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 lower hours. This papers sheds light on the forces on both the labor demand and supply side that give rise to this sorting. We examine an immigration reform that markedly increased the supply of full-time workers in a pre-defined set of border localities in Switzerland. Using social security registers and business census data covering the universe of establishments in a difference-in-differences design, we show that the reform leads to a drop in mothers' labor force participation by 6%. We provide evidence that mothers' drop-out is primarily driven by changes in the structure of local labor markets with firms reducing their demand for part-time workers following the reform. The main channel of competition with immigrant labor in our setting thus manifests itself through the number of hours that workers are willing to supply. Our results are consistent with low(er) hours constituting a job-specific amenity that is costly for firms to provide.

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

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1 Introduction

In many countries, "non-greedy" jobs — positions that do not demand excessively 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 lower hours 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, do firms bear costs when assigning tasks performed in a full-time job across more than one worker?

Understanding potential constraints that may prevent firms from such restructuring is essential: If firms face production technologies that are convex in hours worked, then demand side regulation that ignores such costs may have unintended productivity consequences. Establishing that firms face such costs, and documenting how these costs interact with maternal sorting, however, is challenging empirically as it requires plausibly exogenous variation that shifts both 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 regulation 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 maternal labor force participation, while women without children and fathers remain largely unaffected. Based on data covering the universe of Swiss establishments, we establish that the main mechanism behind maternal drop-out is reduced demand for part-time workers from the firm side. Our findings, consistent with prior work, underline the importance of "non-greedy jobs" in facilitating maternal labor supply. Importantly, though, because we observe firms substituting away from part-time workers when full-time labor supply expands, our results provide novel evidence that firms face costs when providing such jobs. Establishing that this trade-off exists is essential to gauge the effectiveness of different policy instruments to integrate maternal talent in the workforce.

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 in a pre-defined set of localities at the border. In the early 2000s, hurdles for firms to hire CBW from one of the neighboring countries (Italy, France, Germany, Austria) were substantially reduced. 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 rich administrative data linking census and social security records of natives from 1994 to 2010, we then document that mothers' labor force participation in treated municipalities starts to decline following the onset of the reform. By 2010, mothers reduce their participation by 3.9 ppt, or 6% over the pre-reform mean. In contrast, we find no participation effects on fathers, nor on Swiss men or women who do not have children. 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 sorting of men and women in the labor market. Consistent with these extensive margin effects, we document a decrease in mothers' unconditional earnings by $-.46$ units of the inverse hyperbolic sine by 2010 (Chen and Roth, 2024), while fathers' earnings are largely unaffected. Using survey data on workers to examine impacts on those who stay in the labor force, we do not detect changes in hourly wages among male and female workers. Consistent with mothers who tend to work low part-time hours selecting out of the labor market, we observe that the pool of 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 outline 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 four pieces of evidence that are consistent with the mechanics of the model. First, we document a change in the structure of jobs in treated local labor markets that coincides with the drop in maternal labor force participation. Using data from the universe of Swiss establishments,

we show with event-study regressions 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 immigrant workers. On the other hand, the reduction in part-time jobs is fully borne by Swiss workers and, among them, mostly by women.

Second, to further the notion that these shifts are the result of firms replacing part- with full-time workers once the latter become more readily available, we examine heterogeneous treatment effects by a proxy for firms' coordination costs. As coordination costs increase, firms find it less desirable to hire part-time workers pre-reform, but should find it increasingly beneficial to fill full-time positions post-reform. To examine this, we assign establishments in the Business Census to high vs. low levels of "coordination costs" based on the prevalence of full-time workers within their respective five-digit industry at baseline. We validate this proxy measure using O*NET data on occupation characteristics by industry and show that industries with higher "coordination costs" (as defined by a higher share of full-time workers pre-reform) feature longer work weeks, less routine schedules and higher on-the-job pressure. We then document that establishments with high levels of "coordination costs" in the treated region experience an immediate increase in full-time workers, but no changes in part-time workers post-reform. This is consistent with such firms having found it too costly to hire part-time talent pre-reform, but being able to fill positions once more full-time workers enter local labor markets. Instead, shifting from part-time to full-time jobs occurs primarily among establishments in the middle tercile of "coordination costs" for whom part-time labor is no longer as desirable post-reform. Establishments with low levels of "coordination costs" feature no meaningful shifts in their workforce composition.

Third, 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. Fourth, we further document heterogeneity in the social security data that is consistent with the main mechanism operating along the hiring margin: The reduction in maternal labor force participation is stronger for mothers who were out of the labor force 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 first explore whether higher household income post-reform could explain our findings. While partners of treated mothers experience somewhat higher earnings following the reform (+2% 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 participation effect. We further rule out that increased fertility post-reform can fully account for our main

treatment effects: While younger mothers at baseline are more likely to have additional children post-reform, both younger and older mothers reduce their labor supply.

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 5% relative to the average penalty in the control.

Our findings contribute to two 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, 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 to shape female labor supply. To the best of our knowledge, our study is the first to establish that on the labor demand side, firms incur costs when restructuring full-time jobs across multiple workers. These findings 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.

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 either due to differences in skills, differences in specialization by industry or occupation (Amuedo-Dorantes and De La Rica, 2011; Edo and Toubal, 2017), or by relaxing 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. The main competition effect in our setting thus works along the hours margin.

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 prior findings by documenting extensive margin effects and heterogeneous impacts 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 3 explains the data, empirical strategy, and provides descriptive statistics. Section 4 documents our main result and robustness. Section 5 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 6 provides evidence on mechanisms. Section 7 documents the reform's impact on the child penalty. Section 8 concludes.

2 Setting and Reform

2.1 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 was 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. As Beerli et al. (2021) highlight, anticipatory effects of the reform may be possible after announcement in 1999, and in particular after the referendum passed in May 2000. In our empirical specifications, we thus follow Beerli et al. (2021) and conservatively 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 A3 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 A1 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,

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

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 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 removals of restrictions from 2000-2003, and a *Free* phase starting in 2004 throughout the paper.

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]

2.2 The Swiss Labor Market and Maternal Workforce Participation

The OECD characterizes the Swiss labor market as relatively flexible OECD (2000) with comparatively low taxes on labor, the absence of a minimum wage, and employment protection laws that do not impede firms' flexibility in hiring and dismissal. The setting of wages and working schedules is decentralized (see also Lalive and Martenet, 2017).

Switzerland has relatively conservative gender norms around maternal labor supply and still features one of the largest child penalties in earnings (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. In 2016 as the closest year to our study period for which these statistics are available, Swiss mothers on average spent six years out of the labor force after giving birth to their first child (BFS, 2016). Upon returning to the labor market, 90% of mothers work part-time in a position that on average amounts to 35% of a full-time equivalent (BFS, 2016).

[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.

3 Data, descriptive statistics, and empirical strategy

3.1 Data

We use several data sources spanning the relevant time period.

Linked OASI - Census data (Social Security) Our primary data source is the Swiss social security register from the Old-Age and Survivors' Insurance (OASI) that we link to Census data, in the following referred to as "social security data". 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. We define an individual as in the labor force if they have any positive wage earnings in a given year, or receive 12 months of unemployment benefits.[4] We add all income from wage employment spells in a given year to measure earnings. We winsorize earnings at the 99th percentile of the yearly earnings distribution.

We use the population census in 2000 to create our main sample that we then link to the OASI data. 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 Swiss nationals only. For our main results, we further restrict our sample to mothers and fathers, i.e. individuals who have at least one child and are aged between 25 and 39 years in 2000.[6] 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, as documented in Martínez, Saez, and Siegenthaler (2021).

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 in the following categories as the share of a full-time equivalent: full-time ($\geq$ 90%), high part-time (50-89%), and low part-time (<50%). We assign workers to municipal labor markets based on the

[4] In particular, we code individuals as in the labor force if they have positive earnings in a spell of wage employment (including jobs that are not obligated to pay into social security), self employment, or receive 12 months of payments for military duty, maternity leave or unemployment. If an individual is not present in the OASI register in a given year, we classify them as not in the labor force.

[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. The age restriction for parents ensures that we focus on parents whose children are still relatively young and live in the same household.

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 available in 1998.

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, 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.).

3.2 Descriptive Statistics

Maternal LFP– 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 have close to two children at baseline, with the youngest child of mothers close to five 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, labor force participation is at 94% and 93% for men and women respectively, only 68% of mothers, but 98% of fathers, are in the labor market. Conditional on being employed, mothers have substantially lower total median earnings (around 21k CHF compared to 73k CHF for fathers). Based on information from the Census, mothers who are employed work on average 22 weekly hours, whereas fathers work almost 46 average weekly hours. We also observe sorting by gender across industries: Mothers and women are more likely to work in knowledge-intensive services compared to men (40 and 48% respectively vs 30% for men). Men are more likely to work in Manufacturing (20% vs about 10% 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 5 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 4.

3.3 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.[7]

[7]We measure all control variable and assign treatment status based on variables from the Census 2000, see Section 3.1. 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

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.

