Minding Your Business or Minding Your Child? Motherhood and the Entrepreneurship Gap

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Abstract

Women are less likely than men to start firms and female entrepreneurs are less likely to succeed. This paper studies the effect of childbirth on women's entrepreneurial activity. Drawing on rich administrative data from Canada and using an event study and instrumental variable design, I show that childbirth has substantial negative effects on women's founding rates and start-up performance, accounting for a large portion of the gender gap in entrepreneurship. The effects are permanent: entrepreneurial outcomes never recover to their pre-birth levels. These results are not fully explained by household specialization based on labor market advantage. Childcare availability and progressive gender norms reduce the adverse effect of childbirth on the entrepreneurship gap.

Keywords: Entrepreneurship, gender gap, childbirth, household specialization, culture, childcare

JEL classification: G30, J13, J16, L26, M13

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1 Introduction

The surge in female labor market participation has been one of the greatest workforce transformations of the past century. In many countries, about half of the labor force is now female. Yet, women only make up one out of three entrepreneurs worldwide.[1] Entrepreneurship is vital for economic growth: young firms disproportionately create jobs and innovation, driving aggregate productivity dynamics.[2] The gender gap in entrepreneurship is, therefore, a pressing policy issue because it points to a large basin of untapped growth potential. It also points to an understudied source of wealth inequality, since wealth is highly concentrated in the hands of entrepreneurs (Quadrini, 1999; Smith, Zidar and Zwick, 2023).

This paper studies the effect of fertility shocks on women's entrepreneurial activity. Using an event study design around the birth of the first child and an instrumental variable approach, I find that childbirth has a substantial negative impact on women's start-up founding rates. In addition, children lead to a persistent deterioration in firm outcomes for female entrepreneurial firms. I analyze the role of different mechanisms, including specialization within the household, cultural gender norms, and childcare support networks, in explaining the results.

The effect of children on the entrepreneurship gender gap is ex ante ambiguous. In labor markets, mothers experience a large, permanent wage penalty: earnings trajectories between men and women diverge sharply upon childbirth, to never converge again. Entrepreneurship could represent an alternative career path for mothers, who could benefit from the additional flexibility and a better work-life balance than in paid employment. In addition, mothers could choose to become entrepreneurs to avoid discrimination in the workplace, where they might be perceived as less competent and committed to their careers than fathers or childless women and passed on for promotion opportunities (Goldin, 1990; Correll, Benard and Paik, 2007; Cuddy, Fiske and Glick, 2004). Therefore, in principle, children might decrease the entrepreneurship gap.[3]

[1] Source: Enterprise Surveys. Retrieved from The World Bank Gender Data Portal.

[2] See Schumpeter (1942); Haltiwanger, Jarmin, and Miranda (2013); Andrews et al. (2022).

[3] This hypothesis is consistent with the finding that an extension of job-protected maternity leave in Canada led to an increase in entrepreneurial entry among new mothers and with anecdotal evidence on the *mompreneurship* phenomenon (Gottlieb, Townsend and Xu, 2022).

On the other hand, entrepreneurs work longer hours than employees (Levine and Rubinstein, 2017), often with unpredictable schedules. Childcare duties might be hard to reconcile with the commitments of starting and growing a venture. The nature of entrepreneurship lies in the exploitation of time-sensitive opportunities that, if not seized promptly, can fade away. Entrepreneurship might be the quintessential *greedy job* (Goldin, 2014), wherein the substantial time demand and the specific job production function are a barrier for mothers aspiring to engage in entrepreneurial pursuits.

As founders' human capital is an irreplaceable asset for their firms (Becker and Hvide, 2022), delegating management tasks to a hired employee would only partially mitigate the impact. In addition, mothers might face similar prejudices from co-founders and investors as they face from employers in labor markets; thus, entrepreneurship might not represent an easy escape from potential discrimination.[4] Thus, motherhood could increase the gender gap in start-up founding rates; moreover, firm performance might suffer as a consequence of entrepreneurs' reduced available hours.

I develop a simple theoretical framework to illustrate the ambiguity surrounding the effect of childbirth on women's entrepreneurial participation and the resulting distribution of fertility: on one hand, entrepreneurship's flexibility may make it more attractive for mothers; on the other hand, if firms heavily depend on the founder's labor, may render entrepreneurship too costly. Thus, the effect of children on women's entrepreneurial activity is ultimately an empirical question. The model also speaks to the relationship between career choices and fertility. In careers, such as entrepreneurship, where compensation is closely linked to productivity and long hours are rewarded only women with a very high desire for children can justify incurring the career costs imposed by motherhood, with important consequences on aggregate fertility rates.

Studying the effect of motherhood on entrepreneurship requires panel data with information on children and firms, including ownership and financial data. I use the Canadian Employer-Employee Dynamics Dataset (CEEDD), a set of linkable files compiled from individual and corporate tax records by Statistics Canada. CEEDD contains demographic information and employment histories for the entire Canadian population,

[4] Hebert (2020) finds that financiers are biased against founders who operate in gender-incongruent sectors. While this evidence is not specific to prejudices against mothers, it supports the view that financiers are prone to stereotypes.

as well as detailed firm-level data. I link the T1 individual tax file to children data from the Canadian Child Tax Benefit.

Crucially, CEEDD can also be linked to T2 Schedule 50 (T2S50), a tax form containing information on firm ownership structure. The availability of ownership data allows me to correctly identify entrepreneurs, overcoming a common measurement issue in the literature, in which founders are typically proxied by the top wage earners in a start-up. Since business owners can decide to pay themselves a salary or dividends (or a mix of both), the measurement error introduced by ignoring dividend income could be substantial. In addition, the availability of data on ownership stakes allows me to precisely measure the payoff extracted from the start-up by each founder.

The main finding in this paper is that childbirth leads to a decline in women's entrepreneurial activity, both at the extensive and at the intensive margin. In my analysis of firm outcomes, I focus on firms that were founded at least one year prior to a woman's first birth to isolate firms that experience a shock due to childbirth. I run event studies around the birth event using as control group a matched sample of observationally similar firm-entrepreneur pairs in which the control women did not have children. I consider an array of performance measures. Throughout these analyses, I find that, after childbirth, entrepreneurial firms exhibit substantial negative effects across all outcome variables considered.

The effects are economically and statistically significant. In the five years following childbirth, sales decline on average by 21% , assets by 17%, and profit by 21%, relative to the control group. Entrepreneurial rents, i.e., the compensation that entrepreneurs draw from their firms in terms of wages and dividends, contract by 18%. The effects extend beyond mere downsizing. These firms become less profitable: profit margins and return on assets decrease by 6% and 7% respectively. Survival rates also dwindle, but the effect is quite modest. Over each year, there is an approximate 2.5% reduction in the likelihood of these firms remaining operational.

To shed light on the impact of children on the entrepreneurship gender gap, I conduct an alternative test comparing trajectories for firms owned by mothers and fathers. The event studies reveal an analogous pattern to the one observed using women without children as the counterfactual group: men and women are on parallel trends up to the year of childbirth, but they sharply diverge in the year in which the first child is born.

The magnitude of the effect is substantial, yielding a 24% gap in sales and a 22% gap in profits.

The event study approach around first childbirth has the advantage of capturing the overall treatment effect of all children in the population. However, it cannot fully address endogeneity concerns related to selection into parenthood beyond matching on observables. To address endogeneity concerns, I supplement the evidence with an instrumental variable approach. I use the sex of the first two children as an instrument for the birth of a third child. The sibling sex mix instrument, first proposed by Angrist and Evans (1998), is based on the idea that parents prefer a mix of both male and female children within their family; therefore, if a couple has two children of the same sex, parents are more likely to have a third child in the hopes that the new child will be of the opposite sex. The exclusion restriction requires that children's sex only affects entrepreneurial outcomes by changing preferences for family size (but has otherwise no independent impact).

Looking at dynamic effects around the third childbirth using the instrument, I find that having a third child affects start-ups owned by mothers, although the estimates are smaller than those associated with the birth of the first child, and recovery is noticeably faster. For instance, the impact on sales amounts to 14% in the year the third child is born, but firms recover by the third year. This exercise is especially useful for comparing the estimates obtained from the instrumental variable method with those from an event study around the birth of the *third* child. I show that the estimates of the effect of a third child are remarkably similar when using the instrumental variable and the OLS event study design, providing strong evidence that the event-study design is valid.

Young firms face substantial challenges as they make key strategic decisions and handle high levels of uncertainty. In the early stages, firms are more vulnerable to negative shocks and the role of the founder is critical for the company's success. I examine how the impact of children varies across firms at different stages of their life cycle and find that the effect is stronger for early-stage startups — those experiencing the shock when they are at most 5 years old —, underscoring the importance of the founder's human capital for these firms. To support this interpretation, I conduct a placebo test using childbirth events for female angel investors and find no effect.

Turning to heterogeneous effects depending on the timing of birth relative to indus-

try performance, I observe slightly larger short-term effects when women have children during periods of high sectoral growth, suggesting that they may forego potential business opportunities during industry booms. This observation, combined with the pro-cyclical nature of fertility, casts doubt on the hypothesis that women strategically time childbirth in anticipation of a decline in firm performance. Moreover, I restrict the sample to firms owned by entrepreneurs who delay childbirth until age 35 or later and founded their firms before they got married. In this subsample, in which fertility is lower and the timing of childbirth is more uncertain, I continue to find substantial declines in firm performance.

Up to this point, I have examined entrepreneurial outcomes for individuals who were already entrepreneurs before the birth event. But how does childbirth affect the probability of starting a firm in the first place? Are women more or less likely to become founders after they have a child? To answer this question, I expand the sample to all first-time mothers, regardless of whether they were ever entrepreneurs before having a child. I find a marked negative effect of childbirth on founding rates. The decline in start-up founding rates starts in the year before childbirth, consistent with an anticipatory effect of pregnancy. Soon-to-be mothers are 20% less likely to embark on a business venture than their childless counterparts; this effect peaks at 40% in the year of childbirth, gradually tapering off in the following years but never returning to pre-birth levels. The patterns remain remarkably similar using fathers as control group.

Examining the mechanisms behind the findings, I investigate whether they are driven by preferences, such as those regarding task allocation within the household, or frictions, such as limited support networks or childcare options. Using a sample of second-generation immigrants to Canada, I find that women from cultures with traditional gender norms tend to experience a larger impact on firm outcomes following childbirth. This suggests that cultural factors may influence women's preferences for increased childcare responsibilities. The results are reversed for fathers: men from traditional cultures experience *better* outcomes after having a child. This divergence is consistent with childbirth reinforcing entrenched gender norms, whereby fathers take on the provider role and increase their labor supply to the firm, while mothers take on more domestic and caregiving duties.

