers' participation in the labor force increases steadily to up to 80% of mothers working from when their youngest child is between 0 and 16 years old. The large majority of returning mothers (80%) enter the workforce part-time over this time horizon. At the same time, almost 70% of all part-time workers in the economy are mothers. Part-time work thus constitutes an important facilitator of enabling mothers to re-enter the workforce after having children, especially since childcare beyond limited public school hours was not widely available during our study period.

Our difference-in-differences identification strategy leverages a reform that gradually liberalized access to the Swiss labor market for so-called cross border workers (CBW), and led to a large influx of full-time CBW from neighboring countries commuting to a pre-defined set of localities at the border. In the early 2000s, hurdles for Swiss firms to hire CBW from one of the neighboring countries (Italy, France, Germany, Austria) were substantially reduced. Accompanying legislation ensured that working conditions and remuneration for CBW would mirror those of natives. Prior work examining the impacts of this reform has documented positive impacts on highly educated natives' wages due to firms being able to overcome labor shortages and expand (Beerli et al., 2021).

We start by documenting the influx of foreign workers in Swiss local labor markets. Descriptively, the onset of the reform increases the supply of CBW in Swiss municipalities within 15 driving minutes from the border, but not in municipalities farther away. We thus apply a doughnut-design in which we compare outcomes in (treated) municipalities within 15 minutes driving distance to the border to control municipalities that are more than 30 minutes away. An event study around the timing of the reform shows an expansion in non-native workers by 7.5 ppt — a 22% increase over the mean pre-reform — in treated municipalities. This increase is primarily driven by CBW and dominated by full-time workers. Using Mincer-style regressions, we show that the reform is unlikely to have allowed firms to simply hire cheaper labor as post-reform hourly wage gaps between natives and CBW are precisely estimated and minimal (1.4%).

Are mothers impacted by this expansion of full-time talent in local labor markets? Using rich administrative data linking census and social security records of natives from 1994 to 2010, we focus on prime age workers with children below the age of 16, the time horizon over which mothers tend to re-enter the workforce. We document that mothers' workforce participation in treated municipalities starts to decline following the onset of the reform. By 2010, mothers reduce their participation by 5.2 ppt, or 9% over the pre-reform mean. In contrast, we find no participation effects on fathers, nor on prime-age Swiss men or women who do not have children at baseline. This differential effect of the reform on mothers but not fathers remains when we compare individuals

working in the same industry or occupation, and can thus not be solely explained by differential exposure to immigration by gender. Consistently, when using survey data on workers to examine impacts on those who stay in the labor force, we observe that the pool of prime age women who remains in the workforce in the treated region works more hours and has a higher likelihood of being a full-time worker.

How can the larger supply of full-time workers lead to a dropout of mothers, who tend to work part-time, but not fathers? To better understand the underlying mechanism driving our main result, we sketch a standard search and matching model with heterogeneous workers who differ in the number of hours they are willing to supply. This assumption is consistent with data showing that Swiss families prefer mothers to work a substantially lower amount of hours relative to fathers (BFS, 2017). Firms can open either full-time or part-time vacancies and face a production technology that is convex in hours worked, such that full-time equivalent output is reduced by coordination costs for part-time hires. While firms can hire full-time workers for part-time jobs, part-time workers will not accept a match with a full-time vacancy. Thus, a firm opening a full-time vacancy faces a trade-off between (i) higher vacancy costs due to a lower likelihood of filling the vacancy, and (ii) lower coordination costs after the hire. Since vacancy costs are a function of the share of full-time workers in the economy and decrease as their availability rises, firms will respond to an exogenous influx of full-time workers by creating fewer part-time vacancies.

We provide three pieces of empirical evidence that are consistent with such an explanation for our main results. First, we document a change in the structure of jobs in treated local labor markets that coincides with the drop in maternal participation. Using data from the universe of Swiss establishments, we show with event studies at the municipal level that the labor market in the treated region expanded, but almost exclusively in full-time jobs. The absolute and relative number of part-time jobs fell. Disentangling these effects by nationality and gender highlights that the increase in full-time jobs is driven exclusively by non-Swiss workers. On the other hand, the reduction in part-time jobs is fully borne by Swiss workers and, among them, mostly by women. We further show that this pattern of substitution holds within industry.

Second, we then directly explore the reform's impacts on firms' labor demand. Using a representative sample of job vacancies posted by Swiss firms (SJMM, 2023), we find that establishments in the treated region start to post fewer vacancies for part-time workers post-reform.

Third, we document heterogeneity in the social security data that corroborates the idea that low hours are the main reason why mothers are substituted out by CBW. While we cannot directly observe hours in these data, we construct a proxy for part- vs. full-time work by comparing mothers' earnings after the birth of their first child relative to their pre-birth income. We classify mothers as working full-time if they recoup a large share ($\geq 90\%$) of their pre-birth earnings, and we validate this measure with data on hours reported in the Census. We then show with an event study that the composition of mothers in the workforce changes post-reform: The share of mothers who return to the labor market in a full-time capacity is unaffected. Instead, we observe a decrease in the share

of mothers that work part-time. These patterns indicate that mothers willing to return in a full-time capacity are unaffected by the inflow of CBW, while mothers who would have returned to the workforce in a part-time capacity absent the reform are instead staying out of the workforce entirely. Finally, we show that maternal drop-out is likely operating along the hiring margin: The reduction in maternal participation is stronger for mothers who were out of the workforce at the onset of the reform. Taken together, these empirical patterns are indicative of the reduction in demand for part-time workers making it harder for mothers to return to the workforce after engaging in childcare.

We rule out several alternative mechanisms that could rationalize maternal dropout. We start by examining the role of wages. CBW might be cheaper to hire for firms in general, thus replacing mothers as a group whose labor supply is particularly elastic. We find little evidence that would support this hypothesis: While the overall wage gap between CBW and natives is about 5 log points in the post-reform period, this difference shrinks to less than 1.5 log points when controlling for differences in observable characteristics and workplace, consistent with the regulatory guardrails of the CBW reform. As a substantial share of CBW is male, CBW workers on average earn 3.8 log points more relative to Swiss women. Estimating reform impacts on hourly wages among natives who remain in the workforce further suggests limited scope for wage effects being the main driver behind maternal drop out.

We then explore whether higher household income post-reform could explain our findings. While partners of treated mothers experience somewhat higher earnings following the reform (+1% by 2010), the magnitude of this income effect cannot plausibly account for the full extent of mother's participation decline. Indeed, when we estimate semi-elasticities for mothers' labor supply with respect to partner's earnings using either the pre-reform period or the control group, these estimates are two orders of magnitudes smaller than what would be needed to fully explain our main effect. We further rule out that increased fertility post-reform can fully account for our main treatment effects: While mothers who are younger at baseline are indeed more likely to have additional children post-reform, both younger and older mothers reduce their participation in the workforce.

Finally, we connect our results to the literature on the "child penalty" (Kleven, Landais, and Leite-Mariante, 2023) and estimate changes in the participation penalty as a consequence of the reform. In a triple difference-in-differences design, we compare how treated mothers' labor supply changes post-reform for each of the ten years following the birth of their first child. Mothers in treated regions experience a relative increase in the penalty of around 2 ppt, which is precisely estimated in the first five years after the birth and similar in magnitude but more noisily estimated in the years thereafter. This effect size constitutes an increase in the child penalty of about 4–5% relative to the average penalty in the control.

Our findings contribute to three main strands of literature. First, our study relates to work that seeks to understand which factors contribute to or cushion the decline in maternal labor supply and earnings (see, e.g., Cortés and Pan, 2023; Albanesi, Olivetti, and Petrongolo, 2023, for a review).

Within this literature, an emerging strand has focused on the 'structure of work' in shaping such gender differences (Goldin, 2014; Goldin and Katz, 2016). Recent empirical research has provided convincing evidence that demand side regulation, such as hours requirements (Wasserman, 2023; Carry, 2022) or parents' rights to request flexible work hours (Ciasullo and Uccioli, 2023) is a powerful policy lever that shapes female labor supply. Our study provides novel evidence that mothers drop out of the labor market once firms are able to access a broader pool of full-time workers. Our findings thus highlight an unfortunate, but fundamental tension with respect to more flexibility on work hours, and emphasize a broader need to better understand the 'structure of work' from the firm side when assessing policy tools to increase maternal labor supply.

Second, our paper contributes to the understanding of differential adjustments to immigration by gender (see Llull, 2021 for a review). This literature documents how immigrants may affect female workers differently due to differences in specialization by industry or occupation (Amuedo-Dorantes and De La Rica, 2011; Edo and Toubal, 2017), or by relaxing mothers' time constraints through the provision of services such as childcare (Cortes and Tessada, 2011; Cortes and Pan, 2013; Cortés and Pan, 2019). Our paper highlights an additional and so far largely unexplored channel: Immigrants' impact on firms' provision of job amenities, i.e., the option to work part-time. With wages not adjusting, the main competition effect in our setting thus works along the hours margin.

Third, we speak to a large literature in labor economics studying the provision of amenities and its relation to gender gaps across firms. Several recent studies use revealed preference approaches using worker moves (Sorkin, 2018; Morchio and Moser, forthcoming; Lachowska et al., 2023) or directly elicit workers' willingness to pay for specific aspects of job amenities, such as flexibility (Mas and Pallais, 2017; Wiswall and Zafar, 2018; Maestas et al., 2023; Caldwell, Haegele, and Heining, 2025; Humlum, Rasmussen, and Rose, 2025). Common to all of these approaches is a focus on the labor supply side that treats firms, and their respective amenities, as fixed. Using a reduced form approach, we are able to fill in important aspects of the labor demand side in this picture. We find that firms may dynamically adjust the type of jobs offered as a response to supply conditions. Our results are consistent with firms in our setting preferring full-time workers, suggesting that reduced hours are an amenity that is costly to provide.

Lastly, we complement prior work examining firm-level effects of this particular immigration reform in Switzerland. Using representative surveys of firms and workers, Beerli et al. (2021) document gains in hourly wages for highly educated natives as firms are able to overcome labor shortages by hiring high-skill CBW. Administrative registers on the universe of the Swiss population allow us to expand on these findings by documenting extensive margin effects and heterogeneous impacts of the reform by gender. Incorporating these margins enables us to conduct a more comprehensive assessment of (potential) winners and losers of the reform. Our findings are in line with prior work on immigration reforms showing that the groups that are least attached to the workforce (or have the highest supply elasticities) may be those most at risk of being replaced by immigrant labor (Dustmann, Schönberg, and Stuhler, 2017; Dustmann, Schönberg, and Stuhler, 2016).

This paper is organized as follows. The next section describes the setting and reform. Section 2 explains the data, empirical strategy, and provides descriptive statistics. Section 3 documents our main result and robustness. Section 4 introduces a search and matching model to provide hypotheses on how the influx of foreign full-time workers might change firms' demand for part-time workers. Section 5 provides evidence on mechanisms. Section 6 documents the reform's impact on the child penalty. Section 7 concludes.

1 Setting and Reform

1.1 Reform

In the early 2000s, access to the Swiss labor market for European citizens was gradually liberalized. In June 1999, the Swiss government signed a package of bilateral agreements with the European Union after long and uncertain negotiations. Part of these agreements were the "Agreements on the Free Movement of Persons" (AFMP) that introduced free worker mobility between Switzerland and European countries. Before the treaty could be enacted, it required approval by all EU member states, the European Parliament, and by the Swiss electorate. This created some uncertainty about whether and when the bilateral agreement would eventually be enacted, as the treaties were subject to a national referendum in Switzerland.[1] In 2000, the treaty was approved by Swiss voters, the European member states, and by the EU parliament. In June 2002, the AFMP was enacted, 1.5 years later than initially announced. According to Beerli et al. (2021), anticipatory effects of the reform may be possible as early as after the reforms' announcement in 1999, and in particular after the referendum passed in May 2000. In our empirical specifications, we follow Beerli et al. (2021) and define 1999 as the last pre-reform year

The agreement of free movement of workers liberalized access to the Swiss labor market for two types of workers: (i) permanent immigrants with residency in Switzerland (or immigrants for short) and (ii) cross-border workers (CBW), i.e., workers that hold residency in a neighboring country (Germany, Austria, France, Italy) but work in Switzerland. Appendix Table A10 provides a time-line of the step-by-step implementation of the free movement policy. The shading of the table reflects the tightness of immigration restrictions for EU immigrants and cross-border workers.

Between 1999 and 2004, regulations for CBW were liberalized and these changes only affected municipalities in the *border region* (BR). Appendix Figure A16 depicts the geographical distribution of Swiss municipalities in the border region (shaded in grey) and in the non-border region (NBR, in white). The BR had been defined in bilateral agreements between Switzerland and each neighboring country between 1928 and 1973 and it remained unchanged in the course of the reform. For CBW, access to the Swiss labor market *within* the BR was liberalized in two steps:

Transition Period– In the transition phase that started after the announcement of the reform in

[1] The initiation of a referendum in Switzerland highlights that there was considerable opposition in Switzerland against these agreements, particularly against the AFMP treaty.

1999, cantonal migration offices, responsible for handling work permit applications of CBW, gained more leeway in doing so. In 2002, several formal restrictions were abolished. The most important changes were, first, that new cross-border worker permits were now generally valid for five years (instead of one year) and no longer tied to a specific job. Second, CBW were allowed to commute on a weekly basis from their residency abroad to their Swiss workplace rather than daily.

Free Movement– In June 2004, the free movement phase began with firms gaining completely unrestricted access to CBW. Switzerland dropped the prioritization of residents which had imposed a direct recruitment cost for firms who wanted to hire CBW by requiring them to go through a lengthy admission process.[2] In 2004, hiring a CBW became as easy as hiring a Swiss native. Empirically, we will distinguish between a *Transition* phase covering the first removal of restrictions from 2000-2003, and a *Free* phase starting in 2004.

Restrictions for permanent immigrants, i.e., people who acquire residency and the right to work in Switzerland, had been stricter. Resident immigrants to Switzerland were subject to yearly quotas and prioritization of natives (similar to CBW). In 2002, the quotas for immigrants from European countries were increased and in 2004, prioritization was abolished (similar to CBW). In 2007, all remaining restrictions for immigrants from European countries were abolished. From a legal perspective, these changes affected all regions in Switzerland similarly.[3]

1.2 The Swiss Labor Market and Maternal Workforce Participation

Switzerland has relatively conservative gender norms around maternal labor supply and features one of the largest child penalties in earnings in industrialized nations (Kleven et al., 2019; Krapf, Roth, and Slotwinski, 2020). Leave policies are relatively ungenerous compared to its European neighbors, and during our study period, the majority of mothers becomes detached from the workforce for a substantial time period.

Appendix Figure A1 documents parents' participation in the workforce by the age of their youngest child using data from the Census in 2000. Almost all fathers participate in the labor force full-time, and this does not vary by the age of the youngest child. Mothers, in contrast, gradually increase their participation up until the youngest child turns 16 from about 50% to 80%.[4] The share of mothers who work full-time stays relatively constant at 10% until the youngest child is around school-going age and increases only gradually thereafter. The increase in participation over this time horizon primarily stems from mothers entering the workforce part-time. After the youngest child turns 16, mothers' participation plateaus with some moderate movements from part- to full-time activity. Mothers are not just a group that primarily works part-time, but also the main group in the labor market that does so. In Figure A2, we show the composition of prime age

[2] In particular, firms had to provide proof that they could not find "within an appropriate period of time" an equally qualified resident worker to fill a vacancy.

[3] Beerli et al. (2021) document a small increase of resident immigrants in the BR following the expansion of CBW and interpret this change as crowding-in of immigrants as a direct consequence of the CBW reform.

[4] Schooling is mandatory until age 16 in Switzerland.

full- vs. part-time workers. Close to 70% of part-time workers in the Swiss economy are mothers. In contrast, mothers account for only 10% of full-time workers. These patterns suggest that those mothers who eventually return to the labor market do so up until their youngest child turns 16, and enter primarily via part-time positions. As such, part-time work positions in particular may allow mothers to perform childcare responsibilities while also remaining in the labor market.

2 Data, descriptive statistics, and empirical strategy

2.1 Data

Linked Census — OASI data (Social Security) We use the population census in 2000 to create our main sample that we then link to the Swiss social security register from the Old-Age and Survivors' Insurance (OASI). The census contains information on individuals' main demographics, education, place of living, and household composition.[5] We assign individuals to treatment based on the municipality in which they live in the year 2000. To measure partners' labor force outcomes, we link couples living in the same household with household identifiers at baseline. To analyze the number of children in a household that are born during the reform period, we further link to the the Swiss population registry (STATPOP) for 2012. We restrict the sample to individuals who are Swiss nationals and for whom a unique personal identifier is available. For our main results on mothers and fathers, we follow prime age workers aged between 25 and 54 whose youngest child is younger than 16 in the year 2000.[6] We link individuals in the Census to the OASI data based on a unique personal identifier that is provided by the Federal Statistical Office (BFS, FSO) and based on a probabilistic matching procedure.[7]

The OASI register contains employment spells for the universe of all individuals who are employed, self-employed, or who receive benefits in Switzerland between 1994–2010. For each individual and job, the data records one entry with information on start and end month, and associated earnings. In order to capture a meaningful dimension of workforce attachment that abstracts from very sporadic types of participation, we define an individual as "in the workforce" if they have real yearly earnings from wage or self-employment above 3,900 CHF (indexed in 2000), which corresponds to working for more than one month at the 10th percentile of the wage distribution.[8] We add all income from wage employment spells in a given year to measure wage earnings. We drop the year 1998 in all of our main analyses with social security data since about 5-6 % of records for 1998 are missing non-randomly (see Martínez, Saez, and Siegenthaler (2021)).