4 Main results: Reform Impact on Labor Force Participation

4.1 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 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 A2 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.[8]

(1, 2, 3, 4+).

[8] 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.

4.2 Decline in Maternal Participation

Labor Supply – Next, we document the reform's impact on the labor force participation of mothers and fathers. Figure 3 shows that the labor force 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, labor force participation rates of treated mothers are 3.9 ppt lower. This represents a 6% drop over the pre-reform mean (68%). Conversely, the reform did not meaningfully affect the labor force participation of fathers with yearly point estimates indicating a slight 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 2.9 ppt in the *Free* period, fathers' participation dips by .08 ppt. While precisely estimated, the drop for fathers is relatively small and constitutes a decrease of less than 1% (.08%) in this group's participation rate over the pre-reform mean.

Earnings – Figure A3 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.[9]

Hours and Hourly Wages – Since hours are unobserved in the social security data, we use survey data from the 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 as parental status is unobserved. While native's wages are a central object of interest when studying immigration effects, this measure naturally conflates both potential impacts on natives' wages from increased competition through immigrants and potential selection effects among natives who choose to remain in the workforce. In Appendix Figure A4 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.

4.3 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 39) who do not have children at the onset of the reform. Women without children at baseline do not experience a reduction in labor force

[9]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).

participation.[10]

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 labor force. 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 A4 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 slightly smaller, but qualitatively similar, 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 labor force participation is thus 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 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 the main specification of Beerli et al. (2021) (Columns 4 and 9), and when dropping large cities (Columns 5 and 10).

5 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.[11] The measure

[10] 40.5% of this group of women end up having at least one child by 2010. See also Mechanism Section 6.4.2 for fertility impacts of the reform.

[11] 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

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.[12] 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:[13]

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

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 the match creating a surplus).

Matching Workers and firms meet according to a standard matching function hich 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

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).

[12] 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.

[13] 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.

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 $V(p) = V(f) = 0$. 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 $V(p) = V(f) = 0$ and the following two steady-state conditions which equalize the flow in and out of unemployment:

$$\begin{aligned} \phi\, m(\theta)\, \gamma\, u &= \delta\, (p - \gamma\, u) \\ m(\theta)\, (1 - \gamma)\, u &= \delta\, (1 - p - (1 - \gamma)\, u) \end{aligned}$$

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.

6 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 dropout is primarily driven by mothers who are not in employment at the onset of the reform — a pattern that is consistent with impacts occurring through the hiring margin at the firm level. 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 household income, fertility, or via an interaction with gender norms. Taken together, the patterns we document suggest that firms' are less eager to hire mothers who face time constraints once they are able to tap into a sufficiently

large pool of full-time talent.

6.1 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). [14]

6.1.1 Compositional Changes

Appendix Figure A8 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).[15] 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 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. These results 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 post-reform.

[14] As depicted in Appendix Figure A7, 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.

[15] 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 4.1.

6.1.2 Heterogeneity in Job Shifts by a Coordination Cost Proxy

To further the notion that maternal drop-out is related to firms shifting from part- to full-time workers following the border reform, we examine heterogeneous effects by the degree to which establishments in local labor markets represent industries that feature higher costs to coordinate workers. As highlighted by Goldin (2014), firms may differ in the extent to which they face coordination costs when hiring workers that work fewer hours, since depending on the structure of jobs, substituting the same level of output produced by one full-time worker may require more total hours when those are supplied by multiple part-time workers. To further test our proposed mechanism behind maternal drop out, we therefore examine differences in the shift from part- to full-time workers based on a proxy measure for firms' coordination costs. In particular, we would expect that firms in industries with the highest coordination costs are most constrained at baseline, and will show the largest increases in full-time workers post-reform. Firms with intermediate levels of coordination costs, on the other hand, may have tapped into part-time talent to fill vacant positions at baseline, but should prefer to replace part-time with newly available full-time workers post-reform. Finally, firms with the lowest coordination costs will not have faced meaningful constraints before the reform, and thus should experience negligible changes in the composition of their workforce.

In order to examine these predictions, we construct a proxy measure of coordination costs by assigning each establishment to the baseline share of full-time (rather than part-time) workers at the five-digit industry level, based on the Business Census.[16] We first assess whether industries characterized by higher shares of full- rather than part-time workers may plausibly feature higher coordination costs between workers, by examining how work in those industries is organized in terms of schedules and hours.[17] To do so, we use the Census in 2000 to link each worker aged between 20 and 55 in Switzerland to O*NET occupation characteristics via their occupation code. We then calculate worker weighted occupational characteristics by five-digit industry level that reflect the occupational composition of industries at baseline.[18] Since the O*NET is based on workers and occupation characteristics in the United States, this exercise also serves to assess whether common, occupation-specific traits that make some industries more reliant on "greedy" jobs translate across countries, and should thus alleviate concerns that our proxy for coordination costs is endogenous to sorting of workers in the Swiss context.

Appendix Figure A9 documents these correlations with standardized O*NET measures on a scale from 0-100: Industries with a higher share of full-time workers feature occupations that are characterized by a longer typical work week in terms of hours and work schedules that are more irregular, i.e. that deviate from an established routine or a set schedule. We also observe that these are industries in which workers are more likely to face pressure, both in terms of demands on their

[16] Note that this will ensure that e.g. a lawyer working for a high powered law firm and a lawyer working part-time for the government show up in different industry categories.

[17] These and other characteristics are highlighted by (Goldin, 2014).

[18] We drop five-digit industries that have fewer than 200 workers in the Census.

time by meeting deadlines, as well as from competition with coworkers.

We then examine treatment effect heterogeneity in local labor market's reliance on part- vs. full-time workers based on a local firm's tercile of "coordination costs", which we proxy by the industry-level share full-time workers at baseline. We employ Equation 1 and examine as outcomes the total number of full- or part-time workers in a municipality that works for establishments of a particular coordination cost tercile, as a share of total workers in that municipality in 1998. Figure 5 displays results. As outlined above, among "high coordination cost" firms, we observe that the number of full-time workers (as a share of total workers pre-reform) in a local labor market expands, with no meaningful impacts on part-timers. In contrast, we observe a clear reduction in part-timers from firms with intermediate levels of "coordination cost" that is accompanied by a (noisy) expansion in full-time workers. Finally, firms in the lowest tercile do not experience meaningful shifts in worker composition. These patterns highlight that it is firms with intermediate levels of "coordination costs" that were willing to employ part-time workers when full-time talent was not readily available pre-reform, but stop doing so once more workers who are able to supply longer hours enter the labor market.

6.2 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.[19] 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).[20] We observe a reduction of job ads targeting both high and low part-time workloads, which 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 A10 shows the reduction in part-time job ads using our main event-study specification.

6.3 Dropout from Returning Mothers

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

[19] 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.

[20] 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.

hiring margin, i.e. particularly affecting mothers looking to return to the labor force after a break in participation.

Appendix Figure A11 splits our main sample of mothers by whether they are employed at baseline and repeats our main event study. 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 a substantial share in this group (40.5%) will have given birth by 2010.

Taken together, the results in this section are consistent with the notion that the larger availability of Non-Swiss full-time workers changes the recruiting behavior of firms in the treated region. Able to tap into a larger pool of full-time workers, firms start to post more job vacancies directly targeting these workers while reducing their demand for part-timers. Heterogeneity results from the social security data suggest that these changes in the labor market make it more difficult for mothers to return to the workforce after taking a break for child-rearing.

6.4 Alternative Mechanisms

Finally, we test and rule out three main alternative mechanisms that could explain mothers' participation decline besides a re-structuring of jobs in the labor market.

6.4.1 Household Level Income Shocks

We start by examining whether income effects within households can 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 to participate in the labor market.

To examine the importance of potential household income effects, we examine the reform impact on partner's earnings for mothers in our main sample. To do so, we match mothers to their partners at baseline. Appendix Figure A12 documents that the partners of these mothers experience an increase in earnings of about 2% in the reform period.[21] However, these income effects are relatively small compared to the extent of mother's dropout: If we take these estimates at face value, a 1% increase in partner's income in 2010 would need to account for an increase in dropout likelihood of 1.95 ppt to fully explain our main participation effects in that year of –3.9 ppt (see Figure 3).

To gauge whether such magnitudes might be plausible, we examine the semi-elasticity of mother's dropout with respect to partner's earnings in Appendix Table A5. We start by examining this relationship in the cross-section, using our full sample of mothers and their partners in the

[21] Since we do not find meaningful participation effects for partners, we use logs here as we are primarily interested in examining intensive margin effects.

pre-reform period in Column 1. A 1% increase in partner's earnings is associated with a decrease in maternal participation by .015 ppt. This estimate is two orders of magnitudes smaller than what would be needed to fully explain our main participation effect. 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 (–.013 ppt). We obtain a similar estimate (–.012 ppt) when restricting to the control region in the pre-treatment period in Column 3, and a somewhat larger estimate (–.028 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.