The findings about the role of culture suggest that the presence of children increases specialization within the household, raising the question of whether this specialization

is economically rational (with the spouse possessing a labor market advantage pursuing more work while the other spouse takes on childcare duties), or women consistently assume childcare responsibilities, regardless of their comparative advantage. To answer this question, I look into the role of breadwinner status before childbirth in explaining subsequent firm performance. I find that women who were primary earners in their households pre-childbirth have more favorable business outcomes post-event, consistent with rational household specialization; however, even female breadwinners experience sizeable dips in firm performance. In addition, couples with female main earners experience declines in household income after childbirth, while those with male breadwinners do not. If parents allocated work and childcare efficiently based on comparative advantage, the effect of children on family income should be similar irrespective of which spouse is the main earner. Thus, these results rule out that the decline in women's entrepreneurial activity after childbirth is fully explained by income-maximizing household specialization.

The results presented thus far underscore the importance of parental preferences, but the question remains as to whether childcare availability also influences entrepreneurial outcomes. To understand the role of support networks, I link mothers to their own parents through tax identifiers. Grandparents often play an important role as trusted caregivers; thus, proximity of a mother to her own parents might impact entrepreneurial outcomes through childcare provision. I find that women who live close to their own parents experience more favorable outcomes in their businesses after childbirth. This effect, however, does not extend to fathers, suggesting that the availability of a local support network primarily benefits mothers.

This paper fits withing the growing literature on the gender gap in entrepreneurship.[5] To the best of my knowledge, it is the first to study the role of childbirth in

[5]Supply-side explanations have emphasized the role of preferences and beliefs. Women's higher risk aversion could make entrepreneurship a less desirable career option compared to a regular job offering a more predictable income stream (Fossen, 2012; Caliendo, Fossen and Kritikos, 2014). Women might also discard entrepreneurship as a viable occupational choice because society views entrepreneurship as a stereotypically masculine activity (Yang and Aldrich, 2014; Yang and del Carmen Triana, 2019). Even when they do become entrepreneurs, women might be motivated by non-pecuniary career objectives, like reducing work-family conflict, rather than by the ambition to create the next billion-dollar venture (Burke, Fitzroy and Nolan, 2002; Looze and Desai, 2020). Demand-side factors focus on frictions and discrimination. Female entrepreneurs are less likely to raise financing, which is partly explained by investor biases (Guzman and Kacperczyk, 2019; Hebert, 2020). The problem is exacerbated in contexts in which investors are predominantly males, such as VC: male financiers show less interest in female-founded ventures and are less skilled in assessing their potential (Ewens and Townsend, 2020; Raina,

explaining the entrepreneurship gap, quantifying the effect of motherhood on women's entrepreneurial activities both at the intensive and extensive margin. This paper is closest to Yang, Kacperczyk and Naldi (2024), who find that, when child penalties in the labor markets are high, Swedish mothers are more likely to become entrepreneurs. This study is closest to to a small set of papers on reproductive healthcare and entrepreneurship. Zandberg (2021) finds a positive effect of abortion access on female entrepreneurship rates, driven by an increased probability of firm survival. Core (2020) studies the effect of emergency contraception on female bargaining power within founding teams and start-up performance. The positive effects of reproductive healthcare policies on female entrepreneurs are consistent with my findings. However, these papers focus on a reduction in the risk of unwanted pregnancies and therefore cannot speak to the aggregate effect of having children on the entrepreneurship gender gap. A second key difference is that my analysis relies on comprehensive administrative data, which allows an extensive analysis of the effect of motherhood on women's entrepreneurial endeavors and the mechanisms that drive them.

This paper is also related to the literature on the effect of fertility shocks on labor market outcomes.[6] I study the effect of children on women's careers in entrepreneurial labor markets and explore how family policies, such as childcare expansions, affect women's entrepreneurial activities. The peculiarity of this setting is that entrepreneurs, unlike workers, are not beholden to external workplace practices; instead, they have the autonomy to establish their own schedules and workplace rules. This setting provides a unique opportunity to study child penalties in an environment free from organizational policies. In addition, entrepreneurship's significance extends beyond individual careers. Given the role played by entrepreneurs in job creation and economic growth, the effects

2021). Another barrier women face when launching a business is the lack of female entrepreneurial role models in their social networks (Markussen and Røed, 2017).

[6]Child penalties account for most of the remaining gender gap in earnings, while differences in human capital between men and women have now largely disappeared (Kleven, Landais and Søgaard, 2019). But why are child penalties are so large and persistent, and what can we do to reduce them? Theories based on mothers' comparative advantage due to biological differences have little explanatory power (Kleven, Landais and Søgaard, 2021; Andresen and Nix, 2022); instead, cultural norms correlate strongly with child penalties (Boelmann et al., 2021; Kleven, 2022). The effectiveness of public policies, including parental leave and childcare subsidies, in mitigating gender inequality is debated: some studies find positive effects on female labor supply (e.g., (Baker, Gruber and Milligan, 2008; Andresen and Nix, 2022b)), while others find no effects, or small effects concentrated among single mothers (e.g., (Nollenberger and Rodríguez-Planas, 2015; Kleven et al., Forthcoming)).

of childbirth on entrepreneurial firms can have a multiplier effect. For example, it could make it riskier for employees to accept jobs in firms founded by young women, who will therefore find it harder to recruit high-skill workers.

2 Data

For my analysis I use the Canadian Employer-Employee Dynamics Dataset (CEEDD), a dataset compiled by Statistics Canada from several administrative sources. The T1 personal tax file contains individual demographic and financial characteristics, such as birth year, gender, family structure, and total income. The T2 corporate tax file includes firm financial statements, location, and industry classification for all corporations in Canada. The T2 corporate tax file can be linked to Schedule 50 (T2S50), a tax form containing information on firm ownership structure. Private Canadian-controlled corporations are required to file a Schedule 50 form to disclose the identity of all owners with a stake of 10% or more of common or preferred shares.[7] The T4 statement of remuneration file contains job-level information including annual employment income received by each individual worker from each employer. Combining the T2 Schedule 50 and T4 file, I can accurately identify entrepreneurs and measure returns to entrepreneurship.

To identify birth events, I link individual tax files to a supplemental file containing information on children's date of birth. Data on children is collected by Statistics Canada from the Canadian Child Tax Benefit, a federal income-tested program supporting families, and a file of births. Finally, I link individuals to immigration records from the Longitudinal Immigration Database compiled by Immigration, Refugees and Citizenship Canada, the Government department responsible for immigration. This file contains information on all individuals who obtained their permanent residency status in Canada since 1980, including their country of origin and year of arrival. Using the countries of origin of first- and second-generation immigrant entrepreneurs allows me to accurately determine their cultural background. This method differs from previous studies that relied on name-based inferences of CEOs' cultural heritage, eliminating the potential for measurement errors.

[7] Schedule 50 reports information on direct shareholders, which can be individuals or other corporations. When a firm has corporate owners, Statistics Canada reconstructs the ownership chain to identify the ultimate individual owners.

The sample covers the period from 2001 (the first year in which Schedule 50 on firm ownership is available) to 2017. I restrict the parents' sample to individuals who had their first child during the sample period. In addition, I restrict the firms' sample to start-ups that were created during the sample period and had positive sales within the first 5 years since founding. I define entrepreneurs as start-up owners holding at least 20% [8] of firm shares in the first year in which ownership is reported, as long as the ownership structure is reported within 3 years since founding.[9] In my firm-level analysis, I exclude start-ups created by spouses (married and cohabiting couples) to disentangle the effect of childbirth on firms owned by fathers and mothers respectively.

Defining who is an entrepreneur is a debated issue among entrepreneurship scholars. There is no consensus on whether the definition should include all, or a subset, of the self-employed. I focus on individuals who start incorporated firms because incorporation might be a better proxy of entrepreneurship than overall self-employment (Rubinstein and Levine, 2020). Most unincorporated self-employed have little ambitions to grow their businesses, whereas incorporation is most apt for undertaking high growth potential investments, thanks to limited liability and a separate legal identity. (Levine and Rubinstein, 2017) show that individuals choose the legal form of their firm based on the nature of the planned business activity; they rarely switch legal form ex post based on the success of their ventures.

3 Empirical Methodology

Fertility shocks are not random events. Ideally, an econometrician would want to randomly assign children to individuals and compare entrepreneurial outcomes between parents and non-parents. Because this is an impossible experiment[10], I use a quasi-

[8] Results are robust to using alternative ownership thresholds.

[9] I adopt this rule because co-founders can opt to split the equity at a later time rather than immediately upon funding. Postponing the decision has some advantages: it allows founders to learn about each other's skills and contributions, avoiding costly ex-post renegotiations (Wasserman, 2008).

[10] The closest approximation to this ideal experiment is Gallen et al. (2023), who exploit the failure of long-term contraception as an exogenous shock to pregnancy timing. They find that unplanned pregnancies lead to large earning penalties. Their estimates are similar to those obtained from event studies using observational data on all births. Conversely, they find smaller penalties using in vitro fertilization (IVF) success as an instrument for planned pregnancies. However, they show that women who undergo IVF unsuccessfully (the control group) also experience earning losses, suggesting that infertility itself could negatively impact earnings and the instrument might underestimate the effect of planned pregnancies.

experimental approach based on event studies around the birth of the first child. The identifying assumption is that the sharp divergence in entrepreneurial outcomes between mothers and their control group around first childbirth is orthogonal to unobserved determinants of fertility decisions, which should evolve smoothly over time. I address threats to identification due to selection into motherhood by using different control groups and an instrumental variable design, as detailed below.

The first approach I use is to match firms owned by mothers to firms owned by women with zero observed lifetime fertility. Section 3.1 describes the matching algorithm. Using women without children as control group has the advantage of eliminating concerns regarding unobservable differences between men and women. The second approach is to compare entrepreneurial outcomes for mothers and fathers, as described in Section 3.2 This comparison is informative about the effect of childbirth on the entrepreneurship gender gap. In addition, restricting the sample to parents helps mitigate the concern that people who choose to have children might be different from non-parents along some unobservable dimension which also determines entrepreneurial entry and success. Finally, I use the sex of the first two children as an instrumental variable for the birth of a third child, as detailed in Section 3.3. I show that estimates from an event study around the birth of the third child and from the instrumental variable approach are very similar.