[5] As uncertainty about whether the reform would be implemented was only resolved in May 2000 after passage of the popular referendum, we think it is reasonable to use the Census 2000 to measure baseline controls.

[6] Note that while 2000 is the first year post-reform, the decision to have a child will have taken place nine months prior.

[7] See https://www.bfs.admin.ch/bfs/en/home/statistics/population/surveys/snc.html.

[8] We show robustness to this definition and report results on unemployment and any form of self-employment separately.

Business Census To study the reform's effects on the composition of local labor markets, we use data from the Business Census (BC), which is available for the years 1995, 1998, 2001, 2005, and 2008. The BC covers the universe of private and public establishments and reports establishment-level counts of workers by gender, nationality (Swiss, Non-Swiss), and workload measured as a share of a full-time equivalent hours in the following categories: full-time ($\geq$ 90%), high part-time (50-89%), and low part-time (<50%). We assign workers to municipal labor markets based on the municipality of the establishment and use 1998 as the pre-reform baseline year. We drop agricultural establishments for all years, as data for this sector is not consistently available.

Swiss Job Market Monitor (SJMM) The Swiss Job Market Monitor (SJMM) collects a nationally representative sample of job vacancies posted annually in March by firms in Switzerland (Buchmann et al., 2022). Starting in the early 2000s, the main sample collected from print media is supplemented with data from online media, company websites, and online job boards. While the yearly sample size is relatively small, the data contains rich information on the establishment advertising a particular vacancy (such as location, size, industry, ownership), on the nature of the job (workload, occupation, etc.), desired characteristics of applicants and the advertisement medium. We categorize advertisements into full-time, high part-time and low part-time workload based on the employment level indicated in the job ad, and assign vacancies to treatment and control based on the location of the posting establishment.

Swiss Earnings Structure Survey (SESS) To examine hourly wages and hours, we rely on the Swiss Earnings Structure Survey (SESS), conducted every other year by the Federal Statistical Office. The survey is mandatory and comprises a large sample of private and public establishments with at least 3 employees in the secondary and tertiary sector. It collects detailed information on workers by enterprise (wage, hours, occupation, type of contract, etc.), but parental status is unobserved. We restrict the SESS sample to workers at prime age in 2000 who are on a monthly contract. This comprises 90% of all prime age workers and excludes workers hired at an irregular, hourly basis.

2.2 Descriptive Statistics

Maternal Participation in the Workforce – Appendix Table A1 presents summary statistics for our population of interest: Columns 1 and 5 refer to men and women who do not have children at the onset of the reform, whereas Columns 2 and 6 focus on parents as our main sample of interest. We further report statistics for parents by treatment status (columns 3 and 4 for fathers, columns 7 and 8 for mothers)

On average, parents slightly more than two children at baseline, with the youngest child of mothers close to seven years old. In terms of education level, mothers are more likely to have a secondary rather than a tertiary degree relative to fathers and women who do not have children. While for non-parents, workforce participation is at 91% and 88% for men and women respectively,

only 60% of mothers, but 96% of fathers, are participating in the workforce. Conditional on being employed, mothers have substantially lower total median earnings (around 24k CHF compared to 79k CHF for fathers). Based on information from the Census, mothers who are employed work on average 23 weekly hours, whereas fathers work 46 hours. We also observe sorting by gender across industries: Mothers and women are more likely to work in knowledge-intensive services compared to men (42 and 47% respectively vs 31% for men). Men are more likely to work in Manufacturing (around 19% vs 9% for women).

Fathers and mothers in the border (treated) and central (control) region are quite similar on demographic characteristics and fertility patterns. Mothers in the border region are about 6 ppt more likely to hold a tertiary rather than a secondary degree. While participation rates are quite similar, mothers in the border region work slightly more hours (+ 1 weekly hour) and have higher median earnings. In the border region, more mothers and fathers tend to be in knowledge-intensive services.

Inflow of CBW– In Figure 1, we document patterns in the inflow of CBW that directly motivate our empirical strategy. We calculate the municipal share of CBW as the number of CBW in a given year (numerator) over the total number of workers in that municipality in 1998 as the last pre-reform year in the Business Census (denominator), in order to not conflate compositional changes in the workforce with general expansions or contractions of the labor market. We use data from the SESS as the Business Census does not separately identify CBW from Non-Swiss workers in all years. Figure 1 plots bins of the municipal share of CBW by driving distance to the nearest border crossing point in minutes. Panel a reports levels, while Panel b plots changes. Pre-reform, the level of CBW is substantially higher in municipalities within 15 driving minutes to the nearest border crossing. Relative to the pre-reform year 1998, municipalities closer to the border also experience much starker increases in CBW. With the relaxation of permit-specific restrictions from 2002 onwards, we observe a moderate increase in CBW. With the free phase starting in 2004, the share of CBW increases drastically in the years thereafter (by 2008). While these increases are pronounced in municipalities within 15 minutes driving distance to the border, they are considerably smaller in municipalities further than 15 minutes away. We observe negligible shares of CBW in municipalities that are further than 30 minutes driving distance away. We will return to these patterns more formally in the main analysis in Section 3.

2.3 Empirical strategy

Following the descriptive patterns in Figure 1 described above, we define municipalities as treated if they fall within 15 minutes of driving distance to the nearest border crossing. Our main empirical specification is the following event-study that incorporates a doughnut design:

$$y_{imt} = \sum_{\substack{t=1994 \\ t\neq 1999}}^{2010} \gamma_t \cdot I_t \cdot Treat_m + \sum_{\substack{t=1994 \\ t\neq 1999}}^{2010} \eta_t \cdot I_t \cdot Spillover_m + \alpha_m + \alpha_t + X_i\,\delta + \epsilon_{imt} \tag{1}$$

where y_{imt} is the outcome of interest for individual i in year t who lives in municipality m in the year 2000. I_t are indicator variables for a given year, and $Treat_{mt}$ and $Spillover_{mt}$ denote whether an individual lived in a border municipality within 15 minutes (Treat) or between 15 - 30 minutes (Spillover) driving distance from the closest border crossing point at baseline. Year (α_t) and municipality (α_m) fixed effects control for common shocks and time-invariant municipality characteristics, respectively. We use data from the Census in 2000 to measure individual level controls X_i at baseline.[9]

The coefficient of interest, γ_t, measures the impact of the reform for an individual living in a municipality within 15 minutes from the nearest border crossing compared to living in a control municipality farther than 30 minutes away at baseline. We estimate the event study with a doughnut design that controls for reform impacts on municipalities at an intermediate distance, as these areas likely experience some spill-over effects. The key identifying assumption for our empirical strategy is that in the absence of the reform, the outcome for individuals in treated municipalities would have evolved in parallel relative to control municipalities. While this assumption cannot be tested directly, examining parallel trends in the pre-reform period allows us to assess its plausibility. We cluster standard errors at the commuting zone (CZ) level and estimate reform effects relative to 1999 as the last pre-reform year following Beerli et al. (2021).

We further report difference-in-differences (DiD) estimates that bundle the treatment impact relative to the pre-reform period during two periods of post-reform years:

$$y_{imt} = \beta_1 Transition_{mt} \cdot Treat_{mt} + \beta_2 Free_{mt} \cdot Treat_{mt} + \alpha_m + \alpha_t + X_i\delta + \epsilon_{imt} \tag{2}$$

with $Transition_{mt}$ an indicator for the transition period (2000-2003), and $Free_{mt}$ an indicator for the fully liberalized period starting in 2004.

3 Main results: Reform Impact on Participation in the Workforce

3.1 Reform Impact on Non-Swiss Workers

We start by documenting the reform impacts on the presence of non-native workers more formally in an event-study using all available years in the Business Census. For all of the following analyses examining changes in workforce composition using the Business Census, we divide the total number of workers in a category by the total number of workers in a municipality in the last pre-reform year in the Business Census (1998). This allows us to trace how different pools of workers change relative to the pre-reform baseline without conflating our effect sizes with potential general expansions or contractions of the labor market. Figure 2 documents a sharp increase of 7.5 ppt by 2008 in the

[9] We measure all control variable and assign treatment status based on variables from the Census 2000, see Section 2.1. Individual level controls we include are: Age, age squared, highest level of education (primary, secondary, tertiary), bins for the age of the youngest child (0-3, 4-6, 7-12, 13-16, 17+) and bins for the total number of children (1, 2, 3, 4+).

number of Non-Swiss workers as a share of pre-reform local employment. This corresponds to an increase in Non-Swiss workers by 22% over the pre-reform mean (0.34). While we can distinguish between CBW and other Non-Swiss workers only in a more limited set of years, Appendix Figure A3 shows that the growth in Non-Swiss workers is entirely explained by the larger availability of CBW for the years in which both variables are available.[10]

3.2 Decline in Maternal Workforce Participation

Workforce Participation – Next, we document the reform's impact on parents' workforce participation. Figure 3 shows that the participation of mothers who live in treated municipalities evolves in parallel compared to mothers who live further away from the border until the onset of the reform in the early 2000s, and subsequently starts to decline. By 2010, participation rates of treated mothers are 5.2 ppt lower. This represents a 9% drop over the pre-reform mean (58.3%). Conversely, the reform did not meaningfully affect the labor force participation of fathers with yearly point estimates for later reform years indicating only a slight, and imprecisely measured decrease.

Table 1 reports results when bundling yearly estimates across the *Transition* and *Free* period (see Equation 2). Column 1 reports estimates with year and municipality fixed effects only, while Column 2 presents our preferred specification with individual level controls. While mothers' participation drops by 3.8 ppt in the *Free* period, fathers' participation dips by 1.1 ppt. While precisely estimated when bundled across years, the drop for fathers is relatively small and amounts to a decrease of about 1% in this group's participation rate over the pre-reform mean (96.5%).

Earnings – Figure A4 reports the reform's impacts on yearly earnings unconditional on employment. Consistent with the results on labor supply, by 2010 we observe a sizable drop in earnings of .46 units of the inverse hyperbolic sine for mothers, while fathers' earnings are largely unaffected.[11]

Unemployment – Since our main outcome measures participation in the workforce, i.e. captures men and women who receive wage- or self-employment income, we separately examine reform impacts on unemployment benefit receipt in Appendix Figure A7. The outcome is an indicator equal to one if an individual received any unemployment benefits in a given year. We observe no reform impact on fathers, and negative but noisy point estimates for mothers, consistent with this group being less likely to have a job and therefore less likely to qualify for unemployment assistance.

Hours – Since hours are unobserved in the social security data, we use survey data from the

[10] Beerli et al. (2021) use survey data at the firm level. These data separately identify CBW for a more extended set of years. Our point estimates for the available years in the Business Census coincide almost exactly with their estimates. In the year 2010 (unavailable in the Business Census data used in this paper), Beerli et al. (2021) estimate a 10 ppt increase in CBW in municipalities within 15 minutes of the border.

[11] Note that the inverse hyperbolic sine transformation in the context of our outcome (with a mass of zero, and positive earnings otherwise) emphasizes the extensive margin effect, and should not be interpreted as a percentage impact (Chen and Roth, 2024).

SESS to understand the total impacts of the immigration reform on hourly wages. We examine workers in the same age group as our main analysis sample (prime age in 2000) as parental status is unobserved. In Appendix Figure A5 we document impacts on native workers' hours and hourly wages. Among treated women who are in the workforce, we note an expansion in hours worked. Consistently, the likelihood of working full-time as a female worker in the treated region increases. We do not observe meaningful impacts of the reform on hourly wages among female and male workers and will revisit wage pressure as a possible mechanism in section 5.

3.3 Robustness of Main Result

We then document that motherhood — and not just being female — is the defining characteristic behind the decline in labor supply of mothers. Appendix Figure A6 examines the impact on men and women in the same age group (between 25 and 54) who do not have children at the onset of the reform. Prime age women without children at baseline do not experience a reduction in labor force participation. If anything, point estimates for this group are positive.[12] Patterns for prime age men without kids mirror those for fathers.

Second, we document that the decline in maternal labor supply is not accounted for by differential sorting of men and women across industries and occupations, which could have been differentially affected by the inflow of CBW. In order to compare mothers and fathers who work in the same industries or occupations, we estimate our main specification with separate treatment effects and controls for women and men, but joint industry or occupation fixed effects measured at baseline. One challenge with adding industry and occupation fixed effects lies in that these variables are more likely to be missing when an individual is not in the workforce. We therefore report two sets of estimates: i) controlling for the missing industry or occupation category, and ii) dropping individuals with missing values from the estimation sample. Column 1 in Appendix Table A3 repeats our main treatment effect. In columns 2 and 3, we add industry fixed effects. When we include and separately control for missing industry information, coefficient estimates are identical and the adjusted R^2 increases. Treatment effects for mothers are the same when dropping individuals with missing industry information in column 3. A similar picture arises when including occupation fixed effects in columns 4 and 5. Column 6 and 7 report estimates when including learned occupation fixed effects, which are available for a much larger share of the sample. Results are almost identical to our main specification in column 1. The decline in maternal workforce participation is present even when we compare mothers and fathers who work in the same industry or occupation. Differential sorting of men and women across industries and occupations that would be differentially affected by the influx of CBW is therefore unlikely to explain mothers' dropout.

Additional robustness of our main result for mothers and fathers is reported in Table 1. Results remain similar when including individual fixed effects in Columns 3 and 8, NUTS-2 trends as in

[12] 27% of this group of women end up having at least one child by 2010. See also Mechanism Section 5.5.3 for fertility impacts of the reform.

the main specification of Beerli et al. (2021) (Columns 4 and 9), and when dropping large cities (Columns 5 and 10).

4 Conceptual Framework

Why do mothers drop out of the labor force in response to the reform? In this section, we sketch a simple search-and-matching model that sheds light on the potential mechanism behind our main result and guides the empirical analysis in the rest of the paper.

Set-up We set up a standard search and matching model with one-sided heterogeneity and risk-neutral workers who live forever, following Albrecht and Vroman (2002). Workers differ in how many work hours they can supply. In particular, there is a share p of the labor force that has a time constraint (due to child care) which does not allow them to work full-time.[13] The measure of workers is normalized to one. Firms can offer both full and part-time vacancies. We assume that firms have to pay a coordination cost c, drawn from a distribution C, if they hire a part-time instead of a full-time worker. The coordination cost reduces the productivity of a match with a part-time worker compared to a match with a full-time worker.[14] A job can either be vacant or filled and the technology is such that if a job is filled, full-time equivalent output x is given by:[15]

$$x(s,y) = \begin{cases} a, & \text{if } s = ft \text{ and } y = ft \\ a - c, & \text{if } y = pt \end{cases}$$

where s determines whether a worker is a full-time worker (ft) or a part-time worker (pt) and y determines if a job is a full-time (ft) or a part-time (pt) job. The wage paid to a worker once a vacancy is filled is given by $w(s,y)$. If the vacancy is not filled, a fixed vacancy cost z has to be paid. When a vacancy is created, a firm chooses whether to offer it as a part-time or a full-time vacancy to maximize its value. A firm cannot adjust the vacancy ex-post. If a firm offers a part-time vacancy and meets a full-time worker, the worker will be employed part-time (conditional on

[13] In practice, this time constraint may reflect preferences or strong social norms regarding mother's participation. In a representative survey, only around 5% of Swiss mothers and fathers with children under the age of 4 state that their desired employment model for the parents is one where the mother works full-time, whereas 59% of fathers and 53% of mothers prefer a model where the father is working full-time, and the mother works part-time or not at all (BFS, 2017).

[14] A similar idea has first been introduced by Oi (1962) who stipulate a quasi-fixed labor cost which is a fixed cost a firm has to pay for hiring and training and administrative costs per worker. In this model, as firms have to pay the same quasi-fixed labor cost for a part-time and full-time employee, it will naturally be more costly for the firm to replace a full-time employee with two part-time employees. Kopp (2022) provides empirical evidence that firms in Switzerland indeed have a preference for full-time over part-time workers by analyzing search behavior of recruiters on a job platform with job candidates. Recruiters are much more likely to restrict searches by full-time availability and they are considerably less likely to contact a candidate with part-time preferences, everything else equal. The reduction in the contact likelihood due to a specified part-time preference is notably larger than a reduction in the contact likelihood triggered by a lack of work experience, a lack of language skills, or missing educational certificates.

[15] This output set-up is analogous to the set-up in Goldin (2014) who differentiates jobs as requiring greedy and non-greedy hours in a compensating differentials framework.

the match creating a surplus).