6.4.2 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 A13, we observe a small 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 (35 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 30%, compared to 15% for mothers who are above median age. Indeed, as documented in column 2 and 3 in Appendix Table **??**, 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 labor supply by mother's age in columns 4 and 5, we observe larger dropout both for older mothers. Taken together with the results on firms reducing their part-time vacancies, we therefore deem it unlikely that increased fertility *per se* fully explains our main treatment effects.

7 Effects on the Child Penalty

Lastly, we relate our main estimates to recent work on the child penalty (**kleven2019child**) 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.[22] 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.[23] 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:

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

$Post_{ct}$ 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 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 A7. 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 3). 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

[22] 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 **kleven2019child**.

[23] 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.

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.

8 Conclusion

In this paper, we document that the availability of jobs that are non-greedy in hours matters for maternal labor force participation. We show that mothers' labor force 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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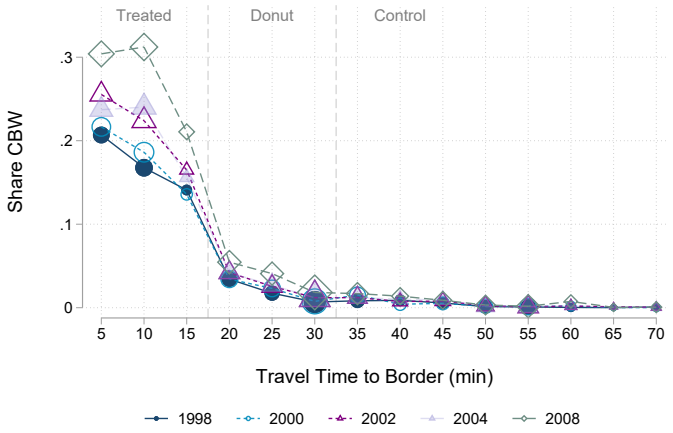
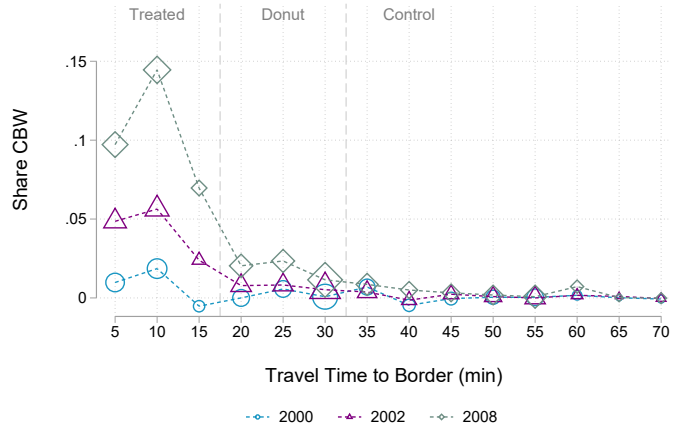
Tables and Figures

Figure 1: Municipal Share CBW by Travel Time to Border



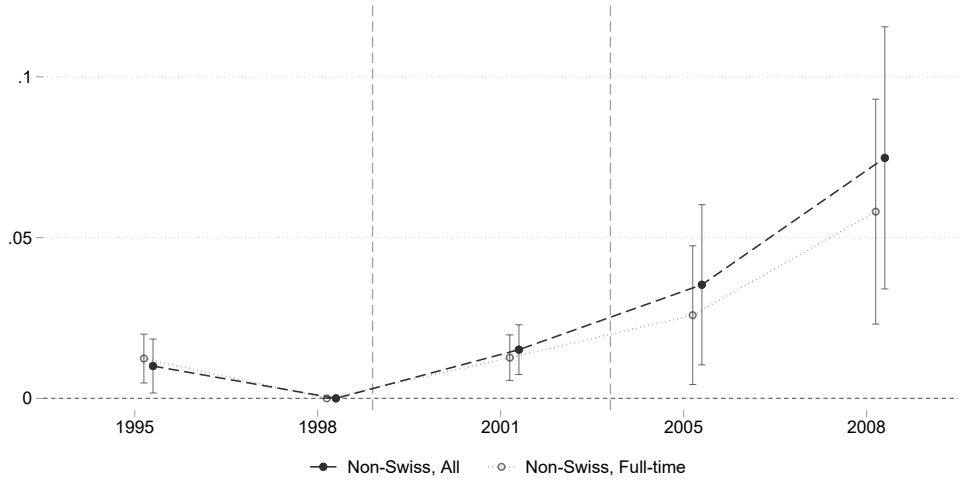
(a) Share CBW by Year



(b) Increase in CBW from 1998

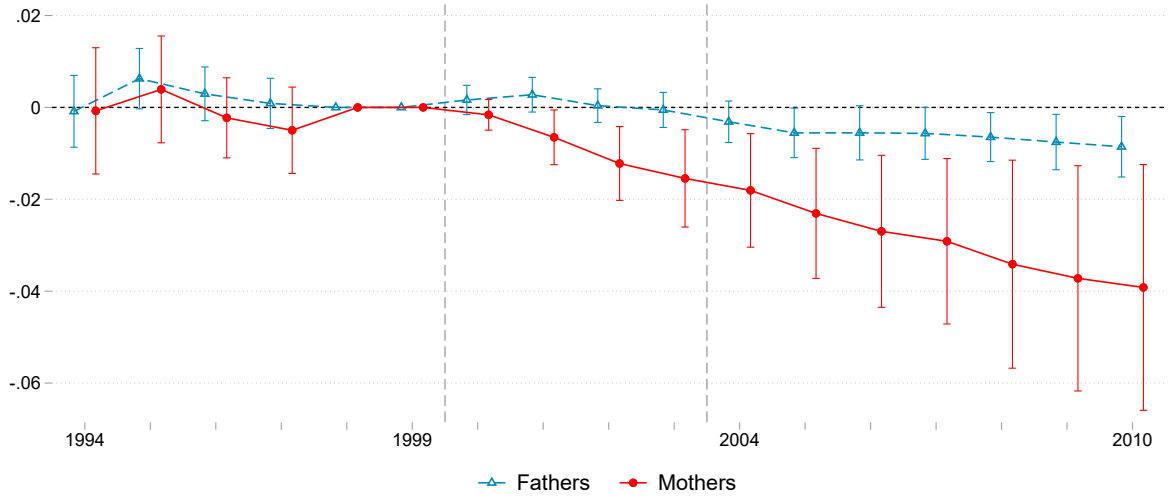
Notes: This figure shows the share of cross-border workers (CBW) and the increase in CBW by travel time to the nearest border crossing in minutes. Share CBW is calculated by dividing the total number of CBW in a municipality by total workers in that municipality in 1998. Panel a: Share CBW in levels. 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 Labor Force Participation of Mothers and Fathers



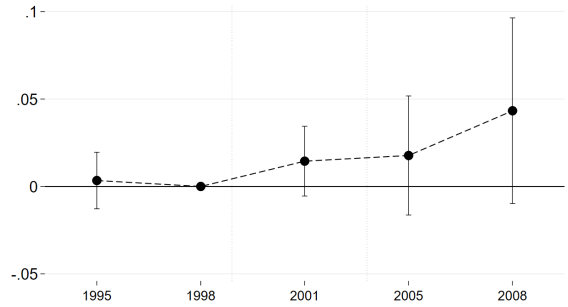
Notes: Estimates of Equation 2 for mothers and fathers (women and men with a child in 2000), aged 25-39 in 2000. The dependent variable is labor force participation in a given year. All specifications include municipality and year fixed effects, and individual-level controls measured in the year 2000: 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 Labor Force Participation: Difference-in-Differences

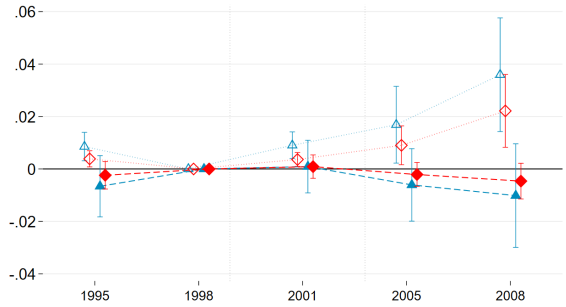
	Mothers					Fathers				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Free * Treat	–0.029***	–0.029***	–0.029***	–0.020***	–0.025***	–0.008***	–0.008***	–0.008***	–0.006***	–0.007***
	(0.008)	(0.008)	(0.008)	(0.006)	(0.008)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Transition *	–0.008*	–0.008*	–0.008*	–0.004	–0.009*	–0.001	–0.001	–0.001	0.000	–0.002
Treat	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Controls		X		X	X		X		X	X
Individual FE			X					X		
Nuts-II Trend				X					X	
No city					X					X
Adj. R^2	0.026	0.055	0.444	0.027	0.056	0.017	0.025	0.416	0.017	0.022
Obs	4,848,960	4,848,960	4,848,960	4,848,960	4,611,456	3,358,080	3,358,080	3,358,080	3,358,080	3,197,296
Dep mean	0.694	0.694	0.694	0.694	0.692	0.976	0.976	0.976	0.976	0.978