One might argue that fertility can be timed strategically and wonder how pregnancy planning might affect the interpretation of the findings. For example, entrepreneurs might decide to have children after their start-ups have reached certain milestones. This would imply that their firms exhibit accelerated growth before pregnancy. I show that firms owned by mothers do not grow faster (or more slowly) in the years before pregnancy; instead, they are on identical trends to control firms up until childbirth and sharply diverge afterwards. Even though fertility can be planned, there is a degree of unpredictability regarding the exact timing of pregnancy and childbirth; at the same time, future entrepreneurial opportunities and start-up outcomes are uncertain at the time of fertility decisions.

To reduce concerns related to selection biases, I verify that results are robust to restricting the sample to women who are close to the end of their child-bearing age, for whom pregnancy is costlier to postpone and pregnancy timing is harder to predict. I find that the results are similar for this sample. This supports the identifying assumption

that the sudden drop in women's entrepreneurial activity observed upon childbirth is caused by the fertility shock, rather than by mothers planning the timing of childbirth with perfect foresight of future entrepreneurial outcomes.

3.1 Mothers vs. childless women

In this section, I restrict the analysis to women, matching mothers to observationally similar women with zero observed lifetime fertility. I use a caliper matching algorithm without replacement to construct the comparison sample. In matching estimators terminology, I use exact matching on year, marital status, and Census Metropolitan Area, together with caliper matching on age, individual income percentile, and family income percentile (with calipers of 1 year and 3% respectively). The matching is performed two years before childbirth.

To study the evolution of firm entry rates following childbirth, I estimate the following specification:

$$Y_{it} = \sum_{\tau \neq -2} \alpha_\tau \mathbb{I}[\tau = t] + \sum_{\tau \neq -2} \beta_\tau \mathbb{I}[\tau = t] \cdot \mathbb{I}[mother] + \gamma X_{it} + \mu_i + \mu_s + \epsilon_{it}, \tag{1}$$

where Y_{it} is equal to 1 if individual i starts a firm in event year t. The regression equation includes a set of indicator variables for event times and their interaction with an indicator for mothers. The coefficients of interest, β_τ, measure the effect of children relative to event time $t = -2$ (the last year in which individuals do not know that they will have a child at $t = 0$). The set of covariates X_{it} includes age dummies to control for life-cycle trends and marital status. Finally, μ_i and μ_s represent individual and time fixed effects, respectively.

Next, I turn to the effect of childbirth on firm outcomes. For entrepreneurs, I use exact matching on firm industry at the 4-digit level, year, founder status, and marital status, with caliper-matching on firm age and entrepreneur's age, using calipers of 1 and 5 years respectively. I match firms two years before childbirth, or one year before childbirth for firms that were founded the year before giving birth. Firms owned by spouses are excluded. I estimate the following firm-level equation:

$$Y_{ft} = \sum_{\tau \neq -2} \alpha_\tau \mathbb{I}[\tau = t] + \sum_{\tau \neq -2} \beta_\tau \mathbb{I}[\tau = t] \cdot \mathbb{I}[\text{mother}] + \gamma X_{ft} + \mu_f + \mu_{kps} + \epsilon^{ft}, \tag{2}$$

where Y_{it} is a firm outcome for firm f in event year t. The set of control variables X_{ft} includes firm age indicators, number of owners, a polynomial for entrepreneur's age, and marital status; μ_f and μ_{kps} denote firm and industry-province-year fixed effects, respectively. Finally, ϵ_{ft} is the error term, which I cluster at the firm level.

3.2 Mothers vs. fathers

Following Kleven, Landais and Søgaard (2019), I restrict the sample to individuals who have their first child during the sample period at event time $t = 0$. Let Y^g_{ist} denote an outcome for individual i of gender $g \in \{m, w\}$ in year s at event time t. I estimate the following equation separately by gender:

$$Y^g_{it} = \sum_{\tau \neq -2} \alpha^g_\tau \mathbb{I}[\tau = t] + \sum_k \beta^g_k \mathbb{I}[k = age_{is}] + \sum_z \gamma^g_z \mathbb{I}[z = s] + \epsilon^g_{it}. \tag{3}$$

The regression equation includes a set of indicator variables for event time, age, and calendar year. The coefficients of interest, α^g_τ, measure the effect of children relative to event time $t = -2$ (the last year in which individuals do not know that they will have a child at $t = 0$). The age dummies are included to control for life-cycle trends, also accounting for the fact that, on average, women become first-time parents at a younger age than men. Finally, the year indicators control for macroeconomic trends. To ease interpretation, I express the level effects estimated in Equation (1) as percentage effects, as follows:

$$P^g_t \equiv \frac{\hat{\alpha}^g_t}{\mathbb{E}[\tilde{Y}^g_{ist}|t]},$$

where $\tilde{Y}^g_{ist}$ is the predicted outcome for individual i omitting the event time indicators. Thus, P^g_t equals the impact of childbirth at event time t, as a fraction of the average counterfactual outcome without children. The differential effect of children between men and women, $P^m_t - P^w_t$, is the child penalty.

Next, I augment Equation (1) to estimate the effect of childbirth on firm-level outcomes. I restrict the sample to a panel of start-up founders who have their first child during an entrepreneurship spell which lasted for at least 2 years between $t = -2$ and $t = 0$. I exclude firms jointly owned by spouses, to avoid confounding the effect of childbirth on mothers and fathers. I estimate the following firm-level equation for men and women

separately:

$$Y_{ft}^{g} = \sum_{\tau \neq -2} \alpha_{\tau}^{g} \mathbb{I}[\tau = t] + \beta^{g} X_{ft} + \mu_{f} + \mu_{ks} + \epsilon_{ft}^{g}, \tag{4}$$

where Y_{ft}^{g} is an outcome for firm f owned by individual i of gender g in event time t and calendar year s (I drop the subscripts is to save on notation). X_{ft} is a vector of individual and firm-level control variables, including a polynomial for entrepreneur's age, marital status, firm age dummies, and the number of firm owners (team size proxies for how "dependent" the start-up is on the founder who has a child). I include firm fixed effects, μ_f, to control for time-invariant firm characteristics: thus, the estimates only rely on within-firm variation over time. Finally, μ_{ks} denotes industry-by-year fixed effects, which capture industry-specific trends, and ϵ_{ft}^{g} is the error term, clustered at the firm level.

3.3 Instrument: sibling sex mix

As identification strategy to address the potential sample selection issues stemming from the endogeneity of childbirth, I compare estimates from an instrumental variable approach to estimates from an event study. I use the sex of the first two children as an instrument for the birth of a third child as in Angrist and Evans (1998). This approach relies on parents' preference for variety in the sex mix of their children: a couple who had two boys or two girls is more likely to have a third child than a couple with one child of each sex. The instrument estimates the local average treatment effect (LATE). This can be interpreted as the average effect of the treatment for compliers, i.e., for individuals who had a third child only because the first two children were of the same sex.

For this instrument to be valid, it needs to be as good as randomly assigned and to satisfy the exclusion restriction, requiring that children's sex has no independent impact on entrepreneurial outcomes.[11] These assumptions cannot be tested directly. However, I show that women who had two same-sex children are observationally similar to women

[11] An additional assumption, which is sometimes overlooked, concerns defiers —individuals who are *negatively* affected by the treatment. In this setting, defiers are individuals who prefer a particular sex, so that having two boys or two girls decreases the probability of having a third child. Unlike Dahl and Moretti (2008) in the United States, I do not find that parents in Canada have a systematic preference for boys during the sample period I examine. De Chaisemartin (2017) shows that it is possible to identify causal estimates under weaker assumptions than the absence of defiers and that the sufficient conditions are likely to hold in the context of the sibling sex mix instrument.

who had two opposite-sex children, supporting the random assignment assumption. One could argue that children's sex might directly affect entrepreneurial outcomes in various ways; for example, women might invest more time or financial resources into raising children of a particular sex. I do not find evidence that women's entrepreneurial behavior is affected by children's sex (which would violate the exclusion restriction). I show that entrepreneurial outcomes do not differ between women who had a male or female first-born.

I restrict the sample to women who had their first child during the sample years and had at least two children *by the end of the sample period* (therefore, in a given year, they might have no children or one child and still be part of the estimation sample). Again, I estimate the dynamic effect of having a third child following Kleven, Landais and Søgaard (2019). I use the following specification:

$$Y_{ft} = \sum_{\tau \neq -2} \alpha_\tau \mathbb{I}[\tau = t] + \gamma X_{ft} + \mu_f + \mu_{ks} + \epsilon_{ft}, \tag{5}$$

where Y_{ft} is an outcome for firm f. Indicator variables $\mathbb{I}[\tau = t]$ denote event times relative to the birth of the third child. Each indicator is instrumented by the interaction $\mathbb{I}[\tau = t] \times \mathbb{I}[\text{same sex}]$, where $\mathbb{I}[\text{same sex}]$ is equal to 1 if the first two children are of the same sex. In addition to controls included in previous specifications, control variables include binned event time indicators around the birth of the second child and an indicator for whether the entrepreneur already had their first child. I include firm and industry-year fixed effects.

Next, I replicate the analysis using OLS rather than 2SLS. The purpose of this exercise is two-fold. First, it allows me to assess the external validity of the instrumental variable approach. Recall that the IV yields the effect on compliers, while OLS estimates the effect on all the treated. Thus, finding similar estimates suggests that external validity is upheld; in other words, the effects observed among compliers are likely to be generalizable to a broader population. Second,this comparison strengthens the credibility of using event studies centered around child birth as a method for identification.

4 Results

4.1 Firm outcomes

Figure 3 presents results for the effect of childbirth on firm outcomes. Panel (a) shows the evolution of firm sales. Businesses owned by mothers and by women without children are on parallel trends until the year just before childbirth. However, a sharp divergence occurs when entrepreneurs have their first child. At this juncture, businesses managed by mothers see a substantial decline in sales, exceeding 20%. Even after a five-year period, these businesses do not fully bounce back, as they still feature a 15% shortfall.

Similar patterns emerge for several different measures of firm performance. Panel (b) focuses on assets, which exhibit an average decline of approximately 18%. Moving to firm profits (i.e., net income) in panel (c), we observe an abrupt initial decline of about 27% in the year of childbirth. While there's a slow recovery in the following years, profits remain down by 17% after five years. Entrepreneurial rents, representing the compensation entrepreneurs receive in terms of wages and dividends, drop by 20% in the year of childbirth. To ensure these findings are not merely a result of downsizing, I also examine the effect on profit margin and returns on assets: both these metrics show an average decline of around 7% in the five years following childbirth.