Matching Workers and firms meet according to a standard matching function which determines the arrival rate of job offers for unemployed workers and the arrival rate of job candidates for a vacancy for a firm. We assume that the matching function is characterized by constant returns to scale: $m(u,v) = m(1,\frac{v}{u})\,u = m(\theta)u$, where $\theta = \frac{v}{u}$, u the unemployment rate and v the measure of vacancies. The arrival rate for a worker is therefore given by $m(\theta)$. While vacancies arrive at the same rate for part-time and full-time workers, part-time workers are only eligible for part-time vacancies. Assuming that a share ϕ of vacancies are part-time, the arrival rate of jobs for part-time workers is therefore $m(\theta)\,\phi$. Similarly, vacancies meet unemployed workers at rate $\frac{m(\theta)}{\theta}$, but full-time vacancies will sometimes meet part-time workers who are unable to work full-time. Assuming that a share γ of all unemployed workers are part-time, a full-time vacancy will meet a suitable worker at rate $(1-\gamma)\frac{m(\theta)}{\theta}$. Below, we will compute the steady-state equilibrium which is a collection of four variables $\{\theta, \phi, \gamma, u\}$ that satisfy the following conditions: all matches that are relatively better than continuing unmatched are formed. Further, since this is a long-run model with free entry and exit, the value of creating a vacancy for a firm must be zero. Finally, the flow of both part-time and full-time workers into and out of unemployment must be equal.

Match formation If an unemployed worker and a firm meet, they will form a match if there is a joint surplus. We denote the value of unemployment of an unemployed worker of type s by $U(s)$ and the value of employment in a job of type y as $N(s,y)$. The value of a vacancy of type y for a firm is $V(y)$ and the value of a filled vacancy for a firm is $J(s,y)$. Hence, if a worker and a vacancy meet, they will create a job if the surplus is non-negative:

$$N(s,y) + J(s,y) \geq U(s) + V(y)$$

The surplus is split between worker and firm according to a standard Nash bargaining process where we denote the workers' share of the surplus as β. The wage is then determined by:

$$N(s,y) - U(s) = \beta[N(s,y) + J(s,y) - U(s) - V(y)]$$

The exogenous separation rate is denoted by δ and the discount rate by r. Value functions are computed in Appendix E.

Equilibrium Free entry and exit implies that $V(pt) = V(ft) = 0$. Using that and substituting the above into the inequality determining whether a match is formed yields:

$$x(s,y) - z \geq rU(s)$$

Following Albrecht and Vroman (2002), we assume that all relevant parameters are such that there is a unique equilibrium in which there is no absolute separation between job markets for full-time

and part-time workers, i.e., full-time workers also take part-time jobs. The conditions for such an equilibrium are that $V(pt) = V(ft) = 0$ and the following two steady-state conditions which equalize the flow in and out of unemployment:

$$\phi\, m(\theta)\, \gamma\, u = \delta\, (p - \gamma\, u)$$
$$m(\theta)\, (1-\gamma)\, u = \delta\, (1 - p - (1-\gamma)\, u)$$

The first equation equalizes the flow out of and into unemployment of part-time workers, whereas the second equalizes those flows for full-time workers (since full-time workers also take part-time jobs, ϕ does not show up in the second flow equation). From these two equations we can compute the equilibrium values for the share of part-time jobs in the economy and the share of unemployed as:

$$\phi = \frac{p\,(1-\gamma)\, m(\theta) + \delta\,(p-\gamma)}{m(\theta)\,\gamma\,(1-p)}$$
$$u = \frac{\delta\,(1-p)}{(1-\gamma)\,(m(\theta)+\delta)}$$

Hence, in equilibrium, the share of part-time jobs offered (ϕ) is higher, the higher the number of part-time workers in the economy:

$$\frac{\partial \phi}{\partial p} = \frac{(1-\gamma)(m(\theta)+\delta)}{m(\theta)\gamma(1-p)^2} > 0$$

The reason behind this is as follows: If a firm offers a full-time vacancy, each period it will meet an unemployed worker according to the matching function. If it meets a part-time worker, the match cannot happen and the firm has to wait for next period to meet another worker and pay the vacancy cost for one more period. The probability that it will meet a full-time worker with whom a potential match can be formed depends on the share of full-time workers. If a firm offers a part-time vacancy, it has to pay the coordination cost but it has a higher chance of filling the vacancy immediately since a successful match can be formed with both types of workers.

In sum, a firm will decide to offer a part-time vacancy if the coordination cost is low compared to the cost of posting a vacancy and if the share of part-time workers in the economy is relatively high. Conversely, if the share of part-time workers in the economy decreases exogenously (for example, if CBW who are full-time workers newly enter the labor market) firms will post more full-time vacancies, and hence, the number of part-time jobs in the economy decreases.

5 Mechanisms

We present several pieces of empirical evidence that are consistent with the mechanics of the model outlined in the previous section and showcase that a reduced availability of part-time jobs in local

labor markets drives the decline in mothers' participation. We first examine the structure of jobs in local labor markets and show that the influx of immigrants working mostly full-time coincides with a decline in part-time workers, particularly Swiss female part-time workers. Second, we leverage a representative sample of job ads and find that firms in treated municipalities are more likely to advertise jobs for full-time rather than part-time positions after the start of the reform. Third, we document that the compositions of returning mothers changes: While there is no change in the probability that a mother returns to the labor market in a full-time capacity after childbirth, the decrease in participation is observed among mothers returning part-time. These patterns are consistent with lower hours being a main driver behind the observed substitution between CBW and mothers. Finally, we explore and rule out three main alternative mechanisms. We find no evidence that our main results are driven by the reform's effects on natives' wages, household income or fertility. Taken together, these patterns are consistent with firms' being less eager to hire mothers who face time constraints once they are able to tap into a sufficiently large pool of full-time talent.

5.1 Structure of Jobs in Local Labor Markets

We examine the composition of the workforce with respect to full-time or part-time status using data on the universe of all workers in the Business Census. For each establishment, these data entail the number of workers employed in jobs of three different workload categories, by nationality (Swiss, Non-Swiss), and by gender. We calculate shares for each worker category by normalizing the number of workers by type (the numerator) with total workers in the last pre-reform year in the Business Census data (1998). [16]

5.1.1 Compositional Changes

Appendix Figure A9 illustrates the impact of the reform by nationality and workload. The number of Non-Swiss workers grows by 7.5 ppt by 2008, and most of this growth stems from workers employed in full-time jobs (5.8 ppt).[17] For Swiss workers, we observe a contraction of 4.3 ppt by 2008. However, this contraction is not driven by a reduction of native full-time workers. To disentangle these effects further, Figure 4 contrasts these aggregate impacts by workload category, depicted on the left-hand side, with detailed effects broken down by nationality and gender, on the right-hand side. In Panel 1a, we observe an increase in the overall number of full-time workers in treated municipalities, albeit somewhat noisily estimated. Panel 1b highlights that the growth in full-time workers is entirely accounted for by Non-Swiss workers from both genders, while the

[16] As depicted in Appendix Figure A8, following the reform, the labor market overall experiences an expansion in FTE by a (noisly estimated) 3.8 ppt by 2008. The full-time share increases by an imprecisely estimated 4.3 ppt , while the part-time share contracts by 1.2 ppt.

[17] The point estimate for the expansion of Non-Swiss workers is of the same magnitude as in Beerli et al. (2021), who use a representative sample of private firms in the SESS that allows for a distinction between resident immigrants and CBW in all years. As documented in Beerli et al. (2021), the increase in immigration is primarily driven by CBW. This coincides with our analysis for the years in which the BC separately identifies CBW, discussed in Section 3.1.

effects on natives working full-time are not distinguishable from zero. The growth in full-time workers contrasts with contractions in part-time jobs, depicted in Panels 2 and 3, respectively. While the share of Non-Swiss workers also increases in these jobs with lower workloads, it does so to a much smaller extent compared to full-time positions (Panel 2b and 3b). The share of Swiss part-time workers, and in particular Swiss part-time women, declines. For low hour part-time jobs in particular, these contractions are not offset by Non-Swiss workers' increases in the same workload category.

If Non-Swiss full-time workers are indeed replacing Swiss female part-time employees, we should observe that this pattern holds not just in the aggregate, but within industries. To examine this, we run event studies with establishment fixed effects separately by industry and report the coefficients for the year 2008 in Appendix Figure A10, with the reform impact for the share of Swiss female part-time workers (over total establishment workers in 1998) depicted on the y-axis against the reform impact on Non-Swiss full-time workers. Industries are weighted by the number of Swiss female part-time workers in 1998. With the exception of construction, we observe that declines in the establishment-level share of Swiss female part-time workers are accompanied by increases in the share of Non-Swiss full-time workers. Among the largest decreases of Swiss female part-time workers occur in Health, Public Administration, Business Services and Other Services. It is also visible that a number of industries such as Hightech Manufacturing and R&D experience strong growth in Non-Swiss talent, irrespective of any substitution. As the labor market is growing over this time period, we can therefore not interpret the patterns in this figure as indicative of how many part-time workers can be substituted by one full-time employee.

Taken together, these results based on the Business Census are suggestive of larger shifts in the composition of the labor market with readily available full-time workers replacing those who cannot fill jobs with a full-time workload due to care-taking constraints.

5.2 Decline in Firms' Demand for Part-time Workers

To further assess the extent to which the above documented changes in local labor markets are the result of demand-side factors, we continue by examining the reform's effects on firms' job posting. To this end, we use data from the Swiss Job Market Monitor (SJMM), a yearly representative sample of jobs advertised by Swiss firms.[18] We assign job ads to the treatment group if the location of the posting establishment is in a treated municipality.

Table 2 shows the reform's effect on firms' vacancy posting behavior. We estimate Equation 2 with the dependent variable an indicator for whether the advertised job has a full-time workload (columns 1–3), a high part-time workload (columns 4–6), or a low part-time workload (columns 7–9).[19] We observe a reduction of job ads targeting both high and low part-time workloads, which

[18]The SJMM is a yearly representative sample of jobs advertised by Swiss firms from different media sources, see (Buchmann et al., 2022). We use the years 1990-2010.

[19]Note that the yearly sample size is relatively small such that we cannot include municipality fixed effects. We add industry fixed effects to account for idiosyncratic changes in the composition of ads in any given year.

is matched by an increase in ads for full-time workers of about 9% over the pre-reform mean. These effects persist when conditioning on ads for the private sector only (columns 2, 5, 8) or restricting to print media (columns 3, 6, 9). Appendix Figure A11 shows the reduction in part-time job ads using our main event-study specification.

5.3 Maternal Drop-out by Hours Supplied

We return to the social security data to examine whether the patterns on the supply side of the labor market support the hypothesis that firms may substitute part-time female Swiss workers with full-time CBW due to a preference for higher-hours workers. Importantly, if hours supplied is the dimension that matters for firms' choices, we should not observe negative labor market consequences for mothers who are willing to work full-time. While we cannot directly observe hours in the social security data, we can construct a proxy thereof by relying on the share of pre-motherhood earnings (when most women work full-time) that women recover upon returning to the workforce. If mothers recover an amount that is close to their pre-birth earnings, they are plausibly more likely to return to the labor market in a "full-time" capacity.

For this exercise, we restrict our main analysis sample to the post-birth years for women who had their first child after 1982 as the earliest year in which we can observe pre-birth earnings in the social security data. We focus on women who did not have earnings from self employment and were wage employed for all 12 months in the year before their first child is born ("pre-birth"). We convert earnings to real terms and trim pre-birth earnings at the 10th and 99th percentile for each year in the data. We further trim the bottom 20% of the pre-birth earnings share to exclude mothers who have a more intermittent labor force attachment from our employment measure. For the event studies, we define mothers as "full-time" employed workers if their post-birth wage earnings amount to at least 90% of their pre-birth value, and as "part-time" employed otherwise.

For the year 2000, we can validate the full-time measure we construct from the post-birth earnings share in the social security data with data from the Census that records whether mothers work full or part-time at the time of enumeration. In the sample of mothers with births after 1982, 15.62 % state in the Census that they work full-time (conditional on working), while this share is 15.28% based on our post-birth earnings measure. For mothers who report working full-time in the Census, post-birth earnings amount to 102% of their pre-birth wage. This is in contrast to mothers who report working part-time, who earn about 60% of their pre-birth earnings on average. In Appendix Figure A12, we plot the density of the share of pre-birth earnings by whether mothers report working full- vs. part-time. While the mapping is not perfect, the mass of each density is consistent with the reported hours in the Census.

Figure 5 documents our main event study on the sample of post-birth mothers. We observe no change in the likelihood of returning to the labor market in a full-time capacity, defined as recovering at least 90% of pre-birth earnings. The group of mothers who is willing to supply full-time hours thus remains unaffected by the CBW shock. In contrast, we observe a decrease in the

likelihood that a treated mother is returning to the labor market in a part-time capacity. By 2010, the likelihood that a mother is working in part-time wage employment is about 5 ppt lower in the treated relative to the control areas. Defining an indicator equal to one if a mother is either full- or part-time employed based on these earnings measures, we observe a similar pattern and magnitude of drop-out in this post-birth sample relative to our main analysis sample. Appendix Table A4 reports the difference-in-differences coefficients and shows that these results are robust to different definitions of defining full-time capacity and to trimming outliers. While our earnings-based measure of full- vs. part-time work is a proxy to categorize workers into categories of hours, these results nevertheless support the interpretation that firms substitute towards CBW primarily due to (most) mothers' supply of lower hours.

5.4 Dropout at Hiring Margin

How does the reduction in part-time jobs come about? Two pieces of evidence from the social security data complement the job ads data and are suggestive of the impact operating along the hiring margin, i.e. particularly affecting mothers looking to return to the labor force after a break in participation. Appendix Table A5 splits our main sample of mothers by whether they were either in the workforce (columns 1–2) or in wage employment (columns 3–4) at baseline. The bulk of the decline in labor force participation is driven by mothers who do not work at the onset of the reform. Consistently, and as documented in Appendix Figure A6, women who do not (yet) have children at baseline and are attached to the labor force do not experience differential dropout, even though almost a third of this group (27%) will have given birth by 2010.

5.5 Alternative Mechanisms

5.5.1 Downward Pressure on Wages

While Switzerland put in place regulatory guardrails to ensure the same wages and work conditions for CBW relative to natives, it could be possible that firms were able to circumvent these restrictions. If the influx of CBW put downward pressure on native's wages, mothers may have found it less attractive to remain in the workforce. We present two pieces of evidence that suggest such an explanation is unlikely to account for the full impact on maternal drop-out.

First, we estimate gaps in log hourly wages between CBW and natives in the treated areas post-reform to understand whether CBW were paid less generally, and relative to Swiss women. Columns 1–4 in Appendix Table A6 document wage gaps gradually adding individual level controls, occupation and industry fixed effects, and establishment fixed effects. We observe a noisily estimated raw gap in hourly wages between CBW and natives of -5.6 log points in column 1. Controlling for individual characteristics in column 2 does not meaningfully close the gap, but makes it more precise. Accounting for the fact that CBW and natives work in different industries and occupations narrows it to -2.7 log points (column 3). Once we compare CBW and natives who

work in the same establishment, CBW earn only 1.4% less compared to natives (column 4). Overall, CBW thus do not constitute a substantially cheaper source of labor. This is even less so when directly compared to Swiss female workers in columns 5–8. Compared to female natives, CBW earn substantially more (+ 3.8 log points), even within the same establishment. This wage premium is explained by CBW being a group that contains many male workers who tend to earn more. Once we account for gender in column 9, wages between CBW and female natives are the same.

Second, we can examine changes in wages among a cross-section of Swiss prime-age workers using the SESS. While native's wages are a central object of interest when studying immigration effects, they naturally conflate potential impacts from increased competition through immigrants and potential selection effects among those who remain in the workforce. This requires particular caution when interpreting impacts on female workers, a group that experiences sharp compositional changes following the reform (see Appendix Figure A5 and our main results). Appendix Figure A13 estimates reform impacts on log hourly wages for male and female workers. In Panel a, we observe no impact on male wages and an imprecisely estimated impact of -2.2 log points for women who remain in the workforce. In Panels b and c, we split the sample by whether workers are on an individually negotiated contract, for which wage adjustments could be more easily realized, and workers on collectively bargained contracts that do not allow for individual flexibility and limit frequent compensation adjustments. We see positive point estimates for male and female workers on individually negotiated contracts, who comprise about half of the sample (Panel b). Instead, the negative point estimates are driven by the group whose contracts limit firms' leeway in setting wages, thus providing suggestive evidence that wage impacts in the overall sample may rather be the result of compositional changes among female workers. Even if we were take the estimate of -2.2 log points for female workers in Panel a at face value, the implied labor supply elasticity at the extensive margin is around 4 (9% reduction in workforce participation over a 2.2% reduction in wages). This value is an order of magnitude above extensive margin elasticity estimates for married women which tend to range between .2 – .6 in industrialized countries (Bargain, Orsini, and Peichl, 2014). Taken together, wage pressure alone is therefore unlikely to explain maternal drop-out in this context.

5.5.2 Household Level Income Shocks

Could income effects within households explain mothers' dropout? As shown by prior work studying the impact of this reform on the firm side (Beerli et al., 2021), highly educated native workers in the border region benefited from wage growth. This raises the possibility that mothers' household income is increasing after the reform, thus making it financially less attractive or necessary to participate in the labor market.