Note: Estimates of Equation 2 for mothers and fathers. This table shows the reform impact by reform period on labor supply. 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)

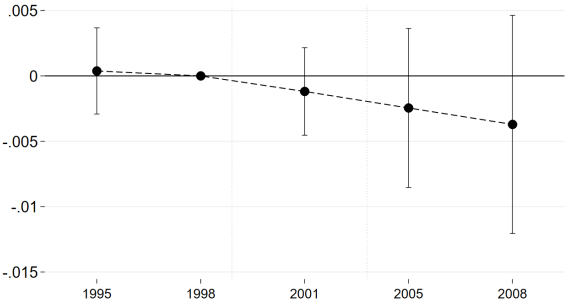
Figure 4: Reform Impact on Job Shares in Local Labor Markets



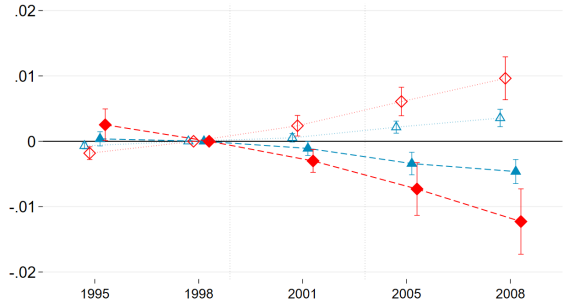
Panel 1a: Full-time ($\geq$ 90% of a FTE)



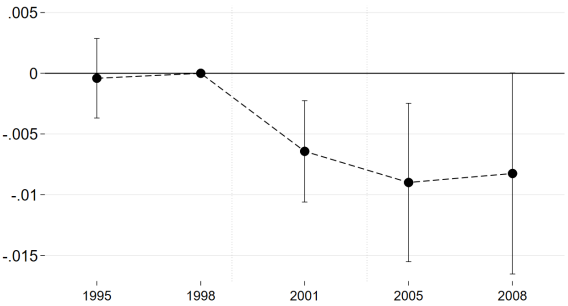
Panel 1b: Full-time by Gender



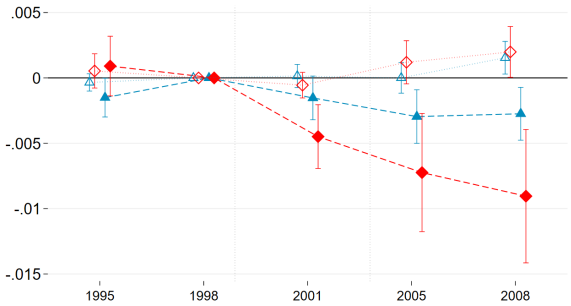
Panel 2a: Part-time I ($\geq$ 50% of a FTE)



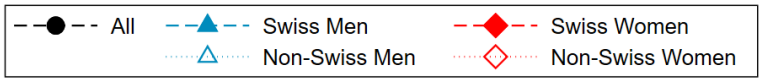
Panel 2b: Part-time I by Gender



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

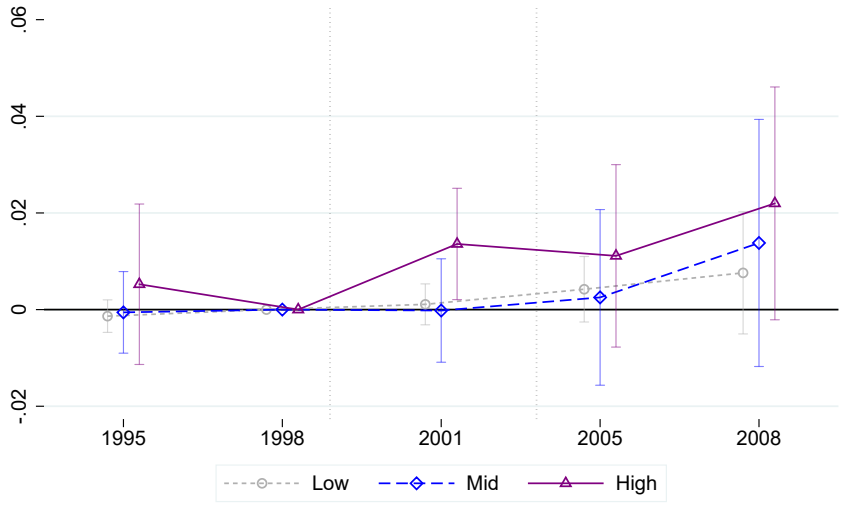


Panel 3b: Part-time II by Gender

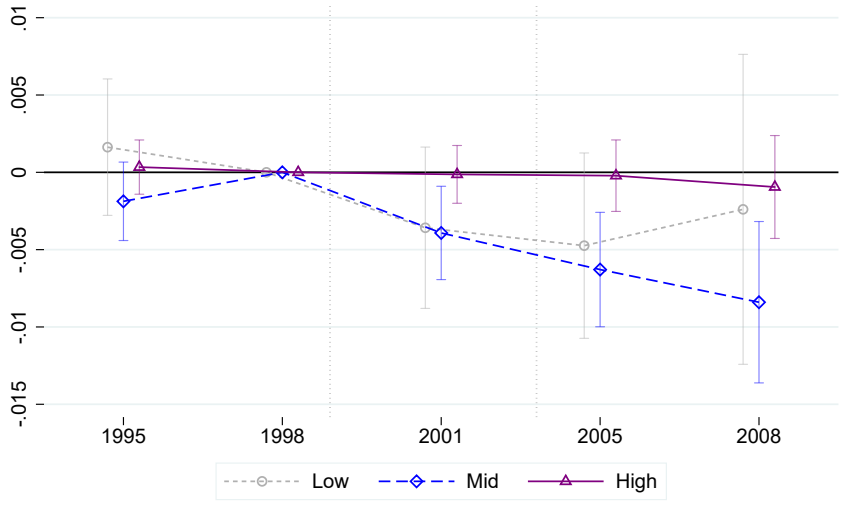


Notes: Estimates of Equation 1. Outcome is the number of workers in the relevant category in a municipality over total workers in 1998 in that municipality. Panel 1: Full-time workers who have an employment level of $\geq$ 90% of a full-time equivalent (FTE). Panel 2: Part-time workers who have an employment 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.

Figure 5: Reform Impact on Local Job Shares by "Coordination Cost" Tercile



a) Full-time



b) Part-time

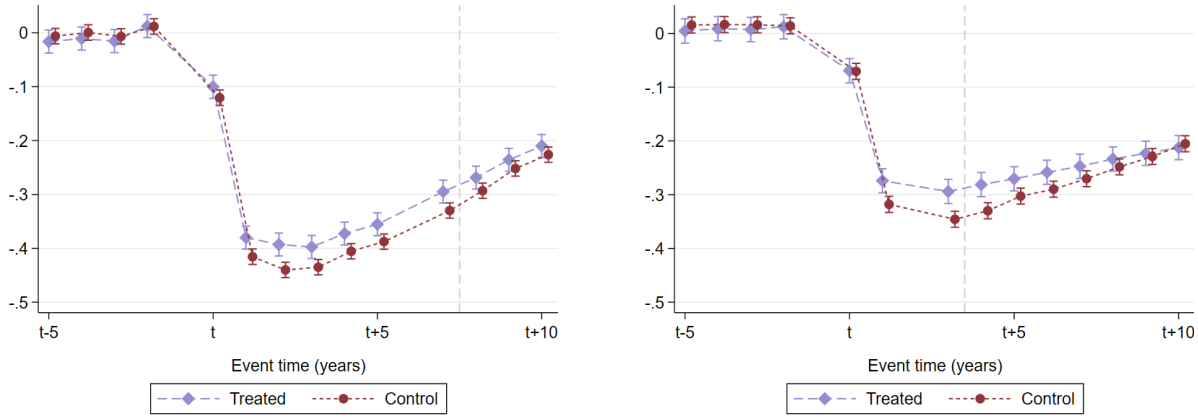
Notes: Estimates of Equation 1. This figure shows the reform's impact on the municipal share of workers by "coordination cost" tercile (Low, Mid, High). The share of workers is defined as the number of full- (Panel a) or part-time (Panel b) workers in a municipality in a "coordination cost" tercile each year relative to all workers in that municipality in 1998. "Coordination cost" terciles are defined based on the five-digit industry-level share of full-time workers 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.

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 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. Based on Social Security data.