Next, I turn to firm survival. Figure 4 shows that motherhood reduces the probability of firm survival relative to firms owned by non-mothers. However, in contrast to the substantial impact seen in other firm outcomes, this effect is relatively modest, hovering around 3-4%. This result highlights how firm survival, while commonly used in prior literature to assess entrepreneurial performance, is an inadequate measure: these firms may stay in business but exhibit signs of stagnation in terms of sales, profitability, and other key metrics. One potential explanation for the persistence of these firms, even in the face of substantial declines in various outcomes,is that mothers have a low opportunity cost of keeping their ventures operational. Given the pervasiveness of child penalties in the labor market, the option of returning to traditional paid employment might not appear significantly more attractive than continuing to operate their businesses. Alternatively, some women might highly value the flexibility and control that entrepreneurship affords them, which could outweigh the challenges they encounter.

A clear pattern emerges in the main results presented so far – firms downsize and

their performance deteriorates. I now turn to analyzing heterogeneity to better understand which firms are driving the results. In Figure 5 I look at firms' life cycle. In Panel A, I expand the sample to include firms of all ages, irrespective of whether the owner is also the founder. In Panel B I focus on startups experiencing the motherhood shock when they are at most 5 years old. Finally, Panel C shows results for mature firms, which are older than 5 when the entrepreneur experiences her first childbirth. While the overall pattern of performance decline holds for firms of all ages, it is stronger among young startups. For instance, looking at firm sales, we observe an immediate drop of 25% in the year of childbirth for young startups, which is more than double the decline experienced by older firms, standing at 11%.

The fact that effects are concentrated in young startups confirms the importance of founders' human capital for nascent firms. These fledgling businesses rely heavily on the founder's active involvement and dedication to build their competitive edge. To corroborate the key role of the founder's human capital in explaining these findings, Figure 6 presents the results of a placebo test involving angel investors. Angel investors are defined in this context as individuals who neither receive wage compensation from the firm nor hold founder status, being absent from the initial ownership structure or owning less than 20% of the firm's initial capital. The results reveal no significant effect on any firm outcomes in the aftermath of childbirth for angel investors, implying that the documented shifts in firm outcomes are unlikely to be attributed to investment patterns but rather to the central contribution of founders' skills and knowledge to their ventures.

Figure 7 analyses how business cycles influence entrepreneurial performance post-childbirth. Ex ante, it is not obvious whether the effects on firm outcomes should be more pronounced when childbirth coincides with a boom or bust. The opportunity cost of having a child during a boom might be higher, making entrepreneurs miss out on fleeting opportunities and rapid market expansion. Conversely, in the midst of a bust, the demands on founders to keep their ventures afloat might intensify, as navigating a contracting market could require a more substantial allocation of the founder's attention and resources.

I define booms as periods where industry sales growth ranks in the upper tercile of all industry-years and busts, analogously, as periods of growth in the lower tercile. I use only firms owned by male entrepreneurs to construct the terciles, to avoid introducing a

mechanical link between the effect of childbirth and industry performance. I find evidence in favor of the first hypothesis: the short-term effects are stronger for women who have their first child during an industry expansion. For instance, in the immediate aftermath (year 0 and 1), sales exhibit a decline of 30% for women who become mothers during an industry boom, in contrast to the 20% decline during a bust. Assets and ROA follow a similar pattern, dropping respectively by 20% and 13% during industry expansions, in comparison to the 9% and 7% decline observed during contractions.

Figure 9 focuses on women who gave birth at the age of 35 or older and were not married or cohabiting when they first founded their startups. For this subgroup, the timing of their pregnancy is arguably more unpredictable. First, the window of opportunity for family planning narrows as women age, resulting in less flexibility to time their pregnancy based on their business outcomes. Second, conception tends to require more time for women in this age bracket. Women between the ages of 35 and 39 experience a 50% reduction in the likelihood of spontaneous conception compared to women aged 19 to 26. In addition, the probability of complications also increase with age: miscarriage rates reach 27% at 40 (Taylor, 2003; Delbaere, 2020).

Focusing on this group helps mitigate reverse causality concerns, specifically the notion that women strategically time childbirth in anticipation of impending declines in firm performance. While it is challenging to entirely eliminate the potential for reverse causality, the scenario in which women accurately predict drastic downturns in firm performance in the subsequent year and opt for family planning as a response appears implausible. This is especially true considering the unpredictability of conception for women within this age bracket. In addition, under the hypothesis that the prediction of a decline in performance leads to having children, the anticipated decline would need to be idiosyncratic, because the inclusion of industry-province-year fixed effects absorbs industry-related shocks. For this group, I find that short-term effects are larger than for the overall population (for example, sales drop by 30% and profits by 32%), potentially reflecting the increased physical demands associated with delayed childbirth.

In Figure C.1, I study the impact of childbirth on firm outcomes without conditioning on survival. I impute zeros for all firm outcomes in cases where the firms cease operations and use the inverse hyperbolic sine of the outcome variables in place of log-

arithm[12]. Using this approach, I continue to find significant negative effects across all outcome variables. Next, in Figure C.3, I show that the findings are not sensitive to the matching procedure used. I create an alternative control group by randomly assigning placebo birth events to women who never actually have children, drawing from the distribution of age at first childbirth among those who eventually become mothers. The parallel trends assumption continues to hold and the impact of childbirth on all examined firm outcomes is negative, albeit this approach slightly underestimates the effect size compared to the matched sample.

As an alternative to using women without children as a control group for mothers, I follow Kleven, Landais and Søgaard (2019) and employ fathers as a counterfactual group. This approach, commonly used in studies on the child penalty, is based on the premise that fathers provide a suitable counterfactual group for mothers since they experience parenthood but do not undergo the physiological and career disruptions associated with childbirth. It's worth noting that since we lack a corresponding control group for fathers, we cannot draw direct conclusions about the impact on men themselves. I show results in Figure 10. During the years leading up to childbirth, coefficients for both men and women are not statistically different from each other, indicating similar trends prior to childbirth.

The estimated effects on firm outcomes are remarkably similar in magnitude when using fathers as the control group, as compared to using women without children. For instance, using women as the control group, we observe a 22% drop in sales during the year of childbirth and a peak decline of 28% in the following year. Using fathers as the control group, the results are almost identical: we see a 21% decrease in year 0 and a 28% decrease in year 1. Similarly, when examining assets, the effect is approximately 12% in year 0 and 17% in year 1 using women as the control group, while using fathers yields estimates of 11% and 15%, respectively.

[12]The inverse hyperbolic sine is defined as $\text{IHS}(x) = \ln\left(x + \sqrt{x^2+1}\right)$. It approximates the log transformation for small values but is also defined for $x \leq 0$.

4.2 Entry into entrepreneurship

How does motherhood impact women's likelihood of becoming entrepreneurs? Figure 11 presents an event study that tracks firm entry surrounding childbirth, using a matched sample of childless women as a control group. While the adverse effects on firm outcomes primarily appear after childbirth, the decline in entrepreneurship entry begins in the pregnancy year, during which soon-to-be mothers are 19% likely to found a business than women without children. This effect intensifies in the birth year, reaching its peak of 42%, and subsequently tapers off, albeit without reverting to pre-birth levels.

I replicate the analysis using fathers as a control group in Figure 12. I estimate separate regressions for mothers and fathers. Much like the findings related to firm outcomes, there is a remarkable similarity in both the magnitude and pattern of the estimates when fathers are used as the comparison group instead of women without children. We again see an anticipation effect in the year before childbirth, which translates into a decline in entry rates of 15% for mothers relative to fathers. The gap grows to 36% in the year of childbirth before gradually receding in the following years. In the main sample I exclude firms co-owned by spouses. In Panel (b) I include these firms and assign them to the spouse with majority ownership; the results are unvaried.

5 Mechanisms

In the previous section, I have presented evidence that childbirth affects entrepreneurial entry rates and firm performance. In this section, I delve into the underlying mechanisms to understand whether these outcomes primarily stem from maternal preferences, driven, for instance, by the desire to assume the dominant caregiving role for their children, or by frictions, where limited childcare alternatives compel mothers into this position. I study the role of cultural influences, household structure, and the availability of childcare, both formal and informal.

5.1 Culture

A large literature in economics has studied culture, defined a set of shared values, beliefs, and preferences that influences the behavior of individuals within a particular society or group, which remain persistent from generation to generation (Guiso, Sapienza and

Zingales, 2006; Alesina and Giuliano, 2015; Boelmann et al., 2021). Gender norms are a subset of cultural norms that specifically pertain to the expectations associated with individuals based on their gender. Cultural values related to gender roles can have far-reaching effects, impacting the division of labor within households, influencing individuals' career choices by prescribing which professions are suitable for men and women, and affecting investment in human capital. In cultures where men are perceived as the primary earners, families may prioritize investing in the education of sons over daughters.

Gender norms can exert substantial pressure on women to align with traditional caregiving roles post childbirth, perpetuating the archetype of the "good mother" as one who prioritizes childcare over career advancement. In cultures where traditional gender norms are particularly entrenched, women may encounter societal disapproval if they opt to continue their careers without a substantial caregiving hiatus. In this section, I examine whether the effect of childbirth on women's entrepreneurial outcomes can be attributed to cultural preferences related to gender norms.

The *epidemiological approach* attempts to disentangle the effect of culture from the effect of the institutional environment by studying immigrants and their descendants. The idea is that immigrants to a given country face the same economic environment, but they carry the cultural values of their home countries to the host country (Fernández, 2011). Canada, with its large immigrant population and its long history of supporting cultural diversity, represents an ideal setting. During my sample years, about 20% of the population of Canada was made up of immigrants. In addition, the composition of the immigrant population is diverse and has changed over time: in the past, the majority of immigrants came from Europe, while today most immigrants are Asian, with an increasing share represented by Africans. As an initial illustration of the findings, I present case studies for a number of immigrant groups. In Figure xx, I show results for firm outcomes, focusing on sales. The two largest immigrant source countries, China and India, exhibit substantial heterogeneity: after childbirth, the gap in firm sales between firms owned by Indian male and female entrepreneurs is very large, at 29%; in contrast, the figure is virtually zero for Chinese immigrants. Because the firm sample is much smaller than the individual-level sample, I group other countries by geographical regions. For immigrants from the Middle East and North Africa, the impact of childbirth on the gap in firm sales lies between the pronounced disparity seen for Indians and the null

effect among Chinese, at around 23%. This figure is comparable to the gap observed for Latin American immigrants. European countries, again, show considerable disparities: Northwestern Europe shows a modest and statistically insignificant effect of 7%, smaller than Southern Europe (14%, though imprecisely estimated) and Eastern Europe, (25%).