To examine the importance of potential household income effects, we estimate the reform impact on partner's earnings for mothers in our main sample. To do so, we match mothers to their partners at baseline and restrict to women whose partner is Swiss. Appendix Figure A14 documents that

the partners of these mothers experience an increase in yearly wage earnings of about 1.4% in the transition and 1% in the free period. However, these income effects are relatively small compared to the extent of mother's dropout: If we take these estimates at face value, the 1% increase in partner's income in 2010 would need to fully account for maternal drop-out of -5.2 ppt.

To gauge whether such magnitudes might be plausible, we examine the semi-elasticity of mother's workforce participation with respect to partner's earnings in Appendix Table A7. We start by examining this relationship in the cross-section, using our full sample of mothers and their partners in the pre-reform period in Column 1. A 1% increase in partner's earnings is associated with a decrease in maternal participation by .02 ppt. This estimate is two orders of magnitudes smaller than what would be needed to explain our main participation effect of -5.2 ppt. Since a concern in the cross-section might be that this reflects selection, in Column 2 we move to a panel by adding individual level fixed effects. This leaves the semi-elasticity essentially unchanged (–.016 ppt). We obtain a similar estimate (–.014 ppt) when restricting to the control region in the pre-treatment period in Column 3, and a somewhat larger estimate (–.027 ppt) when using data for the full time period of our panel (1994 - 2010) for the control group. While the partners of the mothers in our setting thus experience moderate earnings growth post-reform, we deem it unlikely that mother's dropout would be driven purely by this channel given the magnitude of these semi-elasticities.

5.5.3 Fertility Impacts

We further shed light on whether differential fertility may matter for the interpretation of our main effect. To do so, we define an indicator variable equal to one if a mother gives birth in a particular year post-reform and zero otherwise. As depicted in Appendix Figure A15, we observe an increase in the likelihood of giving birth for treated mothers in any given year, especially in the *Free* period. If increased fertility following the reform is the main driver behind mothers' decline in participation, we would expect our labor supply effects to be driven by those mothers who have additional children.

We therefore examine heterogeneous treatment effects by splitting our sample into mothers who are at or below median age (37 and younger) and mothers who are above median age at baseline. Younger mothers are substantially more likely to have additional children post-reform: Their likelihood of a post-reform birth is at 17%, compared to 5% for mothers who are above median age. Indeed, as documented in column 2 and 3 in Appendix Table A8, the differential fertility in the treated region can be entirely attributed to younger mothers. If increased fertility were to be the primary reason for mothers' dropout, we would thus expect younger mothers to drive this result. However, when we examine workforce participation by mother's age in columns 4 and 5, we observe drop-out both for older and younger mothers. We therefore deem it unlikely that increased fertility *per se* fully explains our main treatment effects.

6 Effects on the Child Penalty

Lastly, we relate our main estimates to recent work on the child penalty (Kleven, Landais, and Søgaard, 2019) and document that the reform translates into an increase in the motherhood penalty in participation for women in treated local labor markets. To do so, we construct a sample of mothers with a first birth between the years 1989 and 2000. We restrict our sample to mothers who at the time of their first birth are between 25 and 40 years old, and follow their labor market participation starting 5 years before and 10 years after their first birth.

Our goal is to estimate whether the child penalty in participation for women who live in treated municipalities is changing in response to the reform. Depending on the birth cohort of their child, the reform's impact will materialize at different event times after childbirth. To illustrate the estimation strategy, Figure 6 shows the participation penalties for mothers with a first birth in 1992 and 1996, with the grey dashed lines indicating the timing of the reform for children of these two birth cohorts. For mothers with a first birth in 1992, the last pre-reform year (1999) corresponds to $t+7$ after the birth, while for mothers with a first birth in 1996, the last pre-reform year is $t+4$. The penalty in participation is generally larger for mothers in control municipalities. However, the relative penalty between treated and control regions starts to shrink once the reform takes effect.[20] For mothers with a first birth in 1996, the child penalty between treated and control eventually reverses at $t+10$ after the birth.

We then estimate a triple difference in the participation penalty between treatment and control mothers: For each event time t, we estimate how the child penalty changes when that event time happens post- rather than pre-reform for treated vs. control mothers.[21] We thus estimate the following equation, with y_{imt} an indicator for labor force participation for mother i at event time t, who lives in municipality m at baseline, and whose first child belongs to birth cohort c:

$$y_{imt} = \sum_{j=0}^{10} \alpha_j \cdot Post_{cj} \cdot Treat_m \cdot \mathrm{I}\left[\mathrm{j} = \mathrm{t}\right] + \sum_{\substack{j=-5 \\ j\neq -1}}^{10} \beta_j \cdot Treat_m \cdot \mathrm{I}\left[\mathrm{j} = \mathrm{t}\right] + \sum_k \delta_k \cdot Treat_m \cdot \mathrm{I}\left[\mathrm{k} = \mathrm{c}\right]$$
$$+ \sum_k \sum_{\substack{j=-5 \\ j\neq -1}}^{10} \gamma_{kj} \cdot \mathrm{I}\left[\mathrm{j} = \mathrm{t}\right] \cdot \mathrm{I}\left[\mathrm{k} = \mathrm{c}\right] + \sum_k \zeta_k \cdot \mathrm{I}\left[\mathrm{k} = \mathrm{c}\right] + \eta\, Treat_m + \psi_i + \epsilon_{imt} \tag{3}$$

$Post_{ct}$ is an indicator that is equal to one if a birth cohort's event time t occurs post-reform, $Treat_m$ is an indicator equal to one if the mother lives in a treated municipality at baseline, I [j = t] are event time indicators and I [k = c] are cohort indicators. We control for (mother's) age fixed

[20] Since we are estimating these figures separately for each birth cohort, there are no year fixed effects in these specifications (such that time trends are not netted out). For ease of interpretation, we refrain from dividing these estimates by the impact on fathers as in Kleven, Landais, and Søgaard (2019).

[21] We do not have variation in treatment status and can therefore not estimate treatment effects in the post period for event times $t = -5$ to $t = -1$, as these refer to years in which all birth cohorts in our sample are untreated.

effects with ψ_i. The coefficients of interest, α_j, measure the change in the child penalty at each event time t for mothers in border municipalities post-reform. Result are reported in Appendix Table A9. Column 1 reports results when we use the full sample, while Column 2 reports results when we drop data from the year 1998 (including the corresponding birth cohort for whom this is the baseline year (birth cohort 1999), see Section 2). Qualitatively, results are similar: The participation penalty for treated mothers increases by between 1-2 ppt when this event time occurs in the post-reform period. These effects are somewhat larger and more precisely estimated for event times closer to the birth (i.e. in the first 5 years) and meaningful: One year (five years) after a mother's first birth, this corresponds to an increase in the penalty of about 5% (4%) relative to the control group mean ($t+1$: -.38, $t+5$: -.44) over this time horizon. In other words, the child penalty for mothers in border municipalities *increases* following the reform.

7 Conclusion

In this paper, we document that the availability of jobs that are non-greedy in hours matters for maternal workforce participation. We show that mothers' participation falls in response to a shock to part-time labor demand that affects a pre-determined set of municipalities close to the border in Switzerland. In contrast, fathers and women in the same age group without children remain unaffected.

We provide several pieces of evidence that emphasize that mothers drop out (and stay out) as firms reduce their demand for part-time workers. We can rationalize the mechanism behind this result with a simple search and matching model, in which firms face a coordination cost for part-time labor. In a labor market that contains more full-time talent, firms will thus be less likely to offer part-time positions. This makes it especially hard for mothers to re-enter the labor force part-time after a baby break.

While our study implies that reduced hours jobs can be costly for firms to provide, a promising path for future research lies in documenting the magnitude of such costs. From a policy perspective, this would help to better assess the trade-offs associated with the provision of low(er) hours jobs.

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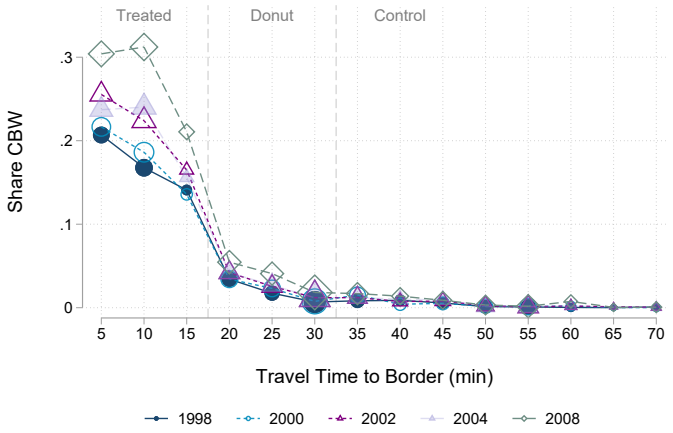
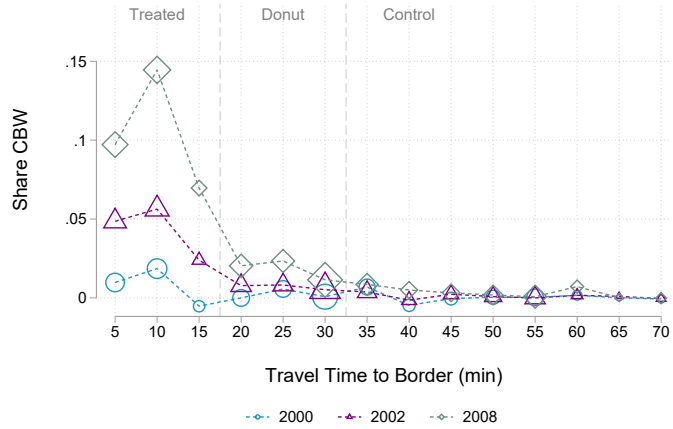
Tables and Figures

Figure 1: Municipal Share CBW by Travel Time to Border



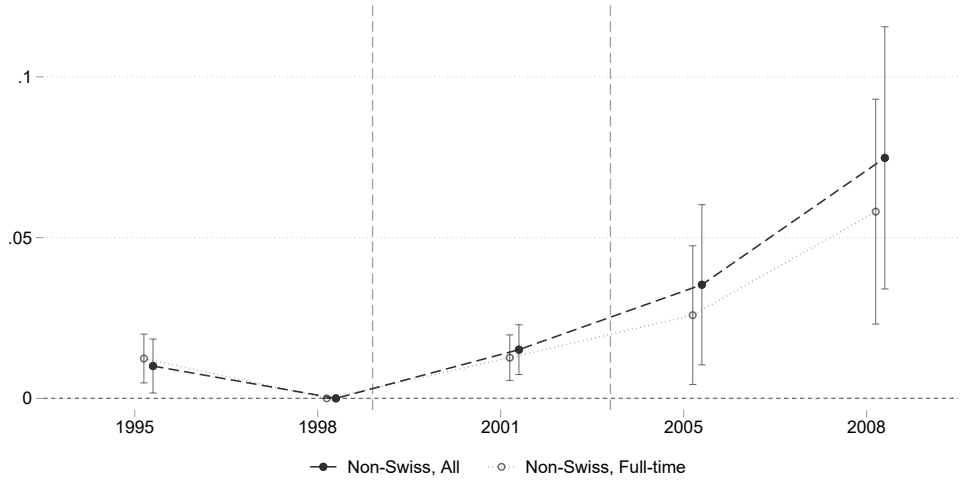
(a) Share CBW by Year



(b) Increase in CBW from 1998

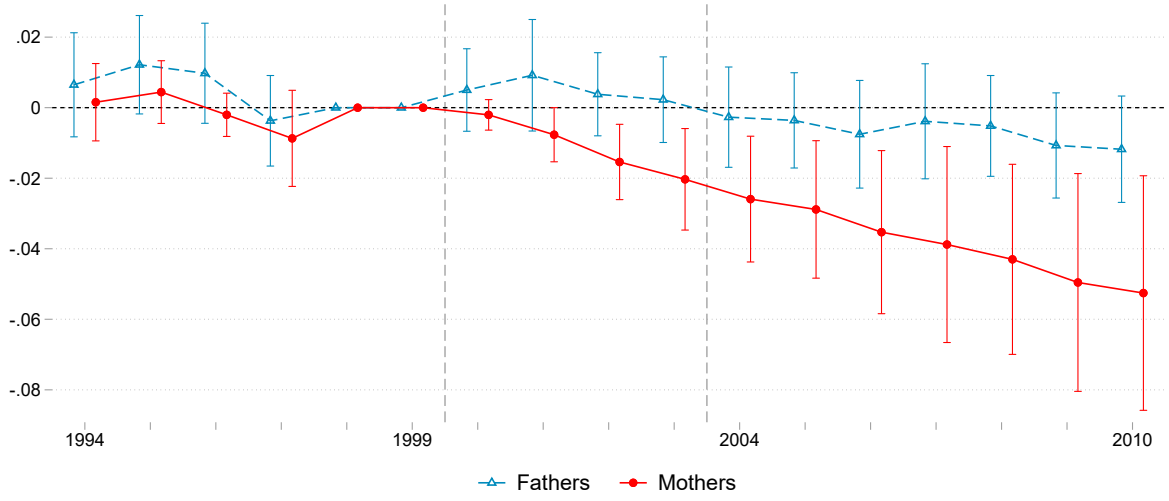
Notes: This figure shows the share of cross-border workers (CBW) and the increase in CBW by travel time to the nearest border crossing in minutes. Share CBW is calculated by dividing the total number of CBW in a municipality by total workers in that municipality in 1998. Panel a: Share CBW in levels. Panel b: Change in the share CBW relative to the share CBW in 1998. Each travel distance bin is weighted by total workers in a municipality in 1998. Based on SESS data.

Figure 2: Reform Impact on Share of Non-Swiss Workers in Local Labor Markets



Notes: Estimates of Equation 1. This figure shows the reform's impact on the municipal share of Non-Swiss workers, and Non-Swiss Full-time workers. The share of Non-Swiss workers is defined as the number of Non-Swiss workers in a municipality in each year relative to all workers in that municipality in 1998. Each municipality is weighted by its number of workers in 1998. Municipality and year fixed effects. Standard errors clustered at the CZ level. Based on Business Census data.

Figure 3: Reform Impact on Parental Participation in the Workforce



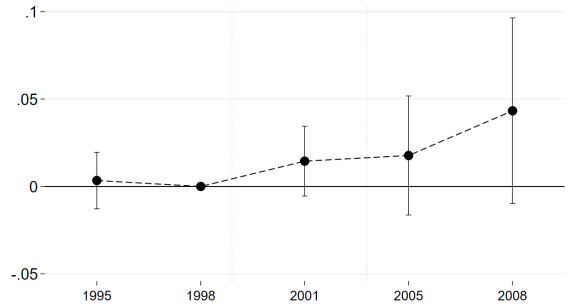
Notes: Estimates of Equation 2 for prime-age mothers and fathers (women and men with a child younger than 16) in 2000. The dependent variable is an indicator for participation in the workforce in a given year. All specifications include municipality and year fixed effects, and individual-level controls measured in the year 2000: age, age squared, indicators for education levels (compulsory, secondary, tertiary), bins for total number of children and bins for age of the youngest child. Standard errors clustered at the CZ level and 95% confidence intervals displayed. Based on social security data.