For Online Publication: Appendix Tables and Figures

A Descriptives

Table A1: Summary Statistics: Workers

	Non-Fathers	Fathers			Non-Mothers	Mothers		
			Border	Central			Border	Central
Demographics								
Census								
Age	31.36	34.75	34.80	34.75	31.13	34.19	34.27	34.17
	(4.14)	(3.31)	(3.29)	(3.31)	(4.21)	(3.57)	(3.53)	(3.58)
Number of Children	0.00	1.89	1.84	1.92	0.00	1.98	1.93	2.02
	(0.00)	(0.79)	(0.78)	(0.80)	(0.00)	(0.81)	(0.80)	(0.82)
Age Youngest Child	.	3.70	3.75	3.67	.	4.70	4.71	4.69
	(.)	(3.45)	(3.47)	(3.43)	(.)	(4.01)	(4.00)	(4.00)
Obligatory Schooling	0.07	0.06	0.06	0.06	0.08	0.12	0.12	0.13
	(0.26)	(0.24)	(0.24)	(0.24)	(0.27)	(0.33)	(0.32)	(0.33)
Secondary Degree	0.55	0.55	0.54	0.56	0.60	0.68	0.65	0.69
	(0.50)	(0.50)	(0.50)	(0.50)	(0.49)	(0.47)	(0.48)	(0.46)
Tertiary Degree	0.34	0.38	0.38	0.37	0.29	0.18	0.22	0.17
	(0.47)	(0.49)	(0.49)	(0.48)	(0.45)	(0.39)	(0.41)	(0.37)
Labor Market								
Social Security Data								
In Labor Force	0.94	0.98	0.97	0.98	0.93	0.68	0.69	0.68
	(0.23)	(0.14)	(0.17)	(0.12)	(0.25)	(0.47)	(0.46)	(0.47)
Any Unemployment Benefits	0.05	0.03	0.04	0.03	0.05	0.04	0.05	0.03
	(0.22)	(0.18)	(0.19)	(0.17)	(0.22)	(0.19)	(0.22)	(0.17)
Median Earnings (CHF) | Employed	59,241	72,809	74,926	71,110	52,000	20,811	25,200	18,776
	(32,094)	(35,822)	(37,546)	(35,159)	(25,211)	(23,353)	(25,820)	(22,014)
Census								
Weekly Hours	43.40	45.80	44.79	46.33	39.08	22.20	23.77	21.63
	(9.68)	(10.06)	(9.24)	(10.61)	(10.06)	(16.22)	(15.18)	(16.99)
Commute time in minutes	22.45	20.55	20.39	20.16	23.97	16.47	16.99	15.83
	(18.36)	(17.94)	(17.09)	(18.14)	(17.71)	(15.33)	(14.56)	(15.45)
Commutes to other area group	0.05	0.04	0.02	0.01	0.05	0.03	0.01	0.00
	(0.21)	(0.20)	(0.16)	(0.09)	(0.21)	(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)	(0.18)	(0.20)	(0.16)
Lowtech Manufacturing	0.09	0.11	0.09	0.12	0.05	0.05	0.04	0.05
	(0.29)	(0.31)	(0.28)	(0.32)	(0.22)	(0.21)	(0.20)	(0.21)
Knowledge Intensive Services	0.32	0.29	0.33	0.26	0.48	0.40	0.43	0.38
	(0.47)	(0.45)	(0.47)	(0.44)	(0.50)	(0.49)	(0.50)	(0.48)
Non-knowledge Intensive Services	0.26	0.28	0.28	0.27	0.30	0.29	0.28	0.29
	(0.44)	(0.45)	(0.45)	(0.45)	(0.46)	(0.45)	(0.45)	(0.45)
Construction	0.09	0.11	0.09	0.12	0.02	0.03	0.02	0.03
	(0.29)	(0.31)	(0.29)	(0.33)	(0.13)	(0.16)	(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	0.11	0.07	0.07	0.06	0.09	0.17	0.15	0.18
	(0.31)	(0.25)	(0.26)	(0.25)	(0.29)	(0.37)	(0.35)	(0.38)
Observations	311,197	209,880	42,998	107,538	242,588	303,060	0.35	0.38

Notes: This table shows summary statistics of non-parents and parents who are aged between 25 and 39 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.

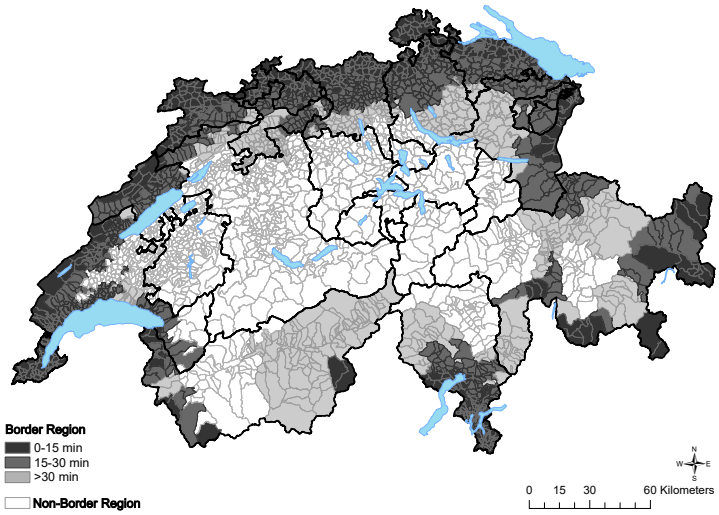
B Setting and Context

Table A3: 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 A1: The border and non-border region and travel distance to the border

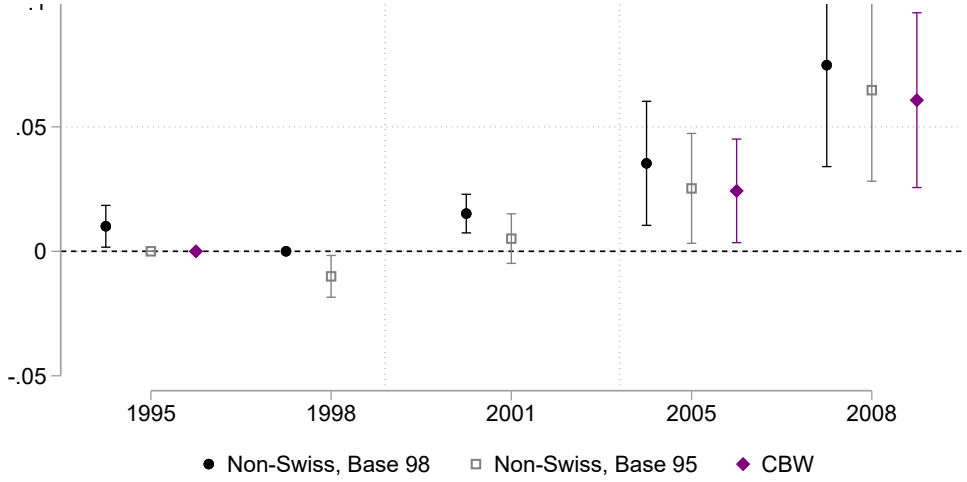


Notes: This figure depicts municipalities in the border region in three different shades of grey and those in the non-border region in white. Within the border region, we distinguish three regions according to their travel time by car to the nearest border crossing. The black lines denote cantonal borders.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

C Further Results

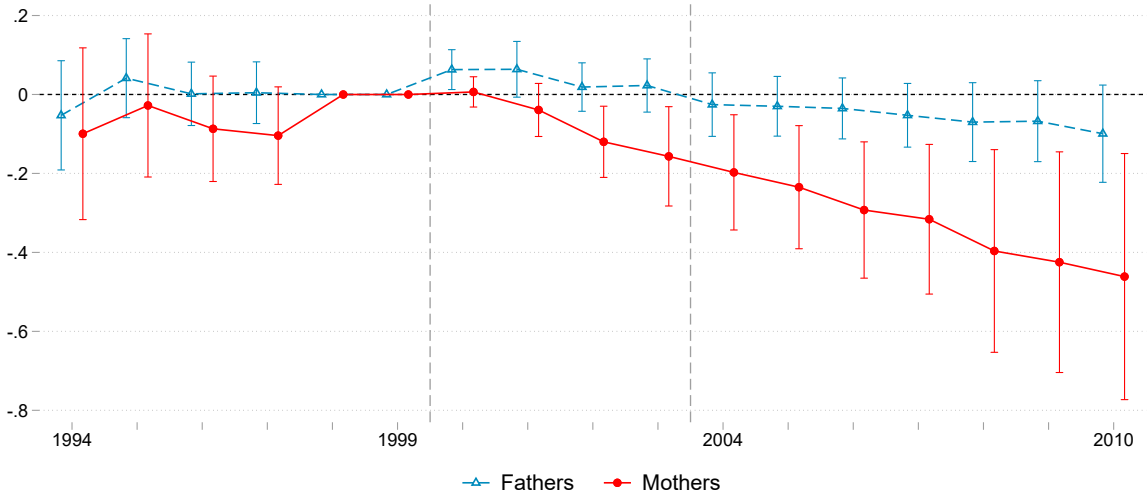
C.1 Additional results: First stage and main results