Next, I focus the analysis on second-generation immigrants, i.e., individuals who were born in Canada but whose parents were born abroad (in Canada these individuals are Canadian citizens since birth, thus, they are more properly referred to as second-generation Canadians). This approach offers several advantages compared to studying first-generation immigrants. Second-generation individuals typically have a stronger command of the host country's language and more exposure to its education system and labor market; in addition, they did not have a direct choice in the immigration decision, which was made by their parents (Fernández, 2007).

To measure gender norms by country of ancestry, I rely on data from the World Values Survey (WVS), a large-scale international research project that examines people's values and beliefs in countries around the world. The survey has been conducted in multiple waves since its inception in the early 1980s, involving thousands of respondents in many countries. It covers a wide range of topics and it has been used to study attitudes toward democracy, social capital, religion, gender roles, family, and more. I use answers to several questions in WVS to construct a gender progressivity index, i.e., a measure of average attitudes that reflect gender norms across countries (see Appendix B for a detailed explanation of how the index is constructed). Figure C.4 shows the distribution of gender norms across countries.

Table 3 compares firm outcomes after childbirth for entrepreneurs whose parents immigrated from countries with more egalitarian versus more conservative gender norms, separately by gender. Women whose parents originated from traditional cultures experience larger declines in sales, profits, and profit margin than their egalitarian counterparts. These results are not explained by systematic differences in pre-birth firm characteristics. Next, I repeat the exercise for fathers. The pattern is completely reversed: male entrepreneurs from traditional cultural backgrounds exhibit better business outcomes following the birth of a child. This divergence in outcomes is consistent with women from traditional backgrounds prioritizing family responsibilities over their entrepreneurial pursuits post-childbirth, affecting their business performance. Conversely, traditional gender

values might reinforce male roles as primary providers.

Table x shows the effect of cultural norms on entry into entrepreneurship. Men from traditional cultures become significantly more likely to become entrepreneurs after the birth of their first child. However, I find no evidence that gender norms impact entrepreneurial entry for mothers. Therefore, the gender gap in entrepreneurial entry increases in traditional cultures, but this increase is driven by differences in men's, and not women's, behavior. This suggests that cultural values related to traditional gender roles might motivate men to pursue entrepreneurship as a means of providing for their families; while, for women, the decision to enter entrepreneurship may be influenced by factors other than cultural expectations related to motherhood.

5.2 Individual or household decisions?

Up to this point, I have treated outcomes after childbirth as resulting from women's individual choices. However, most entrepreneurs with children are married. As a result, there is a substantial element of household decision-making involved in the process. Households may face increased pressure to specialize after having children; women, on average, earn less than their husbands and may prioritize tasks related to home production, such as childcare, while their spouses pursue their comparative advantage in the labor market. I divide women based on whether they are the main earner in the household in the year before having their first child (when about 75% of soon-to-be-mothers are married or cohabiting). If specialization is driving the results, when the mother is the breadwinner, couples will opt for her to focus on entrepreneurship while the spouse takes on a more prominent role in childcare.

I find some evidence consistent with household specialization being at play for entrepreneurial mothers. Table 4 shows that firms owned by main earners outperform those owned by secondary earners. Naturally, one might assume that female breadwinners are inherently more skilled as entrepreneurs. In fact, firms owned by main earners are on average larger; larger firms experience smaller declines in performance after childbirth and this is true regardless of the entrepreneur's main earner status.

To disentangle the role of household specialization, I use inverse probability weighting (IPW) to achieve similar firm distributions for main and secondary earners. The results are very similar after rebalancing the sample: primary earners still maintain an

edge in firm performance. But even among main earners, the performance penalty following childbirth remains substantial. For instance, the effect on sales after childbirth is reduced by approximately 40% compared to secondary earners, but it still amounts to a decrease of 20%. Similarly, the effect on profit margin, although less severe, remains at 6%. Startup still endure significant challenges in maintaining their performance after the arrival of a child, even in entrepreneurial households in which mothers are the breadwinners.

Next, I examine the impact of childbirth on personal and household income depending on main earner status. If parents allocated childcare and labor market responsibilities efficiently based on comparative advantage, the effect of children on family income should be similar regardless of which spouse is the breadwinner. In addition, mothers who are primary earners should experience a less negative (or even positive) impact on their own income, as they might increase their labor supply as a response to the additional financial responsibilities that come with raising children. Table x shows that households in which the wife is the main earner prior to childbirth experience a negative impact on family income, while families with a breadwinner husband do not. Moreover, I find that the effect on individual income for female main earners is more negative than for secondary earners, while their spouses experience an income increase. The birth of a child prompts a shift in household dynamics, leading to a "breadwinning reversal" effect: breadwinner mothers are 13% less likely to remain as primary earners after childbirth.

These findings might be explained by mothers having an inherent comparative advantage in childcare responsibilities, independently of their advantage in the labor market. The existing literature has largely ruled out giving birth as the primary cause of large career penalties for mothers, as shown by the fact that adopting and non-adopting mothers face similar penalties, except for a modest short-term difference (Kleven, Landais and Søgaard, 2021; Andresen and Nix, 2022). These findings notwithstanding, it is possible that the comparative advantage in childcare responsibilities might be related to nurturing abilities other than giving birth or nursing. Perhaps more plausibly, preferences and gender norms might shape decision-making within households, leading women to prioritize childcare responsibilities even if they possess a stronger labor market advantage.

5.3 Informal childcare

The role of grandparents in providing childcare to their grandchildren is an important aspect of family support networks. In the United States, 20% of working mothers with children under five use grandparents as their primary childcare providers (Posadas and Vidal-Fernandez, 2013); in Mexico, grandmothers take care of 40% of children aged under six (Marcos, 2023). Several studies have found that the availability of childcare provided by grandparents has a positive effect on mothers' labor supply but a negative effect on grandmothers' employment (Posadas and Vidal-Fernandez, 2013; Kaufmann, Özdemir, and Ye, 2022; Zamarro, 2020; Marcos, 2023). In this section, I study the role of proximity to grandparents in mitigating the impact of childbirth on women's entrepreneurial outcomes.

To examine the role of grandparents, I first establish a connection between parents within my sample and their own parents. This linkage is made possible by the fact that individuals residing at the same address file taxes together (non-filers, such as children who do not receive income, are input by Statistics Canada). Thus, individuals who lived with their own parents at some point from 2001 onward are included in the sample. Next, I assess whether mothers reside in the same city (more precisely, Census Metropolitan Area or Census Agglomeration) as their parents[13]. This measure of proximity serves as an indicator of potential childcare availability and support networks within families.

Table 5 shows that women who live in the same city as their parents experience less adverse effects on their startup businesses following motherhood. Geographical proximity to grandparents acts as a buffer, alleviating the impact of childbirth on sales, profits, entrepreneurial rents, and profitability. Figure XX presents an event study focused on sales and profits, showing that the mitigating effect of grandparents' proximity for mothers is most pronounced when the child is very young. This observation may be explained by the greater caregiving demands associated with infants and toddlers, which could lead mothers to rely more heavily on the support provided by nearby grandparents during these crucial early years. In addition, as children grow older, formal childcare options, such

[13]A Census Metropolitan Area (CMA) is akin to a commuting zone. Statistics Canada defines CMA as a region with a population of at least 100,000, composed by a core urban area of at least 50,000 people, along with adjacent municipalities that have a high degree of social and economic integration with the urban core, as measured by commuting flows. In rural areas, a Census Agglomeration must have a core population of at least 10,000.

as preschool or daycare, may become more accessible and practical for mothers. Panel B of Table 5 presents a falsification test involving fathers, showing that the proximity of grandparents has no discernible influence on entrepreneurial outcomes of fathers after the arrival of children.

5.4 Formal childcare

For this section, I am in the process of obtaining new data from Statistics Canada to evaluate the impact of the Quebec childcare reform of 1997. This reform introduced a universal childcare system, significantly increasing the availability of affordable childcare services in the province. Its primary objective was to bolster women's labor force participation by offering subsidized and easily accessible childcare. The empirical approach involves comparing changes in entrepreneurial outcomes for women in Quebec before and after the reform with those of women in the rest of Canada.

Figure C.5 offers a cross-sectional comparison between the evolution of firm outcomes around childbirth in Quebec and in the rest of Canada. The impact on sales and assets in Quebec is considerably smaller (with no discernible effect on assets). However, the figures for profits, profitability, and entrepreneur compensation appear to be largely similar between the two regions. The policy evalution will allow to uncover the specific mechanisms at play within the Quebec context.

6 Theoretical framework

6.1 Model of occupational choice

I develop a simple model of occupational choice, building on the canonical model of Lucas (1978). I introduce fertility choices in subsection 6.2. Individuals value monetary payoffs and leisure; they make a choice between wage employment and entrepreneurship to maximize utility. Productivity $z \in [0, \bar{z}]$ is distributed heterogeneously across individuals according to a known distribution $F(z)$. All workers receive the same wage w, while entrepreneurs' payoffs depend on their productivity. Workers cannot choose how many hours they work: contractually, they have to work h_w hours, earning $W = w \cdot h_w$. Conversely, entrepreneurs have the flexibility of optimally choosing their working hours. The maximum number of available hours is denoted by H, thus, an individual who works

h hours enjoys $H - h$ hours of leisure.

Individuals maximize the following value function by choosing to become workers ($x = 0$), in which case they earn the equilibrium wage, or entrepreneurs ($x = 1$), in which case they pocket firm profits given the optimal labor demand and hours worked:

$$V(z, W) = \max_{x \in \{0,1\}} \left\{ (1 - x) \left[W + \frac{(H - h_w)^{1-\gamma}}{1 - \gamma} \right] + x \max_{n,h} \left[f(z, h, n) - Wn + \frac{(H - h)^{1-\gamma}}{1 - \gamma} \right] \right\}.$$

I assume that firms use workers' labor n and entrepreneur's labor h as inputs. Firm profits are increasing at a decreasing rate in both inputs ($f_n > 0$, $f_h > 0$, $f_{nn} < 0$, $f_{hh} < 0$). In addition, I assume complementarity among inputs and between inputs and productivity, that is, all cross-partial derivatives of f are positive. Finally, the production function exhibits concavity in n and h, jointly, which requires, in addition to the conditions on f_{nn} and f_{hh}, that the determinant of the Hessian matrix of the function should be positive:

$$f_{nn} f_{hh} - f_{hn} f_{nh} = f_{nn} f_{hh} - (f_{hn})^2 > 0.$$

This implies that the utility function of the entrepreneur is concave in n and h, since the utility from leisure is also concave, and the cost of employed labour Wn is linear in n. Under these assumptions, the first order conditions are sufficient for determining the maximizing input combination.