Table 1: Reform Impact on Participation in the Workforce: Difference-in-Differences

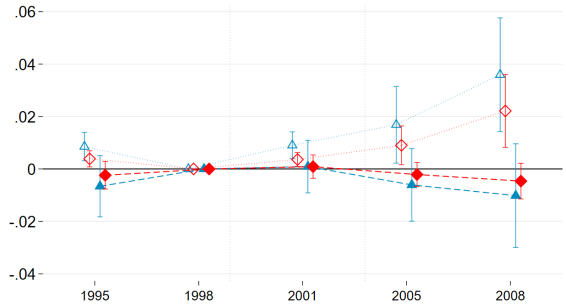
	Mothers					Fathers				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Free * Treat	–0.038***	–0.038***	–0.038***	–0.030***	–0.032***	–0.011***	–0.011***	–0.011***	–0.007**	–0.011***
	(0.012)	(0.012)	(0.012)	(0.008)	(0.011)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Transition *	–0.010*	–0.010*	–0.010*	–0.006	–0.011*	0.000	0.000	0.000	0.002	–0.001
Treat	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Controls		X		X	X		X		X	X
Individual FE			X					X		
Nuts-II Trend				X					X	
No city					X					X
Adj. R^2	0.036	0.069	0.502	0.037	0.069	0.016	0.027	0.425	0.016	0.023
Obs	8,018,192	8,018,192	8,018,192	8,018,192	7,584,528	7,224,800	7,224,800	7,224,800	7,224,800	6,860,112
Dep mean	0.583	0.583	0.583	0.583	0.579	0.965	0.965	0.965	0.965	0.967

Note: Estimates of Equation 2 for mothers and fathers. This table shows the reform impact by reform period on participation in the workforce. Columns 1 and 6: Municipality and year fixed effects only. Columns 2 and 7: Individual level controls measured at baseline. Columns 3 and 8: Individual level fixed effects. Columns 4 and 9: Nuts-II time trends. Columns 5 and 10: Excluding the three largest cities at baseline (Zurich, Geneva, Basel).
Transition is an indicator for the transition period (2000-2003), Free is an indicator for the fully liberalized period (2004-2010). Dep mean is the pre-reform period mean of the dependent variable. All specifications contain municipality and year fixed effects, and individual level controls measured at baseline. Standard errors clustered at the CZ level. * p<0.1, ** p<0.05, *** p<0.01. Based on social security data. (back)

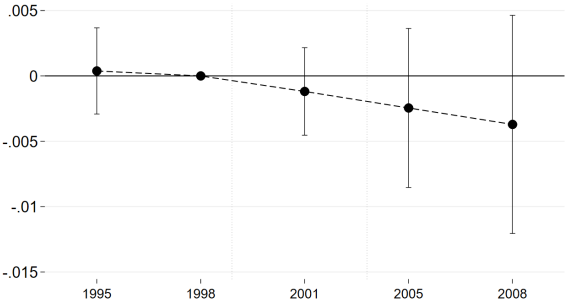
Figure 4: Reform Impact on Job Shares in Local Labor Markets



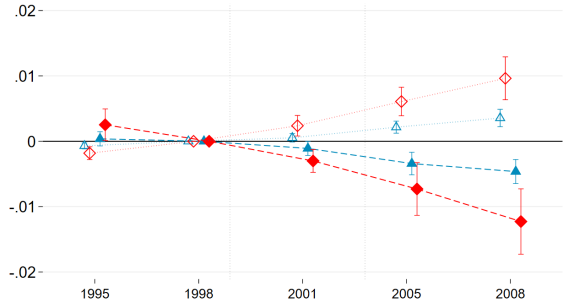
Panel 1a: Full-time ($\geq$ 90% of a FTE)



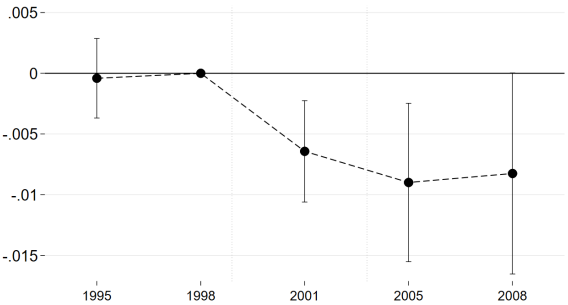
Panel 1b: Full-time by Gender



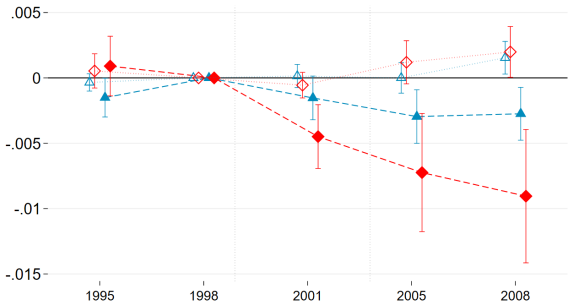
Panel 2a: Part-time I ($\geq$ 50% of a FTE)



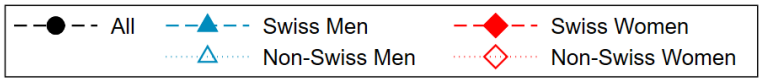
Panel 2b: Part-time I by Gender



Panel 3a: Part-time II ($<$ 50% of a FTE)



Panel 3b: Part-time II by Gender



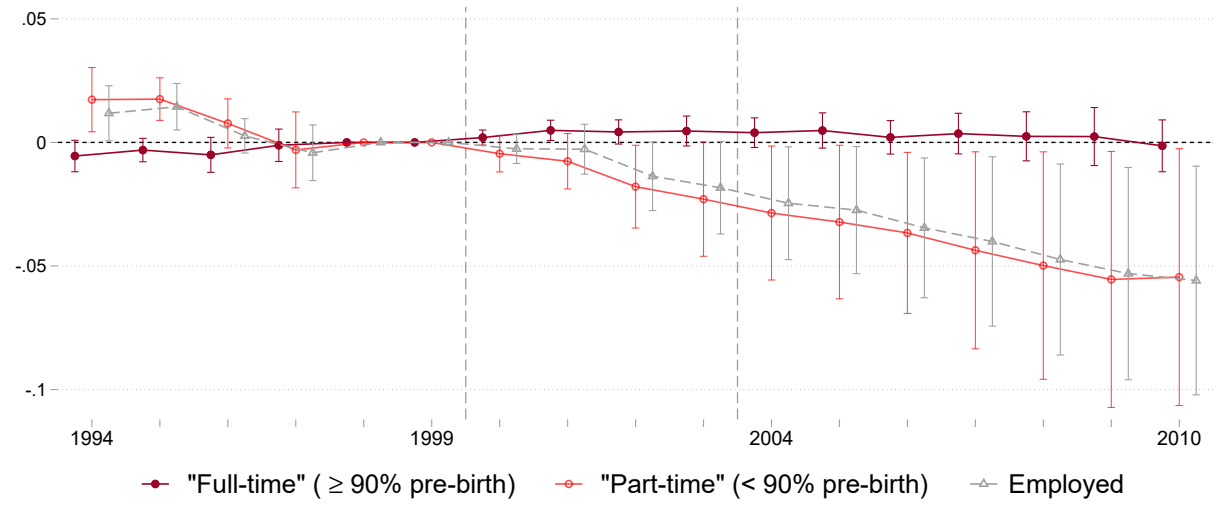
Notes: Estimates of Equation 1. Outcome is the number of workers in the relevant category in a municipality over total workers in 1998 in that municipality. Panel 1: Full-time workers who have an employment level of $\geq$ 90% of a full-time equivalent (FTE). Panel 2: Part-time workers who have an employment level of between 50% - 89% of a FTE. Panel 3: Part-time workers who have an employment level of less than 50% of a FTE. Municipal observations weighted by total number of workers in 1998. All specifications include municipality and year fixed effects. Standard errors clustered at the CZ level. Based on Business Census data.

Table 2: Reform Impact on Job Ads for Part-Time Hires

	Full Time			Part Time I (≥ 50%)			Part Time II (< 50%)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Transition * Treat	0.041*	0.039	0.008	–0.027	–0.028**	–0.007	–0.014	–0.010	–0.001
	(0.025)	(0.024)	(0.024)	(0.017)	(0.014)	(0.017)	(0.012)	(0.012)	(0.012)
Free * Treat	0.083***	0.082***	0.072**	–0.057**	–0.062***	–0.049**	–0.026***	–0.019*	–0.023*
	(0.029)	(0.028)	(0.028)	(0.022)	(0.020)	(0.023)	(0.010)	(0.011)	(0.012)
Treat	–0.027	–0.023	–0.024	0.011	0.013	0.009	0.015*	0.010	0.015*
	(0.019)	(0.020)	(0.019)	(0.014)	(0.012)	(0.014)	(0.009)	(0.010)	(0.008)
Private Sector		X			X			X	
Print Media			X			X			X
Adj. R^2	0.141	0.110	0.134	0.117	0.093	0.106	0.024	0.021	0.029
Obs	22,102	19,280	11,454	22,102	19,280	11,454	22,102	19,280	11,454
Dep mean	.903	.903	.903	.074	.074	.074	.023	.023	.023

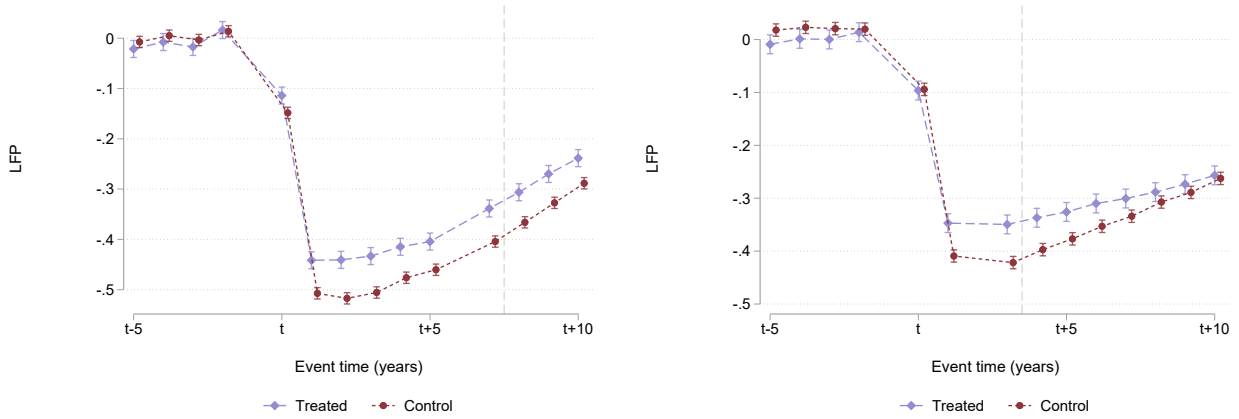
Notes: Estimates of Equation 1. Outcomes are indicators for whether a job is advertised as full-time, i.e., with an employment level of ≥ 90% of a FTE (Columns 1-3), high part-time with a workload ≥ 50% of a FTE (Part Time I: Columns 4-6) or low part-time with a workload lower than 50% of a FTE (Part Time II: Columns 7-9). Columns 1, 4, and 7 are based on the full sample of job ads, Columns 2, 5, and 8 restrict the sample to job ads from private sector firms only, Columns 3, 6, and 9 restrict the sample to job ads published in print media only. Dep mean is the pre-reform period mean of the dependent variable. All specifications include year and industry fixed effects. Standard errors clustered at the CZ level. Based on Job Ads data. * p<0.1, ** p<0.05, *** p<0.01.

Figure 5: Reform Impact on the Type of Mothers' Labor Supply Post-Birth



Notes: Estimates of Equation 1 for mothers in post-birth years by type of labor supply. Mothers are classified as full-time vs part-time based on the share of post-birth relative to pre-birth earnings (see Section 5.3). All specifications include municipal and year fixed effects. Standard errors clustered at the CZ level and 95% confidence intervals displayed. Based on social security data.

Figure 6: Child Penalty in Participation



(a) Birth Cohort 1992

(b) Birth Cohort 1996

Notes: Child penalty in participation for mothers with a first birth in 1992 and 1996, living in treated municipalities (Treated) or control municipalities (Control) at baseline. Vertical gray lines indicate start of the post-reform period. Observations in the doughnut region are excluded. Based on Social Security data.

For Online Publication: Appendix Tables and Figures

A Descriptives

Table A1: Summary Statistics: Prime-Age Adults

	Non-Fathers	Fathers			Non-Mothers	Mothers		
			Border	Central			Border	Central
Demographics								
Census								
Age	36.26	40.23	40.38	40.18	36.83	38.09	38.34	37.98
	(8.21)	(6.21)	(6.23)	(6.19)	(8.61)	(5.92)	(5.96)	(5.89)
Age at First Birth	.	30.19	30.34	30.11	.	27.74	27.99	27.59
	(.)	(4.72)	(4.83)	(4.65)	(.)	(4.44)	(4.56)	(4.36)
Number of Children	0.00	2.12	2.07	2.15	0.00	2.11	2.06	2.16
	(0.00)	(0.85)	(0.84)	(0.86)	(0.00)	(0.85)	(0.83)	(0.85)
Age Youngest Child	.	6.58	6.55	6.59	.	6.87	6.89	6.85
	(.)	(4.67)	(4.63)	(4.68)	(.)	(4.67)	(4.63)	(4.68)
Obligatory Schooling	0.10	0.07	0.07	0.07	0.11	0.13	0.12	0.14
	(0.29)	(0.26)	(0.25)	(0.26)	(0.32)	(0.34)	(0.33)	(0.34)
Secondary Degree	0.53	0.52	0.51	0.53	0.57	0.64	0.61	0.65
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.48)	(0.49)	(0.48)
Tertiary Degree	0.32	0.40	0.41	0.39	0.27	0.21	0.25	0.19
	(0.47)	(0.49)	(0.49)	(0.49)	(0.44)	(0.41)	(0.43)	(0.39)
Labor Market								
Social Security Data								
In Workforce 1999	0.91	0.96	0.95	0.97	0.88	0.60	0.61	0.59
	(0.29)	(0.18)	(0.23)	(0.17)	(0.33)	(0.49)	(0.49)	(0.49)
Any Unemployment Benefits 1999	0.05	0.03	0.04	0.03	0.05	0.03	0.04	0.02
	(0.22)	(0.17)	(0.19)	(0.16)	(0.22)	(0.18)	(0.20)	(0.15)
Median Earnings (CHF) | Employed 1999	63,141	79,001	81,218	77,000	53,870	24,763	29,294	22,820
	(35,868)	(41,915)	(43,726)	(41,239)	(27,932)	(24,118)	(27,472)	(22,404)
Census								
Works Part-Time	0.09	0.06	0.06	0.06	0.30	0.81	0.77	0.82
	(0.29)	(0.23)	(0.23)	(0.23)	(0.46)	(0.39)	(0.42)	(0.38)
Weekly Hours	43.58	46.17	45.10	46.75	38.37	22.69	24.19	22.10
	(9.81)	(10.40)	(9.56)	(10.98)	(10.94)	(16.05)	(15.08)	(16.73)
Commute time in minutes	22.16	20.21	20.18	19.82	23.64	16.07	16.67	15.43
	(18.53)	(18.20)	(17.35)	(18.42)	(17.87)	(15.15)	(14.51)	(15.26)
Commutes to other area group	0.04	0.04	0.02	0.01	0.04	0.03	0.01	0.00
	(0.20)	(0.20)	(0.15)	(0.09)	(0.20)	(0.17)	(0.10)	(0.06)
Industry								
Hightech Manufacturing	0.09	0.09	0.10	0.09	0.05	0.03	0.04	0.03
	(0.29)	(0.29)	(0.30)	(0.28)	(0.21)	(0.17)	(0.19)	(0.16)
Lowtech Manufacturing	0.09	0.10	0.08	0.11	0.05	0.04	0.04	0.05
	(0.29)	(0.30)	(0.27)	(0.31)	(0.22)	(0.21)	(0.19)	(0.21)
Knowledge Intensive Services	0.31	0.31	0.35	0.28	0.47	0.42	0.46	0.40
	(0.46)	(0.46)	(0.48)	(0.45)	(0.50)	(0.49)	(0.50)	(0.49)
Non-knowledge Intensive Services	0.26	0.27	0.26	0.27	0.30	0.28	0.27	0.28
	(0.44)	(0.44)	(0.44)	(0.44)	(0.46)	(0.45)	(0.44)	(0.45)
Construction	0.09	0.10	0.08	0.11	0.02	0.02	0.02	0.03
	(0.28)	(0.30)	(0.28)	(0.31)	(0.13)	(0.15)	(0.15)	(0.16)
Primary Sector	0.04	0.06	0.05	0.08	0.01	0.04	0.03	0.05
	(0.20)	(0.25)	(0.21)	(0.27)	(0.11)	(0.20)	(0.17)	(0.22)
Missing Industry	0.12	0.07	0.07	0.07	0.11	0.16	0.14	0.17
	(0.32)	(0.25)	(0.26)	(0.25)	(0.31)	(0.37)	(0.35)	(0.38)
Observations	461,730	451,550	94,155	229,810	383,134	501,137	107,764	250,262

Notes: This table shows summary statistics of prime-age non-parents and parents of children younger than age 16 in 2000. Variables based on the Census are for the year 2000, variables based on the Social Security data are for the year 1999.

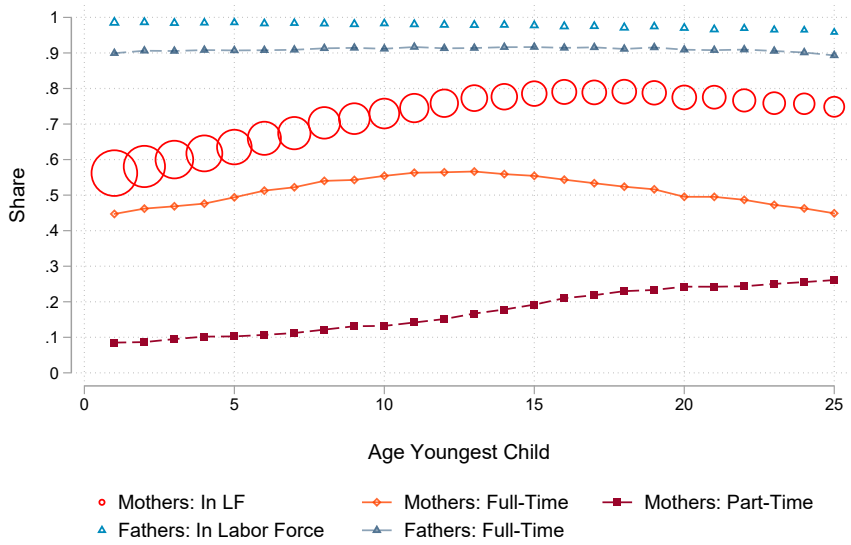
Table A2: Summary Statistics: Establishments

	Border	Central
Non-Swiss		
Non-Swiss, 1995	0.37	0.18
Cross-Border Workers, 1995	0.14	0.00
Non-Swiss, 1998	0.34	0.17
By Employment Level, 1998		
Full-time ($\geq$ 90% FTE)	0.76	0.73
Part-time I ($\geq$ 50% FTE)	0.14	0.14
Part-time II ($<$ 50% FTE)	0.10	0.13
By Origin, Gender and Employment Level, 1998		
Swiss Men	0.37	0.48
Full-time	0.33	0.43
Part-time I	0.02	0.03
Part-time II	0.02	0.03
Swiss Women	0.28	0.35
Full-time	0.15	0.17
Part-time I	0.08	0.10
Part-time II	0.05	0.09
Non-Swiss Men	0.21	0.10
Full-time	0.20	0.09
Part-time I	0.01	0.00
Part-time II	0.01	0.00
Non-Swiss Women	0.13	0.06
Full-time	0.08	0.04
Part-time I	0.03	0.01
Part-time II	0.02	0.01
Number of Establishments	90,619	170,201
Number of Workers	855,154	1,434,155

Notes: This table shows summary statistics of workers in establishments for the year 1998. Based on Business Census data.