Figure A2: Reform Impact on Non-Swiss Workers and CBW



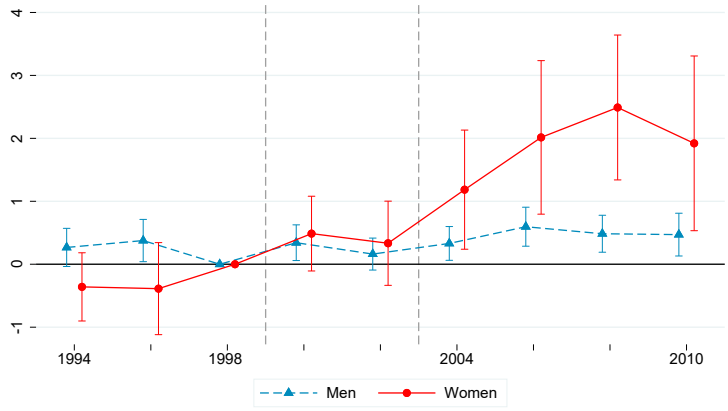
Notes: Estimates of Equation 1. The dependent variable is the municipal share of Non-Swiss or CBW workers, measured as the total number of Non-Swiss or CBW workers over total workers at baseline by municipality. Estimates reported with respect to 1998 as baseline (Non-Swiss, Base 98; same as Appendix 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 A3: Reform Impact on Earnings

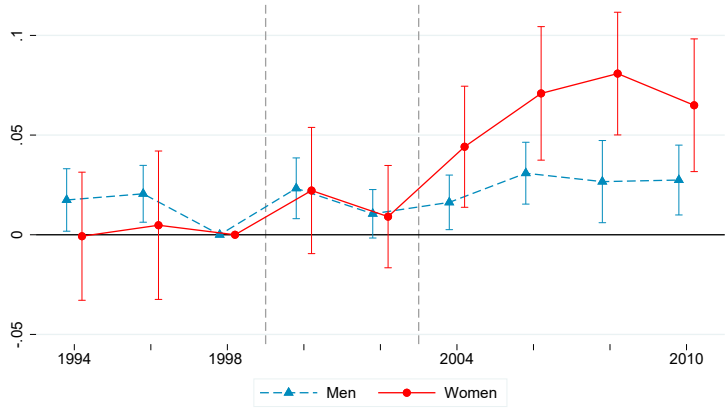


Notes: Estimates of Equation 1. This figure shows the effect of the reform on yearly earnings of mothers and fathers, unconditional on employment. The dependent variable is the inverse hyperbolic sine of yearly earnings across all employment spells. All regressions include municipality and year fixed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

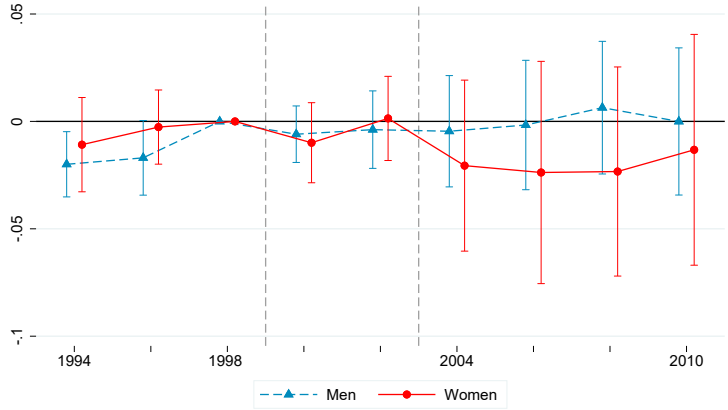
Figure A4: Reform Impact on Employed Women and Men



(a) Weekly Hours



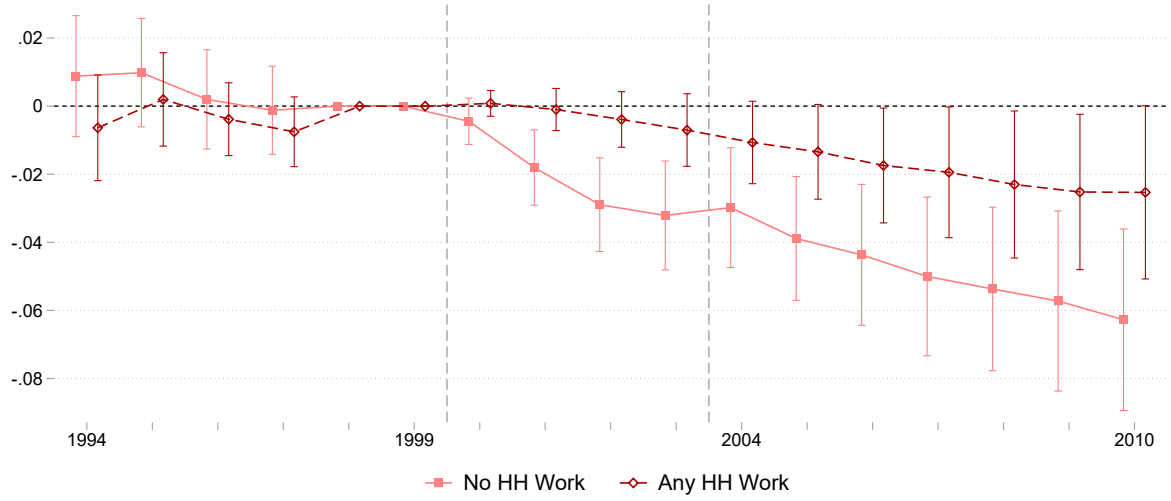
(b) P(Full-time)



(c) Hourly Wage

Notes: Estimates of Equation 1. The sample includes workers between 25 and 39 years old in 2000 who are on regular contracts (i.e., contracts not on an hourly basis). Panel a: Weekly Hours. Panel b: Indicator for working full-time (employment level > 90% of an FTE). Panel c: Log hourly wage. All regressions include municipality and year fixed effects. Standard errors are clustered at the CZ level. Based on SESS data.

Figure A5: Reform Impact on Labor Force Participation by Partners' Participation in Household Work



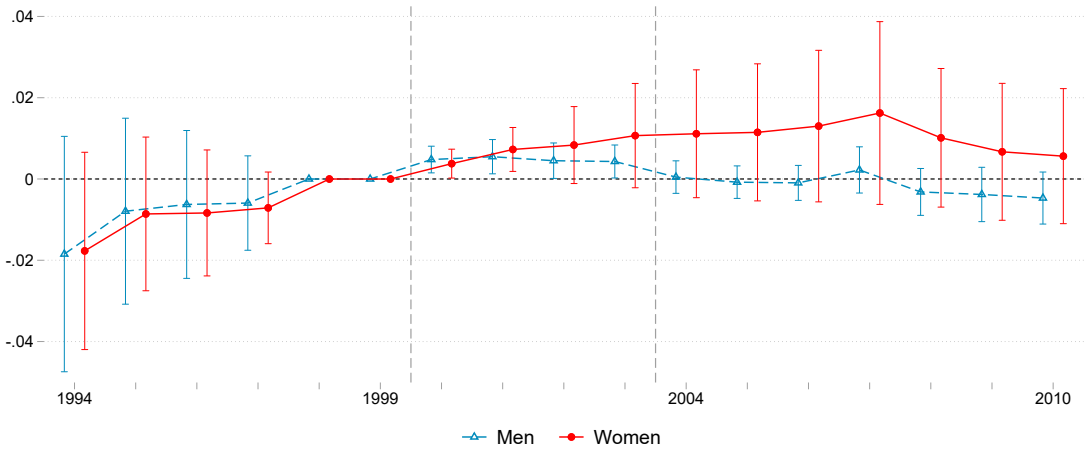
Notes: Estimates of Equation 2. The dependent variable is labor force participation in a given year. Heterogeneity by terciles of partner's involvement in household chores at baseline: Lower Tercile (Conservative), Middle Tercile (Mid), and Upper Tercile (Liberal). All regressions include municipality and year fixed effects, and individual level controls. Standard errors clustered at the CZ level. Based on social security data.