Proposition 1: For any given W, there exists a single threshold $\hat{z}$ above which individuals choose to become entrepreneurs. For the proof, see Appendix A.

To close the model, we use two equilibrium conditions. First, wage is such that the labor market clears, that is, the number of workers equals total labor demand from entrepreneurs:

$$F(\hat{z}(W)) = \int_{\hat{z}(W)}^{\overline{z}} n^*(z, W) dF(z).$$

Second, the marginal entrepreneur is indifferent between entrepreneurship and wage work. The break-even conditions for the marginal entrepreneurs allows us to find $\hat{z}$:

$$W + \frac{(H - h_w)^{1-\gamma}}{1 - \gamma} = f^*(\hat{z}, W) - Wn^*(\hat{z}, W) + \frac{(H - h^*(\hat{z}, W))^{1-\gamma}}{1 - \gamma}.$$

6.2 Occupational choice with children

We can now extend the model to encompass selection into parenthood, in addition to the previously discussed occupational choice. The model now features two periods to capture dynamic entry into and exit from entrepreneurship. In the first period, individuals make their first occupational choice under a veil of ignorance regarding their desire for children.[14] At the beginning of the second period, they draw a valuation of children $b \in [\underline{b}, \bar{b}]$, which represents the subjective benefit that individuals associate with becoming parents and is unique to each individual.

Women with children incur an additional disutility of hours worked $\phi(h)$, capturing the costs associated with being away from their children, such as the potential need to rely on others for childcare, the loss of bonding opportunities, and cultural expectations. I assume that the disutility of work for mothers is increasing at a weakly increasing rate in hours worked: $\phi_h > 0$ and $\phi_{hh} \geq 0$. Alternatively, women with children have to devote a fixed number of hours κ to child-rearing responsibilities, so that the total number of available working hours is now $H' = H - \kappa$[15]. Workers with children switch to a part-time contract; denoting as h_1 the hours worked by non-parents, parents work $h_2 < h_1$ hours[16]. Each part-time worker is equivalent to h_2/h_1 full-time workers. After learning their value of children b, individuals weigh the costs and benefits of having children ($y = 1$) or not ($y = 0$) and make their second occupational choice between entrepreneurship ($x = 1$) and wage work ($x = 0$).

Denoting by y the decision of having children, the value function facing individuals

[14] This assumption is inconsequential in the current framework because there are no costs associated with exit from entrepreneurship, such as irrecoverable investment. Thus, the problem faced by individuals in this two-period model is again static.

[15] Time allocated to childcare responsibilities might itself be a function of productivity z. For example, relatively less productive women might be the secondary income earner in their family and take on a larger share of childcare tasks, while the primary income earner increases labor supply. The empirical evidence partially corroborates the presence of household specialization; however, the division of labor between parents appears to be significantly influenced by traditional gender roles. For instance, Parker and Wang (2013) find that stay-at-home mothers spend 19.7 hours per week watching their children, about three times as many hours as their husbands, who spend 6.5 hours. By contrast, stay-at-home husbands spend 11.3 hours on childcare tasks; their wives, 8.9 (a ratio of 1.3). Mothers in dual-income couples spend on childcare only 3 more hours than their solo-earner counterparts (11.9 vs 8.9) and 70% more hours than their husbands.

[16] I assume that a part-time regime is welfare-improving for workers, that is, $wh_1 + \frac{(H-h_1)^{1-\gamma}}{1-\gamma} - \phi(h_1) < wh_2 + \frac{(H-h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2)$. This reflects the empirical observation that mothers opt to reduce working hours after having a child (Kleven et al., 2019). This implies that $w < \frac{\frac{(H-h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2) - \frac{(H-h_1)^{1-\gamma}}{1-\gamma} + \phi(h_1)}{h_1 - h_2}$.

in the second period is as follows:

$$
\begin{aligned}
V(z,b,w) = \max_{\substack{x\in\{0,1\}\\ y\in\{0,1\}}} \Bigg\{ & (1-x)(1-y)\left[w\, h_1 + \frac{(H-h_1)^{1-\gamma}}{1-\gamma}\right] \\
& + (1-x)\, y \left[w\, h_2 + b + \frac{(H-h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2)\right] \\
& + x\,(1-y) \max_{n,h}\left[f(z,h,n) - wn + \frac{(H-h)^{1-\gamma}}{1-\gamma}\right] \\
& + x\, y \max_{n,h}\left[f(z,h,n) - wn + b + \frac{(H-h)^{1-\gamma}}{1-\gamma} - \phi(h)\right]\Bigg\}.
\end{aligned}
$$

Proposition 2: For any given w, there exists a unique threshold $\hat{z}_2(w)$ above which mothers become entrepreneurs. For the proof, see Appendix A.

Given $\hat{z}_1(W)$ and $\hat{z}_2(W)$, we determine the optimal value and policy functions of an entrepreneur with value z as follows. First, regardless of the value of b and the presence ($y = 1$) or absence of children ($y = 0$), she will become an entrepreneur if $z \geq \hat{z}_1(w)$ and $z \geq \hat{z}_2(w)$. If z is below $\hat{z}_1(w)$ and $\hat{z}_2(w)$, she will work for any b or y. The strategy for individuals with productivity between $\hat{z}_1(w)$ and $\hat{z}_2(w)$ depends on whether $\hat{z}_2(w) > \hat{z}_1(w)$ or $\hat{z}_2(w) < \hat{z}_1(w)$. I analyze here the former case because it is supported by the empirical findings presented in the next section; in the Appendix, I describe the strategy for the latter case. When $z \in [\hat{z}_1(w), \hat{z}_2(w))$ and $\hat{z}_2(w) > \hat{z}_1(w)$, she will become an entrepreneur if she does not have children. Put formally:

$$
x(z, y(b)) = \begin{cases} 1 & \text{if } z \geq \hat{z}_2(w) > \hat{z}_1(w) \\ 1 & \text{if } z \in [\hat{z}_1(w), \hat{z}_2(w)) \ \&\ y(b) = 0 \\ 0 & \text{if } z \in [\hat{z}_1(b), \hat{z}_2(w)) \ \&\ y(b) = 1 \\ 0 & \text{if } z < \hat{z}_1(w) \end{cases}
$$

Given the optimal policy for x conditional on y, we similarly develop the optimal policy for y on a case by case basis. First, if $z < \hat{z}_1(w)$, so that $x = 0$ (she always works), a woman will choose to have children if and only if:

$$
wh_2 + \frac{(H-h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2) + b \geq wh_1 + \frac{(H-h_1)^{1-\gamma}}{1-\gamma}.
$$

So we define the threshold

$$b\big(z < z_1(w)\big) \equiv w(h_1 - h_2) + \frac{(H - h_1)^{1-\gamma} - (H - h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2)$$

If $z \geq \hat{z}_2(w)$ so $x = 1$ and she always chooses entrepreneurship, a woman will choose to have children if and only if:

$$\underbrace{f(h'(z,W),z,W) - Wn(h'(z,W);z,W) + \frac{(H - h'(z,W))^{1-\gamma}}{1-\gamma} - \phi(h'(z,W))}_{f_2(z)} + b \geq$$
$$\underbrace{f(h^*(z,W),z,W) - Wn(h^*(z,W);z,W) + \frac{(H - h^*(z,W))^{1-\gamma}}{1-\gamma}}_{f_1(z)}$$

Denoting the value function of the entrepreneur without children as $f_1(z)$ and the entrepreneur with children as $f_2(z)$, the relevant threshold is:

$$b\big(z \geq \hat{z}_2(w)\big) \equiv f_1(z) - f_2(z)$$

This threshold is increasing in z since:

$$\frac{\partial f_1(z)}{\partial z} - \frac{\partial f_2(z)}{\partial z} = f_z(h^*(z,W),z,W) - f_z(h'(z,W),z,W) > 0.$$

As before, the envelope theorem cancels terms. The right inequality holds because of the fact that $f_{zn} > 0$ and $f_{zh} > 0$, in combination with $h^* > h'$ and $n^* > n'$ (higher productivity increases output more with higher inputs).

Finally, between $\hat{z}_1(w)$ and $\hat{z}_2(w)$, the threshold value of b for having children depends upon the value function for being an entrepreneur without children, and the utility from being a worker with children. Following the same notation as before:

$$b\big(\hat{z}_1(w) \leq z < \hat{z}_2(w)\big) \equiv f_1(z) - wh_2 - \frac{(H - h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2).$$

Note that $f_1(z)$ is increasing in z, so the threshold value of b must be as well. Appendix A details the equilibrium conditions to close the model. Figure 1 Panel (a) depicts an example of equilibrium for the two cases $\hat{z}_2(w) > \hat{z}_2(w)$.

6.3 Discussion

The model offers several empirical predictions. First, more productive individuals have a higher likelihood of becoming entrepreneurs. Productivity is hard to measure; nonetheless, since most individuals have work experience before starting their own firm, we can look at selection of entrepreneurs from the labor market to get a sense of the relationships between productivity and entrepreneurship.

Panel A of Figure 2 depicts the probability that a worker in the n^{th} percentile of the wage distribution starts a firm within the following year. Entry rates increase exponentially with labor income for both men and women. Panel B shows that workers who before starting their firm belonged to the the top of the wage distribution make up a disproportionate fraction of entrepreneurs; for example, former workers in the 99^{th} percentile represent about 3.4% of all entrepreneurs, compared to an average of 0.5% for workers in each percentile below the 50^{th}. But because women are increasingly underrepresented as we move to the right tail of the wage distribution, the female share of entrepreneurs coming from top jobs is small. The prediction that individual productivity is correlated with participation in entrepreneurship is also consistent with the finding that entrepreneurs are more educated and, as youths, scored higher on learning aptitude tests than salaried workers and the self-employed (Levine and Rubinstein, 2017).

Second, entrepreneurs with children will decrease their own labor supply to the firm. This holds true under different modelling choices — assuming that mothers have to allocate a fixed amount of time to childcare, thereby reducing the total time allocatable to work or leisure, or that mothers incur a cost for each hour they work, and this cost escalates as they increase their working hours (because they must cover childcare expenses or experience the adverse consequence of spending less time with their children). Given the equilibrium wage, firm performance declines for start-ups owned by mothers relative to equally productive entrepreneurs who don't have children. The empirical evidence in this paper is consistent with the prediction that childbirth leads to a deterioration in start-up performance.