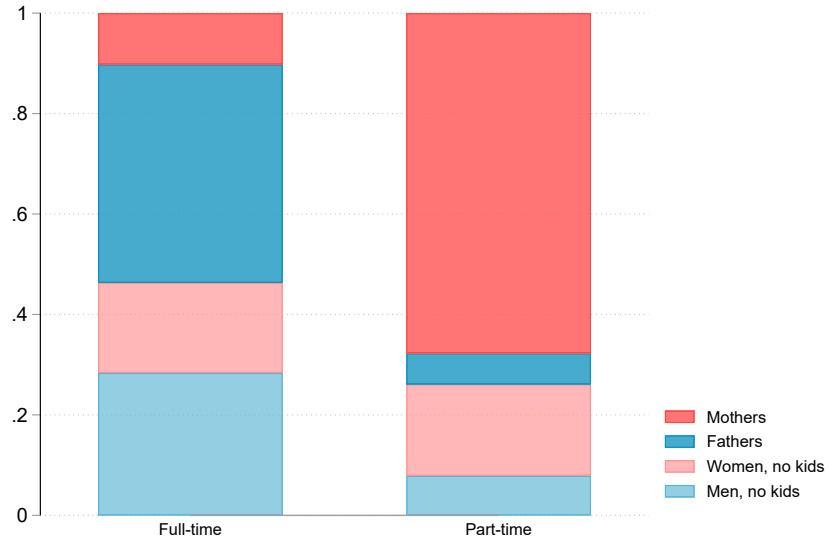
B Setting

Figure A1: Parental Labor Force Participation by Age of Youngest Child



Notes: This figure shows the type of labor force participation of prime-age Swiss mothers and fathers by age of the youngest child. Based on data from the Census 2000.

Figure A2: Composition of Prime Age Full- and Part-time workers

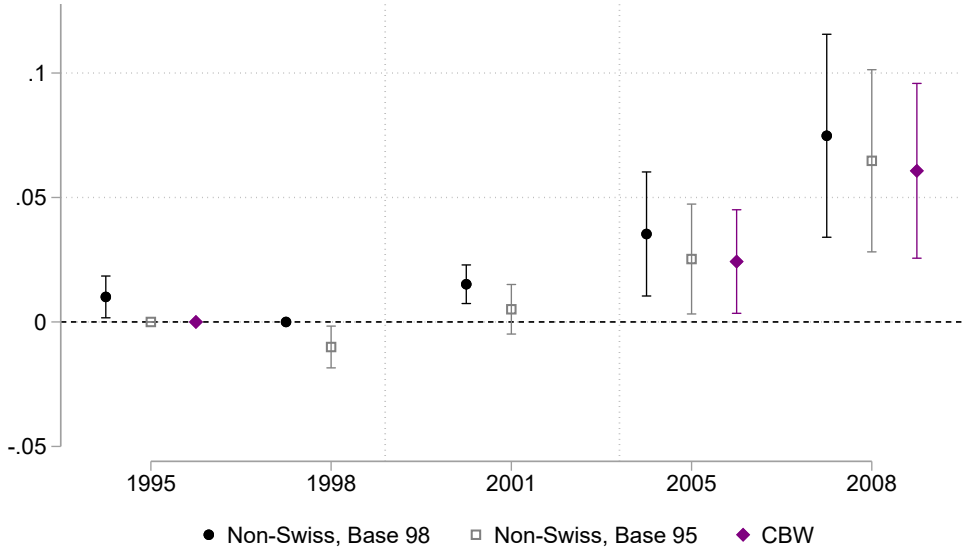


Notes: This figure shows the composition of Swiss prime age full- and part-time workers. Based on data from the Census 2000.

C Further Results

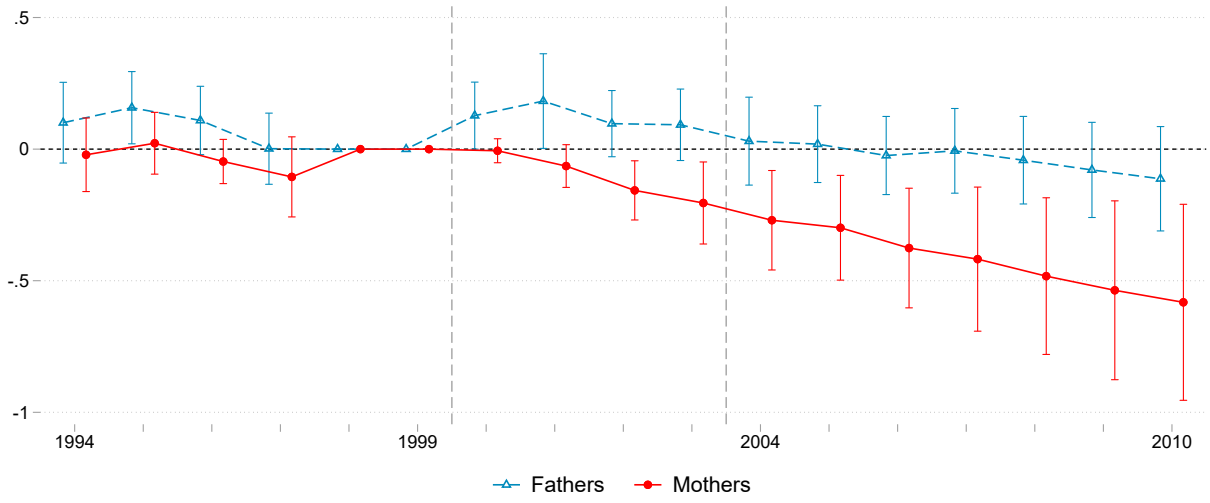
C.1 Additional results: First stage and main results

Figure A3: Reform Impact on Non-Swiss Workers and CBW



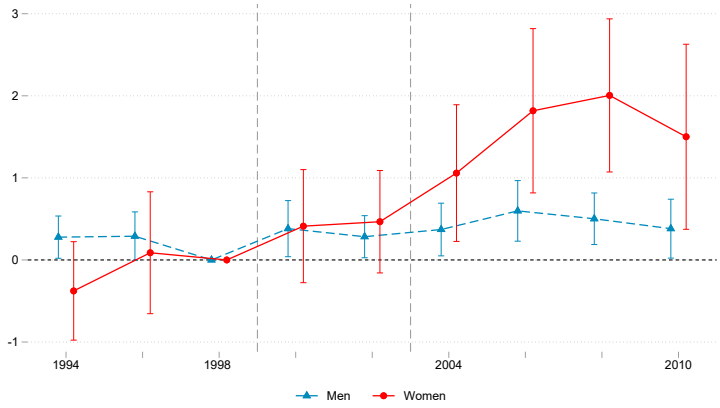
Notes: Estimates of Equation 1. The dependent variable is the municipal share of Non-Swiss or CBW workers, measured as the total number of Non-Swiss or CBW workers over total workers at baseline by municipality. Estimates reported with respect to 1998 as baseline (Non-Swiss, Base 98; same as Appendix Figure **??**) and 1995 (Non-Swiss, Base 95 and CBW), due to CBW totals only available in 1995, 2005 and 2008. All regressions include municipality and year fixed effects. Standard errors are clustered at the CZ level. Based on Business Census data.

Figure A4: Reform Impact on Earnings

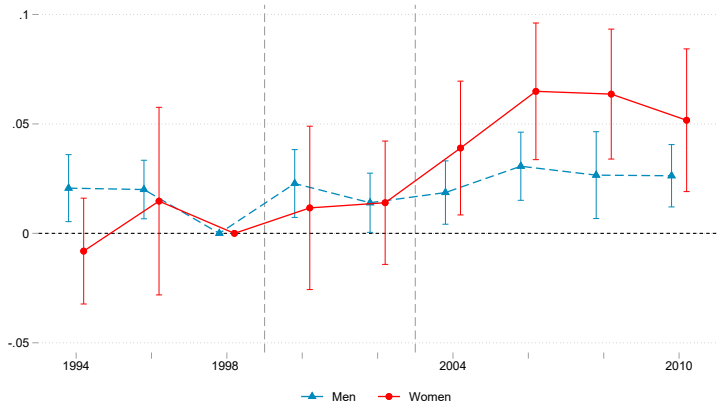


Notes: Estimates of Equation 1. This figure shows the effect of the reform on yearly wage earnings of mothers and fathers, unconditional on employment. The dependent variable is the inverse hyperbolic sine of yearly wage earnings across all employment spells. All regressions include municipality and year fixed effects and individual level controls at baseline. Standard errors clustered at the CZ level. Based on social security data.

Figure A5: Reform Impact on Composition of Employed Women and Men



(a) Weekly Hours



(b) P(Full-time)

Notes: Estimates of Equation 1. The sample includes Swiss workers who are between 25 and 54 years old in 2000 on regular contracts (i.e., contracts not on an hourly basis). Panel a: Weekly Hours. Panel b: Indicator for working full-time (employment level $\geq$ 90% of an FTE). All regressions include municipality and year fixed effects and control for age, age squared and level of education (low, mid, high). Standard errors are clustered at the CZ level. Based on SESS data.

Figure A6: Reform Impact on Participation in the Workforce for Men and Women without Children

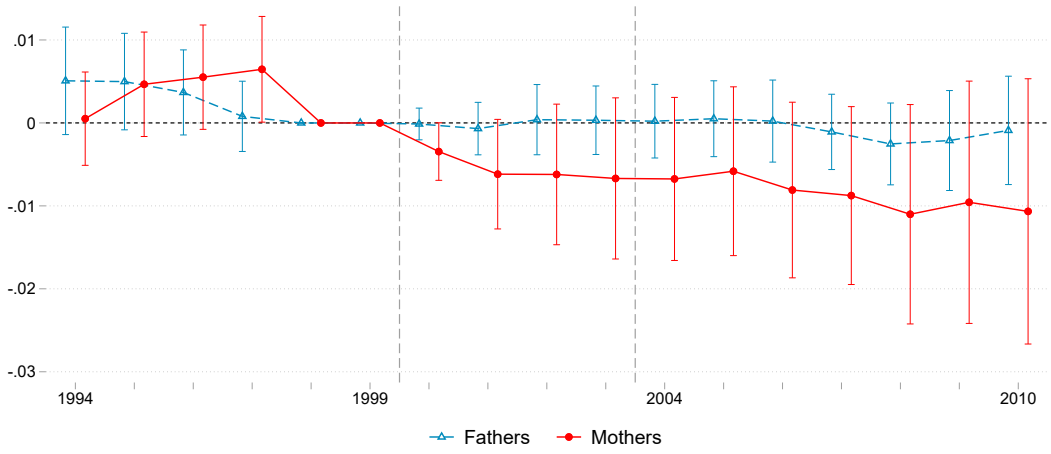
Notes: Estimates of Equation 1. This figure shows the effect of the reform on labor market participation of men and women who are aged between 25 and 54 in 2000 and do not have a child at baseline. The dependent variable is an indicator for being in the workforce, defined as having yearly earnings from wage or self-employment above 3,900 CHF in real terms. All regressions include municipality and year fixed effects and individual level controls measured at baseline (age, age squared and indicators for education levels). Standard errors clustered at the CZ level. Based on social security data.

Table A3: Robustness: Reform Impact on Participation in the Workforce, Industry and Occupation Fixed Effects

		Industry		Occupation		Learned Occupation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female * Free * Treat	–0.038***	–0.038***	–0.038***	–0.038***	–0.031***	–0.038***	–0.033***
	(0.012)	(0.012)	(0.001)	(0.012)	(0.001)	(0.012)	(0.001)
Female * Transition * Treat	–0.010*	–0.010*	–0.016***	–0.010*	–0.013***	–0.010*	–0.006***
	(0.005)	(0.005)	(0.001)	(0.005)	(0.001)	(0.005)	(0.001)
Male * Free * Treat	–0.011***	–0.011***	–0.008***	–0.011***	–0.008***	–0.011***	–0.009***
	(0.003)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Male * Transition * Treat	0.000	0.000	0.003***	0.000	0.003***	0.000	0.002*
	(0.003)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)
Without Missing Ind/Occ			X		X		X
Adj. R^2	0.192	0.298	0.122	0.260	0.109	0.197	0.189
Obs	15,242,992	15,242,992	10,919,216	15,242,992	9,676,944	15,242,992	12,509,120
Dep mean: Female	0.583	0.583	0.745	0.583	0.756	0.583	0.609

Note: Estimates of Equation 2 for mothers and fathers. This table shows the reform impact by reform period on workforce participation controlling for industry or occupation fixed effects measured at baseline. The outcome is an indicator for yearly earnings above 3,900 CHF in real terms from either wage or self-employment. Column 1: Main result (see Table 1). Columns 2 and 3: Industry fixed effects, including (Column 2) or excluding (Column 3) individuals with missing industry information. Columns 4 and 5: Occupation fixed effects, including (Column 4) or excluding (Column 5) individuals with missing occupation information. Columns 6 and 7: Learned occupation fixed effects, including (Column 6) or excluding (Column 7) individuals with missing learned occupation information.
Transition is an indicator for the transition period (2000-2003), Free is an indicator for the fully liberalized period (2004-2010). Dep mean shows workforce participation of mothers in the pre-reform period. All specifications contain municipality and year fixed effects and individual level controls. Standard errors clustered at the CZ level. * p<0.1, ** p<0.05, *** p<0.01. Based on social security data. (back)

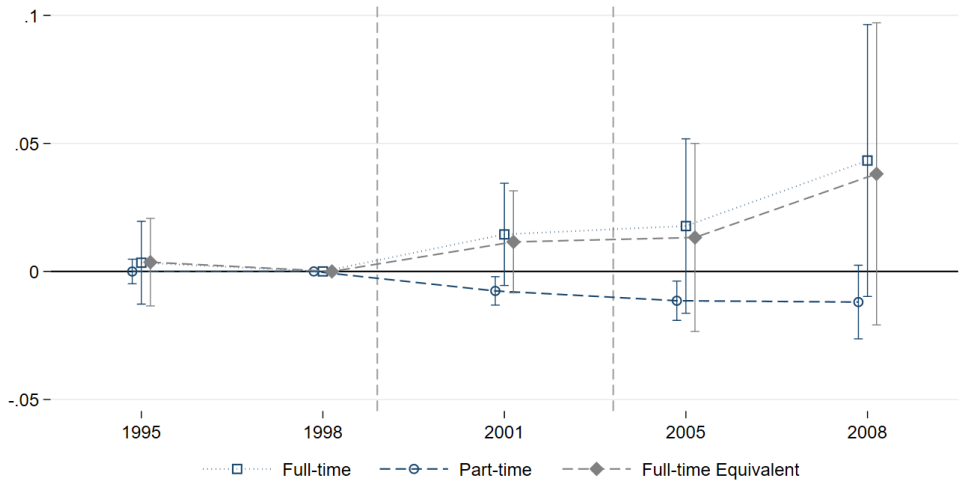
Figure A7: Reform Impact on Receiving Unemployment Benefits for Parents



Notes: Estimates of Equation 1. This figure shows the effect of the reform on receipt of unemployment benefits of mothers and fathers in our main sample. The dependent variable is an indicator for receiving any unemployment benefits in a given year. All regressions include municipality and year fixed effects and individual level controls measured at baseline (age, age squared and indicators for education levels). Standard errors clustered at the CZ level. Based on social security data.