Table A4: Robustness: Reform Impact on Labor Supply, Industry and Occupation Fixed Effects

		Industry		Occupation		Learned Occupation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female * Free * Treat	–0.029***	–0.029***	–0.022***	–0.029***	–0.017***	–0.029***	–0.024***
	(0.008)	(0.008)	(0.001)	(0.008)	(0.001)	(0.008)	(0.001)
Female * Transition * Treat	–0.008*	–0.008*	–0.005***	–0.008*	–0.002**	–0.008*	–0.004***
	(0.005)	(0.005)	(0.001)	(0.005)	(0.001)	(0.005)	(0.001)
Male * Free * Treat	–0.008***	–0.008***	–0.005***	–0.008***	–0.005***	–0.008***	–0.006***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Male * Transition * Treat	–0.001	–0.001	0.002**	–0.001	0.001	–0.001	–0.000
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Without Missing Ind/Occ			X		X		X
Adj. R^2	0.148	0.234	0.099	0.205	0.088	0.152	0.149
Obs	8,207,040	8,207,040	5,575,312	8,207,040	4,968,928	8,207,040	6,765,360
Dep mean: Female	0.694	0.694	0.829	0.694	0.838	0.694	0.716

Note: Estimates of Equation 2 for mothers and fathers. This table shows the reform impact by reform period on labor supply controlling for industry or occupation fixed effects measured at baseline. 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 is average labor supply 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)

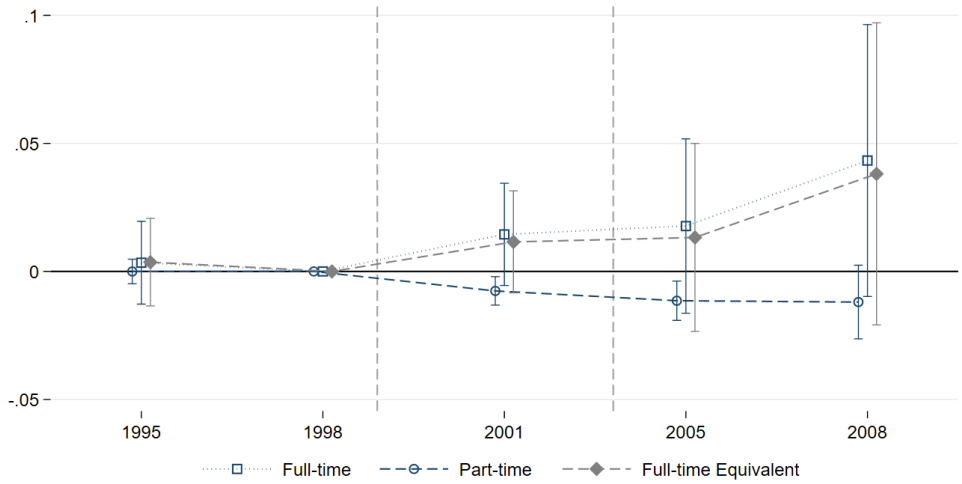
Figure A6: Reform Impact on Labor Force Participation for Men and Women without Children



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 39 and do not have a child at baseline. The dependent variable is an indicator for being in the labor force. 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.

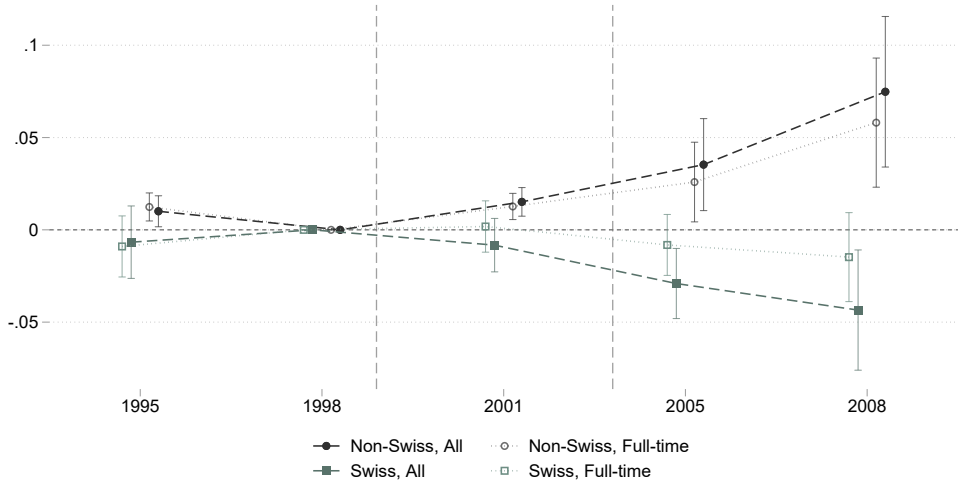
C.2 Mechanism

Figure A7: Reform Impact on Job Shares



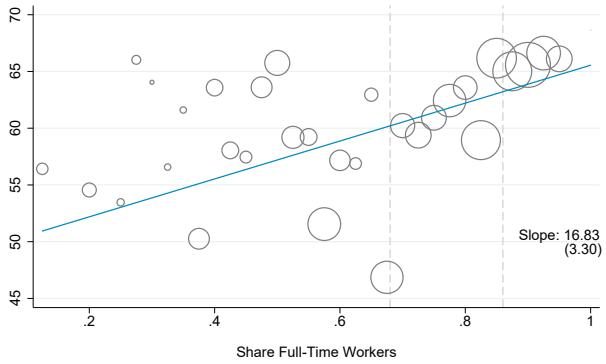
Notes: Estimates of Equation 1. Outcome is the number of workers in the relevant category in a municipality over total workers in 1998 in that municipality. Municipal observations weighted by total number of workers in 1998. All regressions include municipality and year fixed effects. Standard errors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

Figure A8: Reform Impact on Workforce Composition

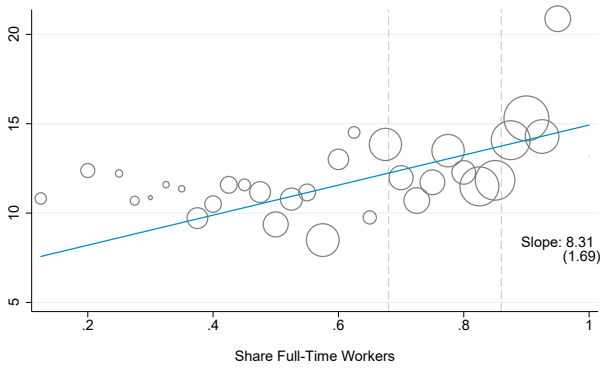


Notes: Estimates of Equation 1. Outcome is the number of workers in the relevant category in a municipality over total workers in 1998 in that municipality. Municipal observations are weighted by total number of workers in 1998. All specifications include municipality and year fixed effects. Standard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

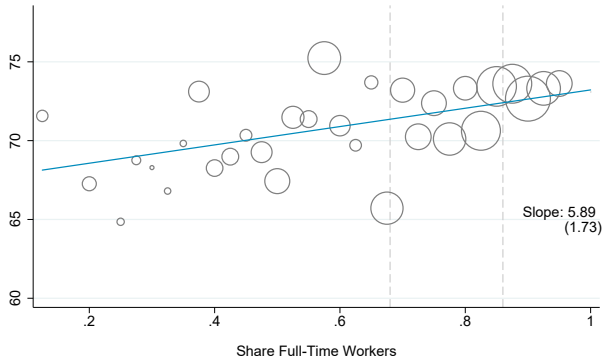
Figure A9: Industry-level Correlations: Measures of Workplace Organization (O*NET) and Prevalence of Full-Time Workers (Business Census)