The model points out the theoretical ambiguity surrounding the effect of childbirth on entrepreneurial participation. On the one hand, entrepreneurs' ability to set their own schedules makes entrepreneurship more appealing for mothers. If the marginal entrepreneur does not have to work excessive hours, the flexibility of entrepreneurship could

lead to an increase in the number of entrepreneurs after childbirth. On the other hand, if the production function of the firm heavily relies on the founder's labor, reducing work hours could be prohibitively costly. In such cases, entrepreneurship may become less attractive for mothers, as they might be unable to balance the demands of childcare with the substantial time commitment needed for the firm to operate optimally.

The impact of motherhood on entrepreneurship is also affected by the structure and institutions prevailing in the labor market. In a labor market with substantial penalties[17] for women, entrepreneurship becomes relatively more attractive as it lowers the required rate of return that entrepreneurs are willing to accept. Entrepreneurship might become a more appealing option even in a labor market with no financial penalties for mothers but also no flexibility, for example, no part-time — so that the consumption-leisure trade-off is unfavorable.

The effect of children on women's entrepreneurial activity is ultimately an empirical question. In this paper, I show evidence of a large, negative effect of motherhood on entrepreneurship rates. Firm entry drops substantially around childbirth, while exit only increases slightly. These findings are consistent with the existence of exit costs, including the loss of business networks, potential discounting of entrepreneurial experience by prospective employers[18], and costs associated with terminating business contracts prematurely. Women may anticipate the potential impact of motherhood on their entrepreneurial endeavors and avoid entering entrepreneurship when they anticipate having a child. I find that the drop in entry rates starts one year before childbirth, suggesting anticipatory decision-making, while the performance of existing entrepreneurs remains unaffected until the year of childbirth.

Finally, the model speaks to the relationship between career choices and fertility.

[17]The use of the term *child penalties*, describing the decline in women's earnings after childbirth, has sometimes faced criticism on the ground that this decline may arise from women's preferences in allocating their time between childcare and wage work, rather than being a result of external factors or discrimination in the labor market. Kleven, Landais and Søgaard (2019) find that the decrease in mothers' earnings can be attributed roughly equally to drops in labor force participation, working hours, and wage rates. In my model, I do not allow individuals to exit the labor market altogether and I do not model heterogeneity in job tasks or discrimination, which would result in different wage rates. Instead, I model child penalties as a reduction in hours which improves the trade-off between labor and leisure in the presence of children.

[18]In a UK audit study, Koellinger et al. (2015) find that previous self-employment experience is interpreted as a bad signal in the labor market. Employers may infer that such candidates possess different skills, work habits, or personality traits that are deemed less suitable for employment positions.

In careers where compensation is more closely linked to productivity and longer hours are rewarded, such as entrepreneurship, only women with a high enough desire for children can justify incurring the career costs imposed by motherhood. In the population, the relative fertility rates of entrepreneurs and workers are determined by the correlation between fertility preferences and productivity. Estimating this correlation is challenging because any empirical proxy for productivity (e.g., wage or education) is potentially influenced by fertility decisions, even before they occur[19]. But if desire for children is distributed in the population independently of productivity, the model implies that fertility rates are lower for more productive women, who are more likely to become entrepreneurs.

7 Conclusion

This paper provides a comprehensive assessment of the impact of motherhood on women's entrepreneurship. I employ a rich administrative dataset from Canada and an empirical design based on event studies and an instrumental variable. I find that the advent of motherhood leads to a substantial decline in women's founding rates, and for women who are already entrepreneurs, their firms experience significant performance deterioration following childbirth. Even though the effects taper off over time, they never return to pre-birth levels. Children explain a significant fraction of the entrepreneurship gender gap, and therefore, any scholarly or policy discourse concerning the entrepreneurship gender gap cannot ignore the role of fertility.

In recent years, policymakers have championed many initiatives to promote women's participation in entrepreneurship, ranging from financing programs to mentorship and networking initiatives. Simultaneously, concerns about declining birth rates and aging populations in many developed countries have prompted discussions about measures to

[19] Adda et al. (2017) study the career cost of children in a structural model and find that women with high fertility preferences preemptively choose careers with flatter paths, and make educational choices accordingly, to mitigate the risk of potential infertility. A large literature has studied the relationship between income and fertility behavior. An empirical regularity in fertility studies based on the last two centuries of data has been the negative relationship between income and fertility, as well as between women's education and fertility, in post-industrialization societies. This pattern has started to disappear or even reverse in the past two decades: for example, the relationship between women's labor force participation and fertility is now *positive*. This shift has led to the emergence of new models of fertility, in which reconciling career and family is a crucial determinant of fertility decisions (see Doepke et al. (2023) for a review).

encourage family formation and boost fertility. Recognizing the intertwined nature of these challenges is crucial: the traditional dichotomy between family and a fulfilling career has yielded to a new paradigm in which women increasingly aspire to achieve both. Understanding the impact of motherhood on women's careers and entrepreneurial pursuits is essential for designing policies that allow women to integrate family and professional aspirations.

This paper focuses on women's entrepreneurial activities and on the entrepreneurship gender gap arising as a consequence of childbirth. Yet, family formation can have other consequences for entrepreneurship at the aggregate level, affecting both men and women. For example, a working spouse can provide consumption insurance in case of failure, increasing entrepreneurial entry and risk taking. Avenues for future research include this and other important questions related to family formation, risk sharing within the household, and their consequences for entrepreneurship.

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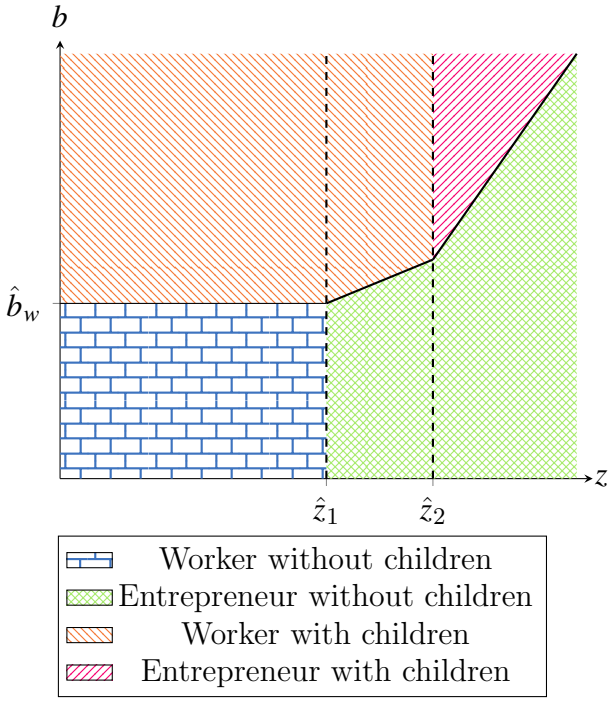
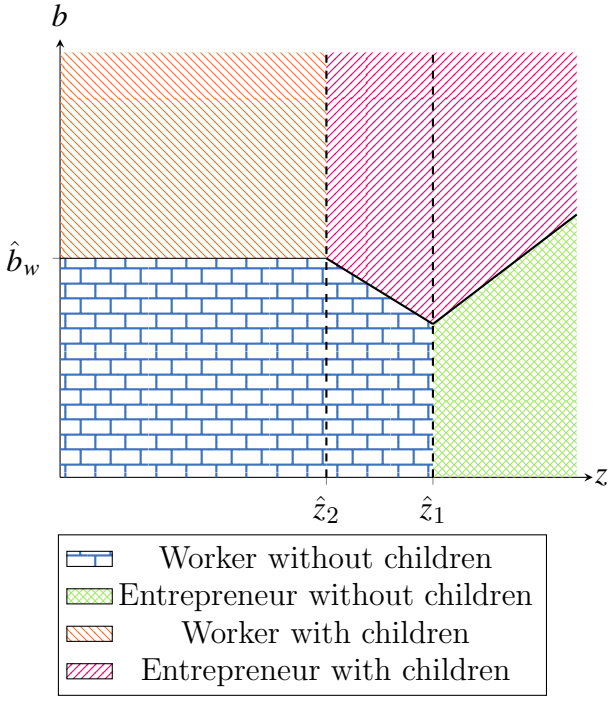
Figures

Figure 1: Model equilibrium

(a) Example of equilibrium with $\hat{z}_2 > \hat{z}_1$



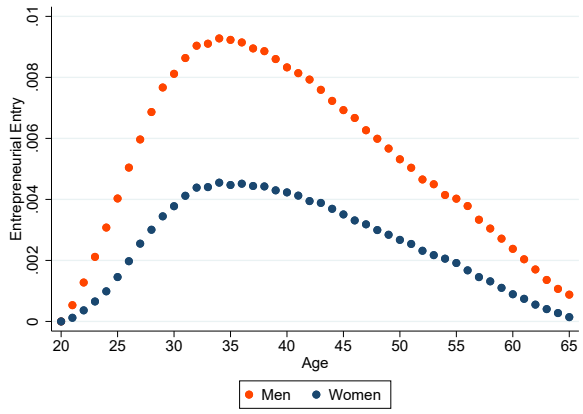
(b) Example of equilibrium with $\hat{z}_2 < \hat{z}_1$



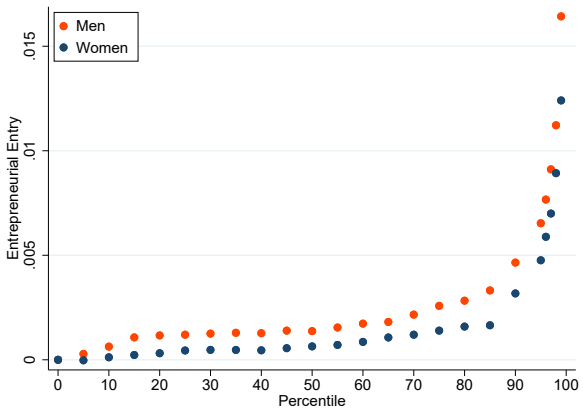
Notes: The graphs depict the possible equilibria for the model of occupational choice with children.