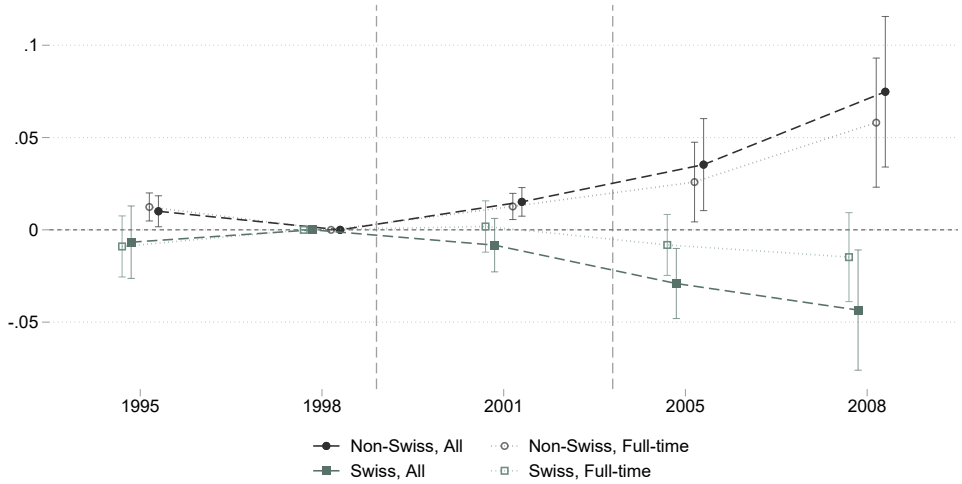
C.2 Mechanism

Figure A8: Reform Impact on Job Shares



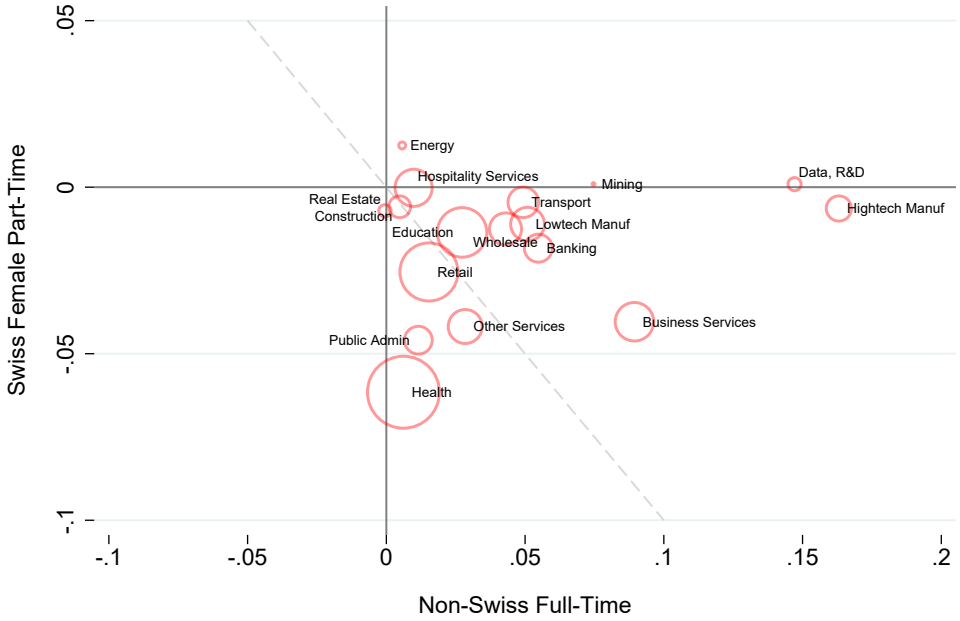
Notes: Estimates of Equation 1. Outcome is the number of workers in the relevant category in a municipality over total workers in 1998 in that municipality. Municipal observations weighted by total number of workers in 1998. All regressions include municipality and year fixed effects. Standard errors are clustered on the CZ level. Based on Business Census data.

Figure A9: Reform Impact on Workforce Composition



Notes: Estimates of Equation 1. Outcome is the number of workers in the relevant category in a municipality over total workers in 1998 in that municipality. Municipal observations are weighted by total number of workers in 1998. All specifications include municipality and year fixed effects. Standard errors clustered at the CZ level. This figure is based on Business Census data.

Figure A10: Reform Impact on Workforce Composition by Industry

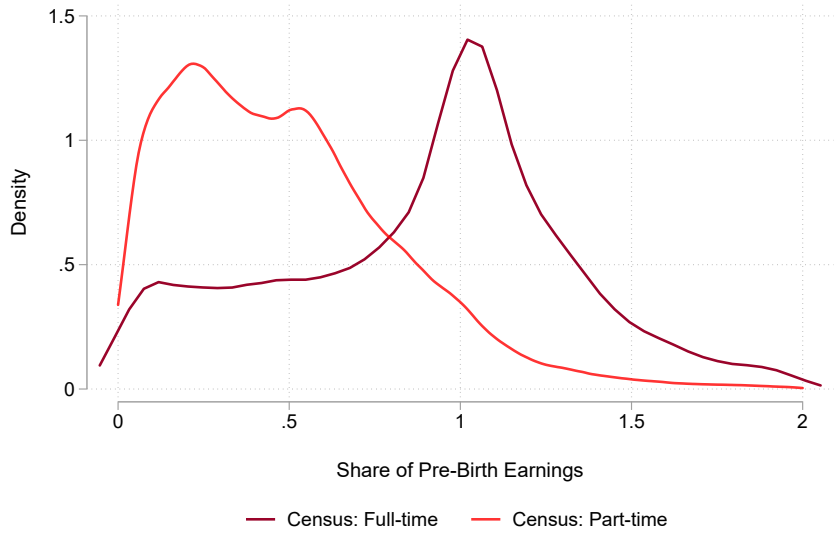


Notes: This figure shows the reform impact on Non-Swiss full-time workers and Swiss female part-time workers by industry in 2008 within establishment. Coefficients for 2008 reported from estimates of Equation 1. Outcome is the number of workers in the relevant category in an establishment over total workers in 1998 in that establishment. Establishments are weighted by total number of workers in 1998. Dashed line indicated 45 degree line. All specifications include municipality and year fixed effects. Standard errors clustered at the CZ level. This figure is based on Business Census data.

Figure A11: Reform Impact on Part-Time Job Vacancies

Notes: Estimates of Equation 1. Outcome is an indicator for whether a job ad is for a part-time position. The specification includes year and industry fixed effects. Standard errors clustered at the CZ level. Based on Job Ad data.

Figure A12: Part-and Full-time Classification based on Post-Birth Earnings and Census 2000



Notes: Density of the Post-Birth Earnings as a Share of Pre-Birth Earnings in 2000 by whether a mother reports working part-time or full-time hours in the Census. Based on OASI and Census 2000 data.

Table A4: Reform Impact by Type of Maternal Labor Supply

	Part-time (Earnings based)						Full-time (Earnings based)				
	Main	Controls	$< 100\%$	$< 110\%$	No trim pre-birth	No trim share	Main	Controls	$\geq 100\%$	$\geq 110\%$	No trim pre-birth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Free * Treat	–0.050**	–0.050**	–0.055**	–0.063**	–0.037**	–0.052**	0.005	0.006	0.011	0.019	0.003
	(0.023)	(0.024)	(0.026)	(0.031)	(0.018)	(0.024)	(0.006)	(0.006)	(0.008)	(0.012)	(0.005)
Transition *	–0.020*	–0.021*	–0.020*	–0.025*	–0.020**	–0.021*	0.007*	0.007*	0.007	0.011	0.007*
Treat	(0.011)	(0.011)	(0.012)	(0.014)	(0.010)	(0.011)	(0.004)	(0.004)	(0.005)	(0.007)	(0.004)
Adj. R^2	0.024	0.025	0.028	0.032	0.027	0.022	0.082	0.091	0.076	0.070	0.091
Obs	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672	3,834,672
Dep mean	0.301	0.301	0.328	0.353	0.471	0.326	0.087	0.087	0.061	0.035	0.115

Notes: Estimates of Equation 2 for mothers in post-birth years by type of labor supply. Mothers are classified as full-time vs part-time based on the share of post-birth relative to pre-birth earnings. Column 1: Main specification, with full-time defined as recovering $\geq 90\%$ of pre-birth earnings. Column 2: Additional individual level controls for X. Column 3: Full-time defined as recovering $\geq 100\%$ of pre-birth earnings. Column 4: Full-time defined as recovering $\geq 110\%$ of pre-birth earnings. Column 5: Based on using untrimmed pre-birth earnings to construct post-birth earnings shares. Column 6: Based on untrimmed post-birth earnings share.

Table A5: Workforce Participation by Attachment at Baseline

	Not in Workforce (1)	In Workforce (2)	In Wage Employment (3)	Not in Wage Employment (4)
Free * Treat	–0.041***	–0.026***	–0.045***	–0.025***
	(0.013)	(0.008)	(0.013)	(0.008)
Transition * Treat	–0.009	–0.011*	–0.010	–0.010*
	(0.007)	(0.006)	(0.006)	(0.006)
Adj. R^2	0.145	0.049	0.121	0.049
Obs	3,191,344	4,826,848	3,585,280	4,432,912
Dep mean	0.210	0.830	0.280	0.829
P-value		.031		.004

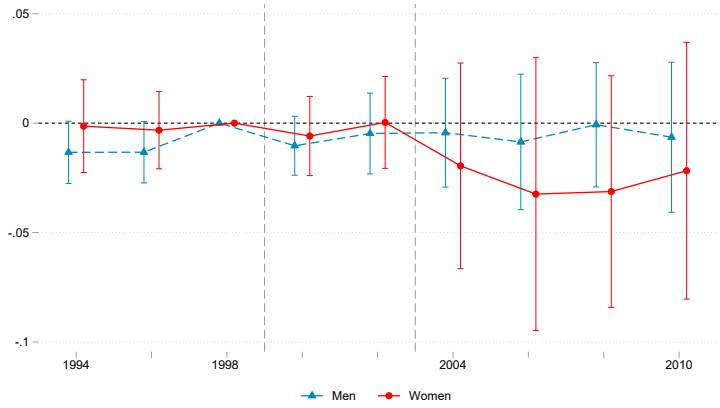
Note: Estimates of Equation 2 for mothers in our main sample. Outcome is an indicator for being in the workforce. P-value for test of equality of coefficients between columns 1 &2, and 3&4 respectively. Dep mean is the pre-reform period mean of the dependent variable. All regressions include municipality and year fixed effects. Standard errors clustered at the CZ level. * p<0.1, ** p<0.05, *** p<0.01. Based on social security data. (back)

Table A6: Wage Gaps between CBW and Swiss Workers

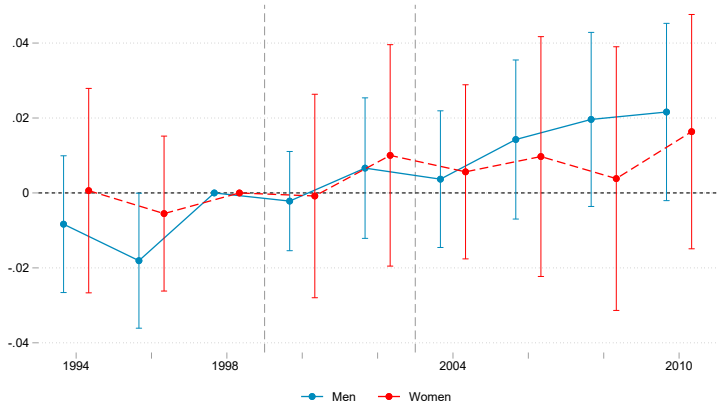
	All Natives				Female Natives				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cross Border	–0.056	–0.048**	–0.027***	–0.014***	0.045	0.031	0.041***	0.038***	–0.005
Worker	(0.039)	(0.020)	(0.006)	(0.005)	(0.050)	(0.030)	(0.009)	(0.004)	(0.004)
Individ. Controls		X	X	X		X	X	X	X
Female		X	X	X					X
Occ + Ind FE			X	X			X	X	X
Establishment FE				X				X	X
Adj. R^2	0.095	0.487	0.596	0.758	0.118	0.433	0.565	0.748	0.753
Obs	1,117,965	1,091,572	1,091,572	1,084,748	698,861	682,434	682,434	673,747	673,747
Dep mean	3.553	3.553	3.553	3.553	3.489	3.489	3.489	3.489	3.489

Note: Wage gap estimates for CBW relative to Swiss workers in the post-period (2004-2010) in the border region. Outcome is the log of real hourly wages trimmed at the 1st and 99th percentile. Columns 1–4: CBW compared to all Swiss natives. Columns 5 –9: CBW compared to Swiss female workers only. Columns 1 & 5: Raw wage gap. Columns 2 & 6: Individual level controls: age (fixed effects), married, education (low, mid, high), tenure (fixed effects), management position (low, mid, high) + gender in Column 2. Columns 3 & 7: Individual controls + industry and occupation fixed effects + gender in Column 3. Columns 4 & 8: Individual controls + industry and occupation + establishment fixed effects + gender in Column 4. Column 9: Same as column 8 + gender. All specifications include year and municipality fixed effects. Robust standard errors. Data from SESS.

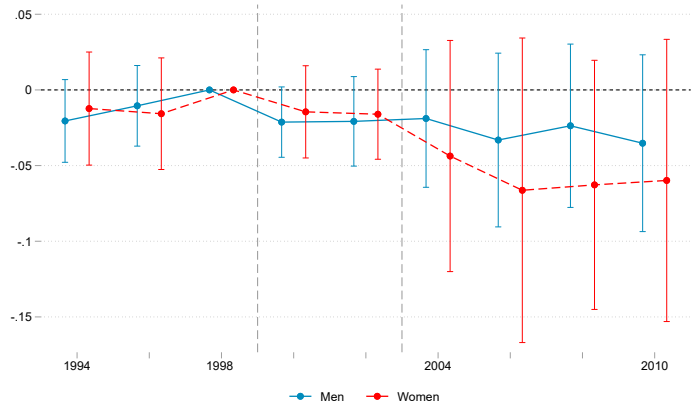
Figure A13: Reform Impact on Hourly Wages of Employed Women and Men



(a) Log Hourly Wage



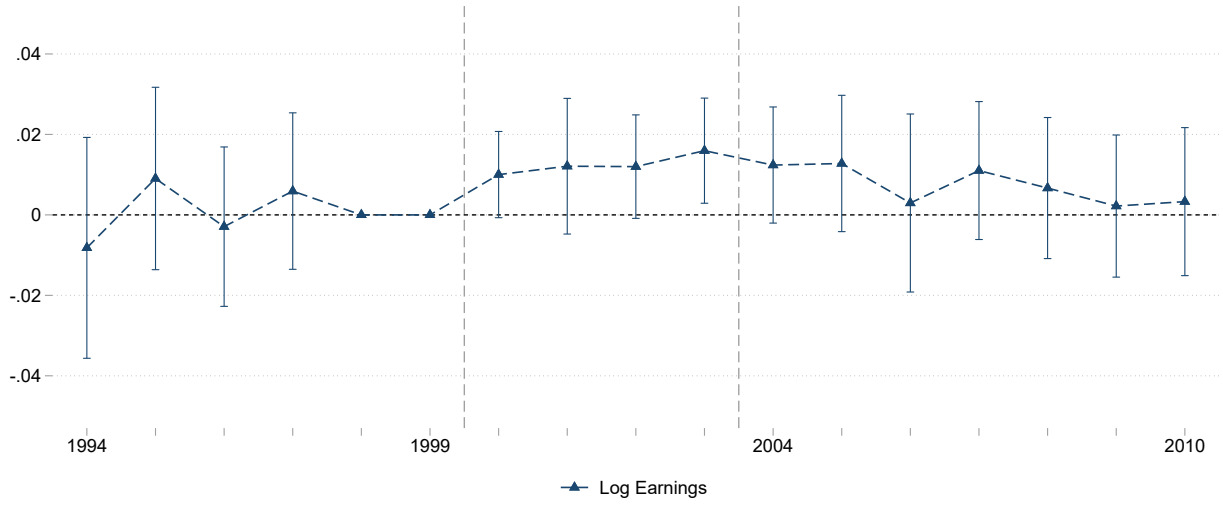
(b) Log Hourly Wage | Individual Contract



(c) Log Hourly Wage | Collective Contract

Notes: Estimates of Equation 1. The sample includes Swiss workers who are between 25 and 54 years old in 2000 on regular contracts (i.e., contracts not on an hourly basis). The outcome is the log of hourly wages, trimmed at the 1st and 99th percentile by year. Panel a: Log hourly wage for full sample. Panel b: Log hourly wage for workers with a contract that was negotiated on an individual basis. Panel c: Log hourly wage for workers with a contract that was negotiated in a collective agreement. All regressions include municipality and year fixed effects and control for age, age squared and level of education (low, mid, high). Standard errors are clustered at the CZ level. Based on SESS data.