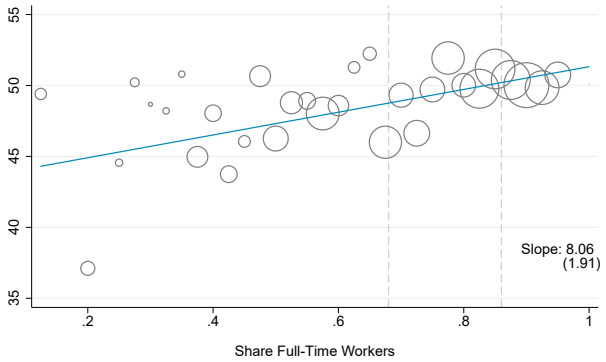
a) Duration of a Typical Work Week



b) Work Schedules



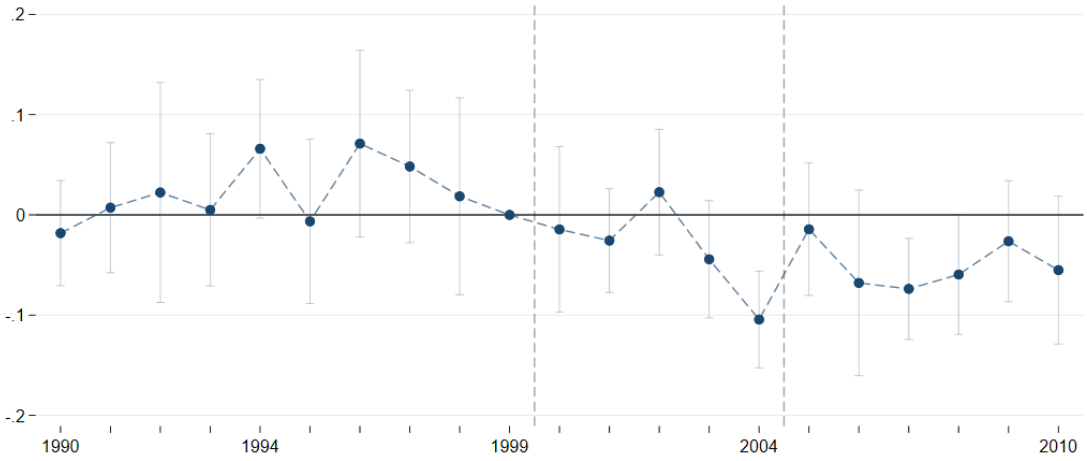
c) Time Pressure



d) Competition

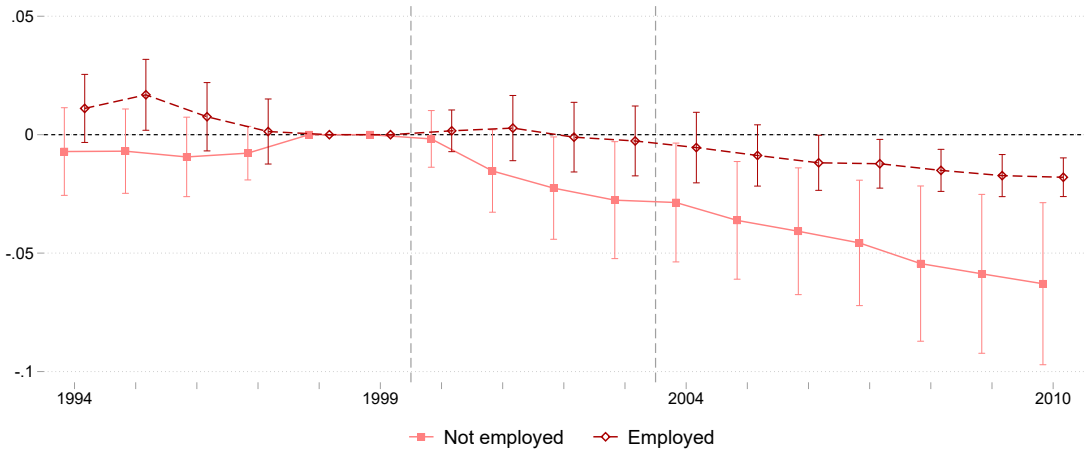
Notes: Binned scatter plots of standardized O*NET occupation measures and the share of full-time workers by five-digit industry. The O*NET measures are: Competitive pressure: To what extent does this job require the worker to compete or to be aware of competitive pressures? Work Schedules: How regular are the work schedules for this job? Based on Business Census data and O*NET.

Figure A10: 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 A11: Reform Impact on Labor Force Participation by Employment Status



Notes: Estimates of Equation 2 for mothers by whether they were in employment (Employed) or not in employment (Not employed) at baseline (1999). The dependent variable is an indicator for labor force participation. All regressions include municipality and year fixed effects, and individual level controls. Standard errors are clustered on the CZ level. Based on social security data.

Figure A12: Reform Impact on Log(Partner's Earnings)

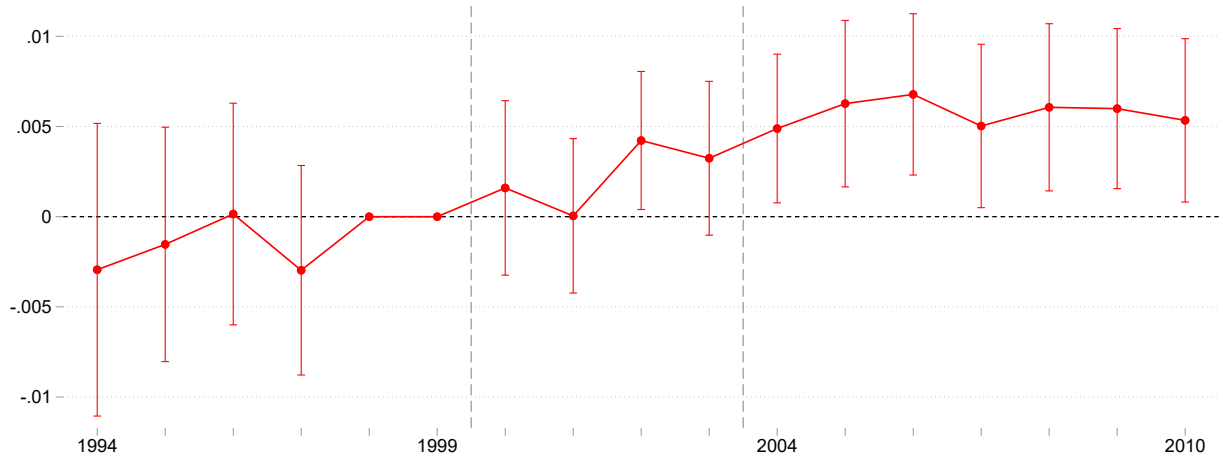
Notes: Estimates of Equation 1. Outcome is the log of partner's earnings in a given year for our main sample of mothers. The specification includes municipality and year fixed effects, and individual level controls. Standard errors are clustered at the CZ level. Based on social security data.

Table A5: Semi-Elasticity: Mother's Labor Supply and Partner's Earnings

	(1)	(2)	(3)	(4)
Log Partner's	–0.015***	–0.013***	–0.012***	–0.028***
Earnings	(0.002)	(0.001)	(0.002)	(0.002)
Individual FE		X	X	X
Adj. R^2	0.144	0.574	0.570	0.442
Obs	1,038,500	1,033,548	546,823	1,737,697
Dep mean	0.673	0.673	0.671	0.720

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 labor force 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 A13: Reform Impact on Likelihood of Giving Birth



Notes: Estimates of Equation 1. Outcome is an indicator for giving birth in a given year. 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 A6: Birth

	P(Birth)			In Labor Force	
Age:	All	≤ 35	> 35	≤ 35	> 35
	(1)	(2)	(3)	(4)	(5)
Free * Treat	0.007***	0.014***	–0.000	–0.015**	–0.046***
	(0.002)	(0.005)	(0.003)	(0.007)	(0.014)
Transition *	0.004	0.005	0.003	0.008	–0.027***
Treat	(0.002)	(0.005)	(0.002)	(0.010)	(0.008)
Adj. R^2	0.089	0.079	0.104	0.058	0.076
Obs	4,806,096	2,305,984	2,500,112	2,324,688	2,524,272
Dep mean	0.150	0.182	0.120	0.754	0.639

Note: 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 A7: Reform Impact on the Child Penalty

	Full Sample (1)	Omit 1998 (2)
Post * Treat * T = 0	–0.021*	–0.021*
	(0.012)	(0.012)
Post * Treat * T = 1	–0.020**	–0.026**
	(0.008)	(0.012)
Post * Treat * T = 2	–0.020***	–0.024***
	(0.007)	(0.008)
Post * Treat * T = 3	–0.021***	–0.020***
	(0.006)	(0.007)
Post * Treat * T = 4	–0.014**	–0.009
	(0.006)	(0.007)
Post * Treat * T = 5	–0.017***	–0.016**
	(0.006)	(0.006)
Post * Treat * T = 6	–0.012**	–0.010
	(0.006)	(0.006)
Post * Treat * T = 7	–0.015**	–0.012*
	(0.006)	(0.007)
Post * Treat * T = 8	–0.010	0.004
	(0.007)	(0.008)
Post * Treat * T = 9	–0.022***	–0.009
	(0.008)	(0.010)
Post * Treat * T = 10	–0.010	–0.007
	(0.010)	(0.010)
R^2	0.130	0.136
Obs.	2,284,918	1,411,185

Note: This table shows estimates of Equation 3. It displays the post-reform change in the child penalty in 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 3). 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 5.

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:

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

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

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

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

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

And the value of a full-time vacancy:

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

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:

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

This gives:

$$w(f,p) = \beta(a-c-z) + (1-\beta)rU(f)$$
$$w(p,p) = \beta(a-c-z) + (1-\beta)rU(p)$$
$$w(f,f) = \beta(a-z) + (1-\beta)rU(f)$$

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

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

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:

$$V(f) = 0 \tag{4}$$
$$V(p) = 0 \tag{5}$$

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 now move to compute the cost of posting a vacancy using the second equilibrium condition $V(p) = 0$ and the expression for J found above:

$$v = \frac{m(\theta)}{\theta}[\gamma(J(p,p)) + (1-\gamma)(\max\{J(f,p),0\})]$$
$$v = \frac{m(\theta)}{\theta}(\gamma\frac{(1-\beta)(a-c-rU(p))}{r+\delta} + (1-\gamma)\frac{(1-\beta)(a-c-rU(f)}{r+\delta}$$

Doing the same for $V(f) = 0$, we get:

$$v = \frac{m(\theta)}{\theta}[(1-\gamma)\frac{(1-\beta)(a-rU(f))}{r+\delta}]$$

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

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

We then compute $U(f)$:

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

In a next step, we compute the cost of posting a vacancy using that $V(f) = V(p)$ (since both are 0), and that $J(f,p) \geq 0$ (as we assume above that full-time workers take part-time jobs):

$$
\begin{aligned}
(1-\gamma)J(f,f) &= \gamma J(p,p) + (1-\gamma)J(f,p) \\
(1-\gamma)\frac{(1-\beta)(a-rU(f))}{r+\delta} &= \gamma\frac{(1-\beta)(a-c-rU(o))}{r+\delta} + (1-\gamma)\frac{(1-\beta)(a-c-rU(f))}{r+\delta} \\
(1-\gamma)(1-\beta)c &= \gamma(1-\beta)(a-c-rU(p)) \\
\gamma(a-c-rU(p)) - (1-\gamma)c &= 0
\end{aligned}
$$

Then, we use U(p) from above:

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

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

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

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

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

Plugging in the gray expression from above yields:

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