Figure A14: Reform Impact on Male Spouses



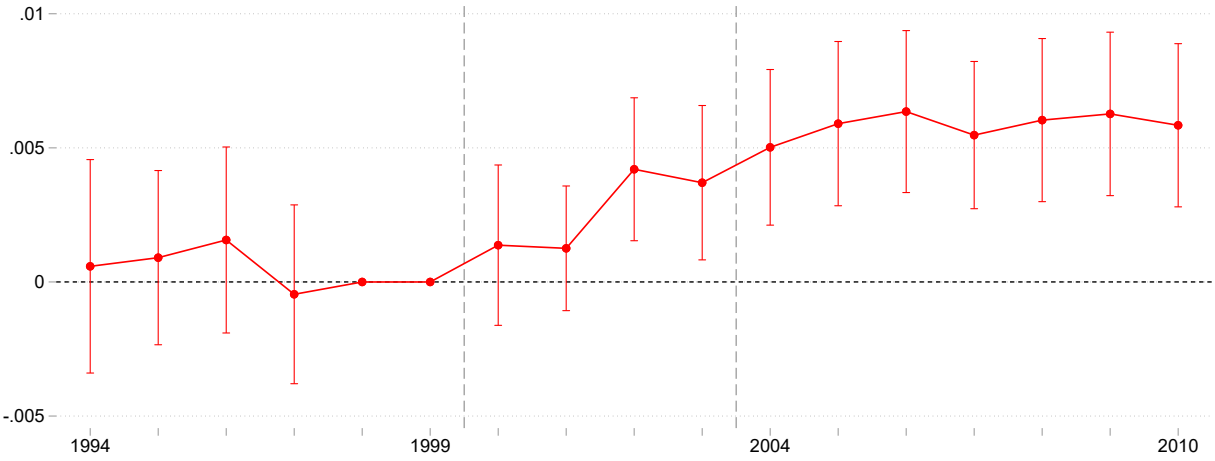
Notes: Estimates of Equation 1. Outcome is the log of earnings of the male partners in a given year for our main sample of mothers. The specification includes municipality and year fixed effects, and individual level controls. Standard errors are clustered at the CZ level. Based on social security data.

Table A7: Semi-Elasticity: Mother's Labor Supply and Partner's Earnings

	(1)	(2)	(3)	(4)
Log Partner's	–0.020***	–0.016***	–0.014***	–0.027***
Earnings	(0.003)	(0.002)	(0.003)	(0.002)
Individual FE		X	X	X
Adj. R^2	0.132	0.626	0.622	0.496
Obs	1,664,573	1,656,152	863,711	2,746,367
Dep mean	0.557	0.557	0.550	0.640

Note: This table shows the semi-elasticity of mother's labor supply with respect to partner's earnings. It regresses an indicator for mother's workforce participation on the log of partner's earnings for different samples. Column 1: Full sample, pre-reform period only. Column 2: Full sample, pre-reform period only with individual fixed effects. Column 3: Control region only, pre-treatment period with individual fixed effects. Column 4: Control region only, all time periods (1994-2010) with individual fixed effects. Dep mean is the pre-reform period mean of the dependent variable. All regressions include municipality and year fixed effects. Standard errors clustered at the CZ level. * p<0.1, ** p<0.05, *** p<0.01. Based on social security data. (back)

Figure A15: Reform Impact on Likelihood of Giving Birth



Notes: Estimates of Equation 1. Outcome is an indicator for giving birth in a given year for mothers in our main sample. The specification includes municipality and year fixed effects, and individual level controls. Standard errors are clustered on the CZ level. Based on social security data.

Table A8: Birth

	P(Birth)			In Workforce	
Age:	All	< Median	≥ Median	< Median	≥ Median
	(1)	(2)	(3)	(4)	(5)
Free * Treat	0.005***	0.010***	–0.002	–0.023***	–0.056***
	(0.002)	(0.003)	(0.002)	(0.007)	(0.021)
Transition *	0.002	0.005	–0.001	0.007	–0.031**
Treat	(0.001)	(0.003)	(0.001)	(0.009)	(0.013)
Adj. R^2	0.092	0.086	0.085	0.067	0.094
Obs	7,933,936	3,757,808	4,176,128	3,790,176	4,228,016
Dep mean	0.104	0.167	0.047	0.634	0.538

Note: Estimates of Equation 2 for mothers in our main sample. Outcome is an indicator for giving birth (columns 1–3) and an indicator for being in the workforce (columns 4–5). Dep mean is the pre-reform period mean of the dependent variable. All regressions include municipality and year fixed effects. Standard errors clustered at the CZ level. * p<0.1, ** p<0.05, *** p<0.01. Based on social security data. (back)

D Child Penalty Estimates

Table A9: Reform Impact on the Child Penalty

	Full Sample (1)	Omit 1998 (2)
Post * Border * T = 0	–0.012	–0.010
	(0.008)	(0.008)
Post * Border * T = 1	–0.022**	–0.017
	(0.010)	(0.010)
Post * Border * T = 2	–0.019**	–0.018**
	(0.008)	(0.008)
Post * Border * T = 3	–0.022***	–0.019**
	(0.008)	(0.008)
Post * Border * T = 4	–0.018***	–0.014**
	(0.007)	(0.006)
Post * Border * T = 5	–0.019***	–0.015**
	(0.007)	(0.006)
Post * Border * T = 6	–0.016**	–0.011*
	(0.006)	(0.006)
Post * Border * T = 7	–0.016**	–0.013*
	(0.008)	(0.007)
Post * Border * T = 8	–0.007	0.004
	(0.007)	(0.007)
Post * Border * T = 9	–0.018**	–0.002
	(0.008)	(0.007)
Post * Border * T = 10	–0.014	–0.012
	(0.010)	(0.010)
R^2	0.129	0.133
Obs.	2,803,472	2,433,540

Note: This table shows estimates of Equation 3. It displays the post-reform change in the child penalty in labor force participation for treated mothers. Column 1: Full sample. Column 2: Excludes social security data from the year 1998 and the 1999 birth cohort, as 1998 constitutes the baseline year for this cohort (see Section 2). Observations in the doughnut region excluded. Based on social security data. * p<0.1, ** p<0.05, *** p<0.01. (back)

E Model: Derivations

The following provides the computations for the model outlined in Section 4.

E.1 Value functions

The value of employment for a worker of type s is given by:

$$N(s,y) = \frac{w(s,y) + \delta U(s)}{r+\delta}$$

The value of a filled vacancy of type y with a worker of type s is given by:

$$J(s,y) = \frac{x(s,y) - w(s,y) - z + \delta V(y)}{r+\delta}$$

The value of unemployment for a part-time worker is given by:

$$rU(pt) = b + m(\theta)\phi(N(pt,pt) - U(pt))$$

where b denotes the unemployment benefit. For a full-time worker, the value of unemployment is given by:

$$rU(ft) = b + m(\theta)[\phi(\max\{N(ft,pt) - U(ft), 0\}) + (1-\phi)(N(ft,ft) - U(ft))]$$

The value of a part-time vacancy is given by:

$$rV(pt) = -v + \frac{m(\theta)}{\theta}[\gamma(J(pt,pt) - V(pt)) + (1-\gamma)(\max\{J(ft,pt), 0\} - V(pt))]$$

And the value of a full-time vacancy:

$$rV(ft) = -v + \frac{m(\theta)}{\theta}(1-\gamma)(J(ft,ft) - V(ft))$$

E.2 Wages

Wages are computed using the fact that workers receive share β of surplus:

$$N(s,y) - U(s) = \beta(N(s,y) + J(s,y) - U(s) - V(y))$$

Using the expressions for N(s,y), J(s,y), U(s) and using that V(y) = 0, we get:

$$\frac{w(s,y) + \delta U(s) - (r+\delta)U(s)}{r+\delta} = \beta \frac{x(s,y) + \delta U(s) - (r+\delta)U(s)}{r+\delta}$$
$$w(s,y) = \beta\left(x(s,y) - z\right) + (1-\beta)\, r\, U(s)$$

This gives:

$$w(ft,pt) = \beta(a-c-z) + (1-\beta)rU(ft)$$
$$w(pt,pt) = \beta(a-c-z) + (1-\beta)rU(pt)$$
$$w(ft,ft) = \beta(a-z) + (1-\beta)rU(ft)$$

Hence, we have that $w(ft,ft) \geq w(ft,pt) > w(pt,pt)$ since $U(ft) > U(pt)$ and $c \geq 0$. The wages can be used to simply $J(s,y)$ to:

$$J(s,y) = \frac{(1-\beta)(x(s,y) - z - rU(s))}{r+\delta}$$

E.3 Equilibrium

We assume that parameters are such that it is beneficial for full-time workers to take part-time jobs. The equilibrium conditions are then the following four equations. The first two are the free entry conditions:

$$V(ft) = 0 \tag{4}$$
$$V(pt) = 0 \tag{5}$$

The third equates the flows in and out of unemployment of part-time workers and the fourth does the same for full-time workers:

$$\phi m(\theta)\gamma u = \delta(p - \gamma u) \tag{6}$$
$$m(\theta)(1-\gamma)u = \delta(1 - p - (1-\gamma)u) \tag{7}$$

where p denotes the share of part-time workers in the total economy of mass 1, and u denotes the share unemployed.
From the last two Steady State equations, we can compute u and ϕ: From (6), we get:

$$\phi = \frac{\delta(p - \gamma u)}{m(\theta)\gamma u}$$

From (7), we get:

$$u((1-\gamma)(m(\theta)+\delta)) = \delta(1-p)$$
$$u = \frac{\delta(1-p)}{(1-\gamma)(m(\theta)+\delta)}$$

Plugging this into the expression for ϕ from just above, we get:

$$\phi = \frac{p(1-\gamma)m(\theta) + \delta(p-\gamma)}{m(\theta)\gamma(1-p)}$$

We move on to compute the value functions in equilibrium. First, we compute $U(pt)$:

$$\begin{aligned}
rU(pt) &= b + m(\theta)\phi(N(pt,pt) - U(pt)) \\
rU(pt) &= b + m(\theta)\phi\left(\frac{w(pt,pt) + \delta U(pt)}{r+\delta} - U(pt)\right) \\
rU(pt) &= b + m(\theta)\phi\left(\frac{\beta(a-c-z) + (1-\beta)rU(pt) + \delta U(pt)}{r+\delta} - U(pt)\right) \\
rU(pt) &= b + m(\theta)\phi\left(\frac{\beta(a-c-z-rU(pt))}{r+\delta}\right) \\
U(pt)[r(r+\delta) + m(\theta)\phi\beta r] &= (r+\delta)b + m(\theta)\phi\beta(a-c-z) \\
rU(pt) &= \frac{(r+\delta)b + m(\theta)\phi\beta(a-c-z)}{r+\delta+m(\theta)\phi\beta}
\end{aligned}$$

We then compute $U(ft)$:

$$\begin{aligned}
rU(ft) &= b + m(\theta)[\phi N(ft,pt) + (1-\phi)N(ft,ft) - U(ft)] \\
rU(ft) &= b + m(\theta)\left[\phi\frac{\beta(a-c-z) + (1-\beta)rU(ft) + \delta U(f)}{r+\delta} + (1-\phi)\frac{\beta(a-z) + (1-\beta)rU(f) + \delta U(f)}{r+\delta} - U(ft)\right] \\
rU(ft) &= b + m(\theta)\left[\frac{U(ft)(r+\delta-\beta r) + \phi\beta(a-c-z) + (1-\phi)\beta(a-z)}{r+\delta}\right] \\
rU(ft) &= \frac{b(r+\delta) + m(\theta)\beta(\phi(a-c-z) + (1-\phi)(a-z))}{r+\delta+m(\theta)\beta} \\
rU(ft) &= \frac{b(r+\delta) + m(\theta)\beta(a-\phi c-z)}{r+\delta+m(\theta)\beta}
\end{aligned}$$

In a next step, we compute the cost of posting a vacancy using that $V(ft) = V(pt)$ (since both are

0), and that $J(ft, pt) \geq 0$ (as we assume above that full-time workers take part-time jobs):

$$\begin{aligned}
(1-\gamma)J(ft,ft) &= \gamma J(pt,pt) + (1-\gamma)J(ft,pt) \\
(1-\gamma)\frac{(a-z-rU(ft))}{r+\delta} &= \gamma\frac{(a-c-z-rU(pt))}{r+\delta} + (1-\gamma)\frac{(a-c-z-rU(ft))}{r+\delta} \\
(1-\gamma)c &= \gamma(a-c-z-rU(pt)) \\
\gamma(a-c-z-rU(pt)) - (1-\gamma)c &= 0
\end{aligned}$$

Then, we use U(pt) from above:

$$\begin{aligned}
\gamma\left(a-c-z-\frac{(r+\delta)b+m(\theta)\phi\beta(a-c-z)}{r+\delta+m(\theta)\phi\beta}\right) - (1-\gamma)c &= 0 \\
\gamma\left(\frac{(r+\delta)(a-c-z-b)}{r+\delta+m(\theta)\phi\beta}\right) &= (1-\gamma)c \\
\gamma(r+\delta)(a-c-z-b) &= (1-\gamma)(r+\delta+m(\theta)\phi\beta)c
\end{aligned}$$

Add $(1-\gamma)(r+\delta)(a-b-z-c)$ to both sides:

$$\begin{aligned}
(1-\gamma)(r+\delta)(a-b-z-c) + \gamma(r+\delta)(a-c-z-b) &= (1-\gamma)(r+\delta)(a-b-z-c) + (1-\gamma)(r+\delta+m(\theta)\phi\beta)c \\
(a-b-z-c)(r+\delta) &= (1-\gamma)(r+\delta)(c+a-b-z-c) + (1-\gamma)(m(\theta)\phi\beta)c \\
(a-b-z-c)(r+\delta) &= (1-\gamma)\left[(r+\delta)(a-b-z) + m(\theta)\phi\beta c\right] \\
(r+\delta)(a-b-z) + m(\theta)\phi\beta c &= \frac{(a-b-z-c)(r+\delta)}{1-\gamma}
\end{aligned}$$

In a next step, we use that $V(ft) = 0$:

$$\begin{aligned}
z &= \frac{m(\theta)}{\theta}(1-\gamma)(J(ft,ft)) \\
z &= \frac{m(\theta)}{\theta}\frac{(1-\gamma)(1-\beta)(a-z-rU(ft))}{r+\delta} \\
z &= \frac{m(\theta)}{\theta}\frac{(1-\gamma)(1-\beta)\left(a-z-\frac{b(r+\delta)+m(\theta)\beta(a-\phi c-z)}{r+\delta+m(\theta)\beta}\right)}{r+\delta} \\
z &= \frac{m(\theta)}{\theta}\frac{(1-\gamma)(1-\beta)[(a-z)(r+\delta+m(\theta)\beta) - b(r+\delta) - m(\theta)\beta(a-z-\phi c)]}{(r+\delta+m(\theta)\beta)(r+\delta)} \\
z &= \frac{m(\theta)}{\theta}\frac{(1-\gamma)(1-\beta)[(r+\delta)(a-b-z) + m(\theta)\beta\phi c]}{(r+\delta+m(\theta)\beta)(r+\delta)}
\end{aligned}$$

Plugging in the gray expression from above yields:

$$z = \frac{m(\theta)}{\theta} \frac{(1-\gamma)(1-\beta)\left[\frac{(a-b-z-c)(r+\delta)}{1-\gamma}\right]}{(r+\delta+m(\theta)\beta)(r+\delta)}$$
$$z = \frac{m(\theta)}{\theta} \frac{(1-\beta)(a-b-z-c)}{r+\delta+m(\theta)\beta}$$
$$z = \frac{m(\theta)}{\theta} \frac{(1-\beta)(a-b-c)}{r+\delta+m(\theta)\beta+\frac{m(\theta)}{\theta}(1-\beta)}$$

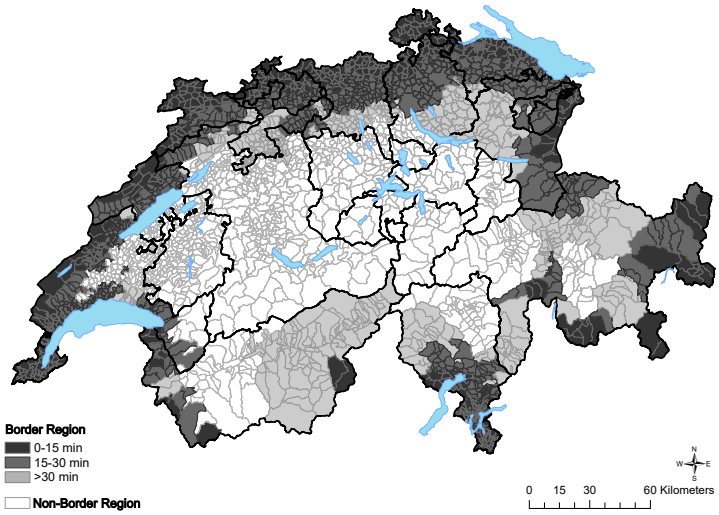
F Further Reform Context

Table A10: The different phases of the introduction of free movement of workers

			Cross-border workers		Immigrants
Phase	**Year**	**Event**	*Border region*	*Non-border region*	*Both regions*
Pre-reform	1995		Admission process (priority requirement), further restrictions	No access	Admission process, annual quotas, further restrictions
	1996				
	1997				
	1998	Announcement			
Transition	1999	AFMP signed	Anticipatory effects possible		
phase	2000	Referendum			
	2001				
	2002	AFMP enacted	Abolition of further restrictions		Higher quotas, further changes[a]
	2003				
Free movement	2004	Liberalization	***Free***		Abolition of admission process
phase in border	2005	in border region			
region	2006				
	2007	Full liberalization		***Free***	***Free***
	2008				

[a] Extension of durations of several residency permits. Allowance of family reunion for most permit holders.

Figure A16: The border and non-border region and travel distance to the border



Notes: This figure depicts municipalities in the border region in three different shades of grey and those in the non-border region in white. Within the border region, we distinguish three regions according to their travel time by car to the nearest border crossing. The black lines denote cantonal borders. Reproduced from Beerli et al. (2021).