Figure 2: Entrepreneurs' selection

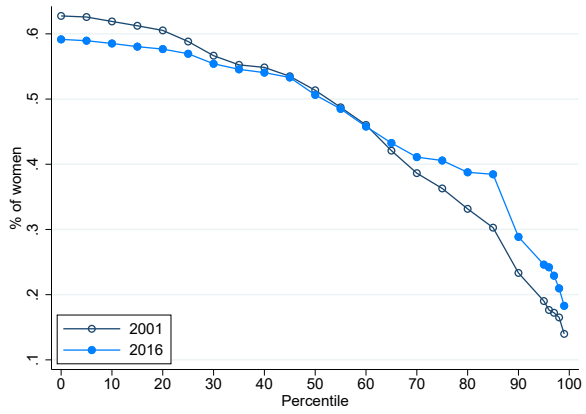
(a) Probability of entry by age



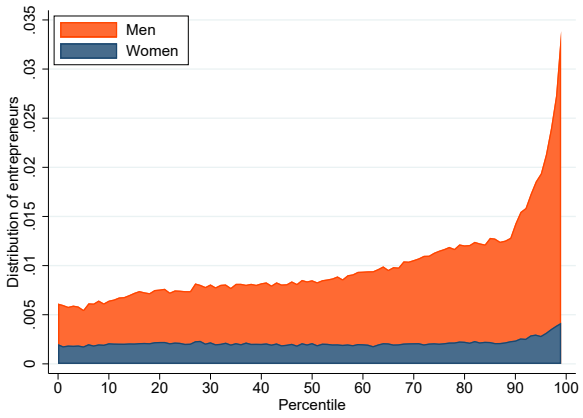
(b) Probability of entry by income



(c) Women in the wage distribution

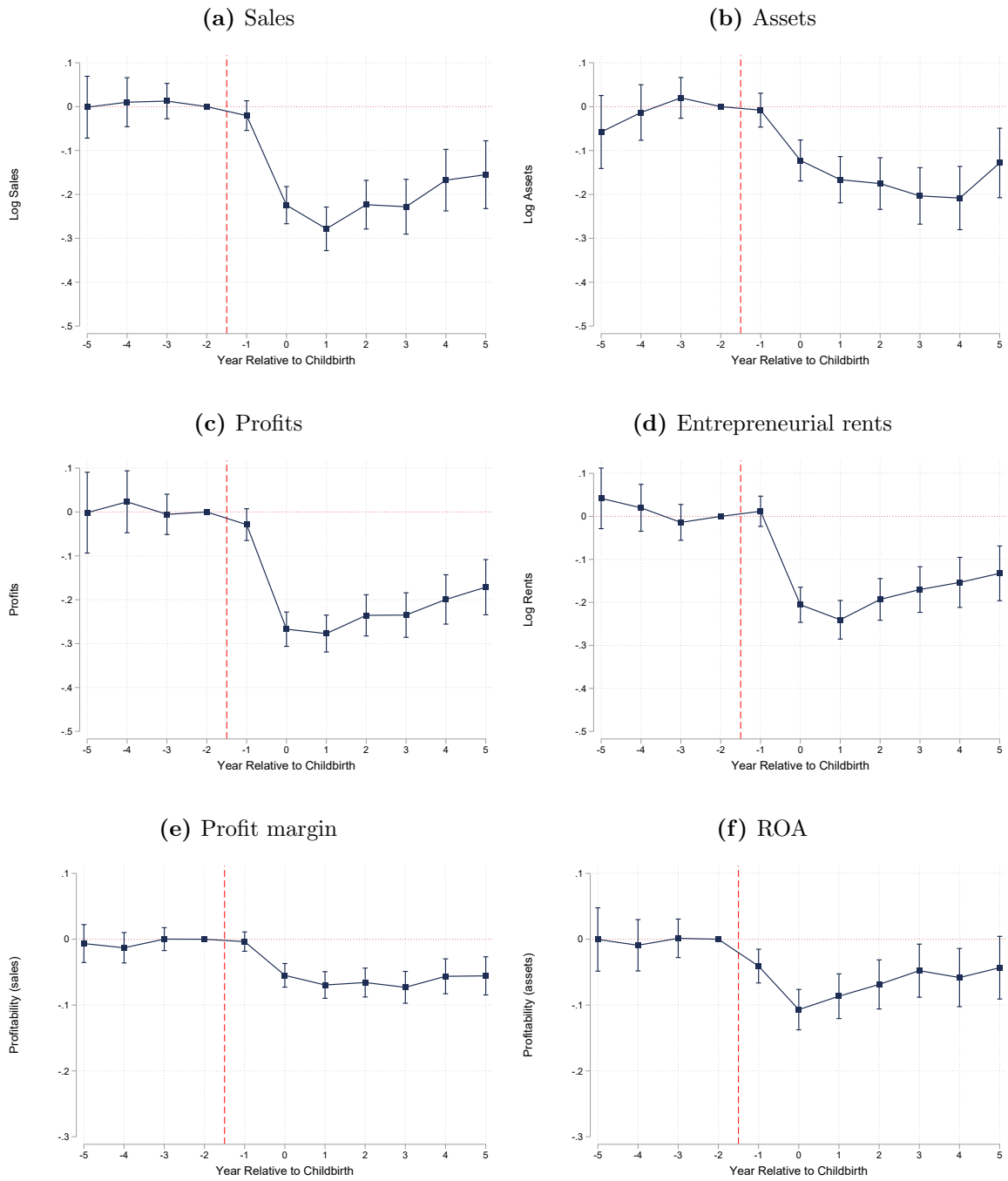


(d) Entrepreneurs' composition



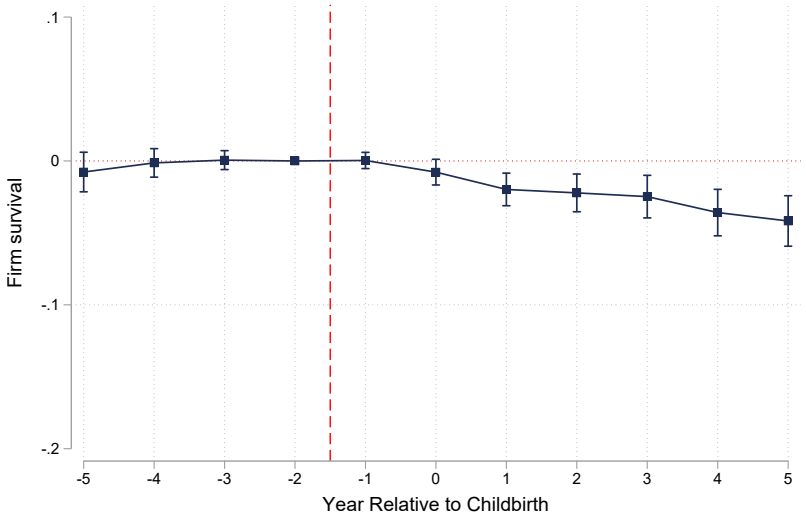
Notes: This figure reports the probability that an individual starts a firm in a given year by age in Panel (a) and by percentile of the income distribution in Panel (b), for men and women respectively . Panel (c) depicts the share of women across the income distribution. Panel (d) despicts composition of entrepreneurs by percentile and gender.

Figure 3: Firm outcomes



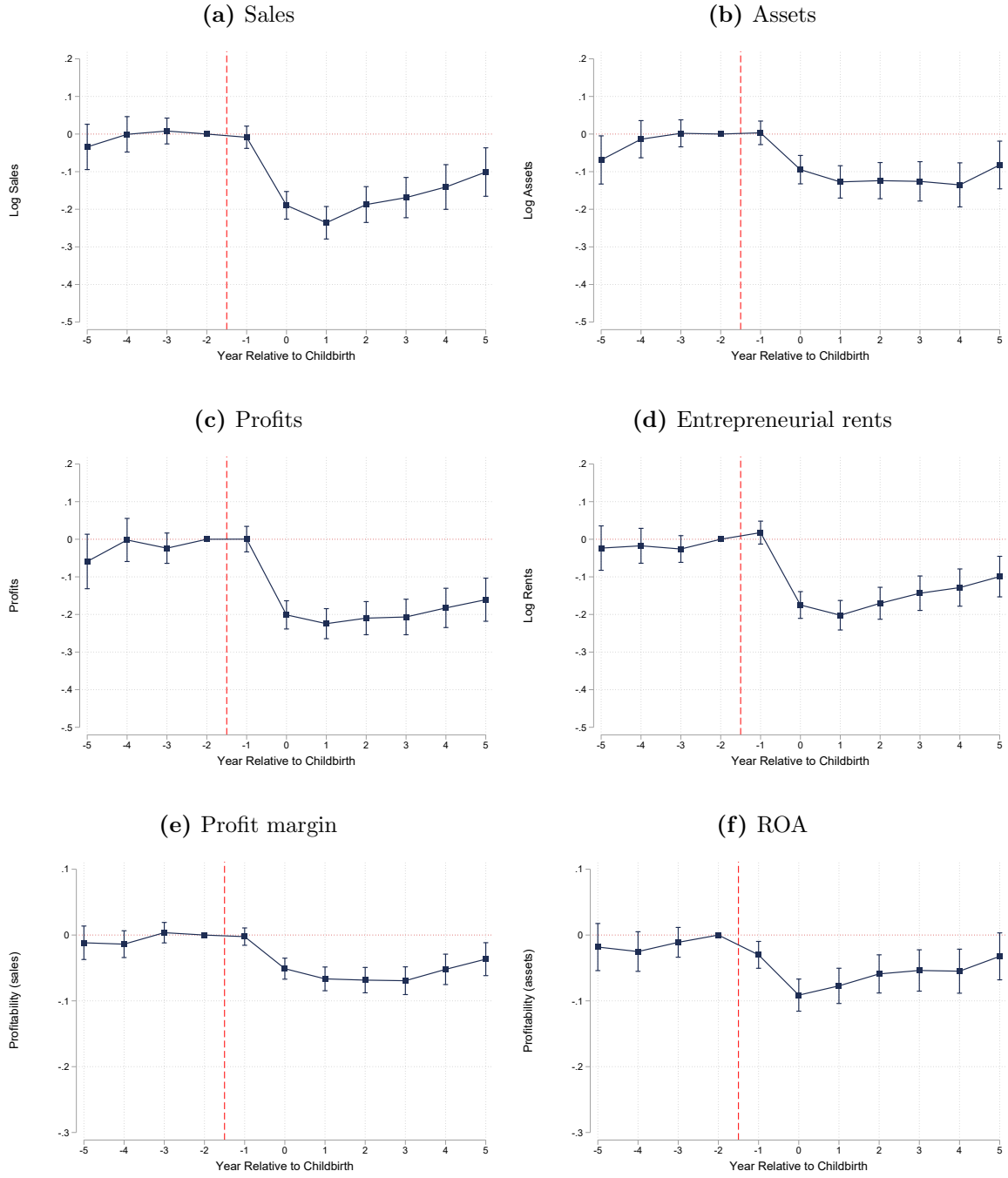
Notes: The graphs show event time coefficients β_τ estimated from equation 2. The control group is a matched sample of firms owned by women with zero observed fertility. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure 4: Firm survival



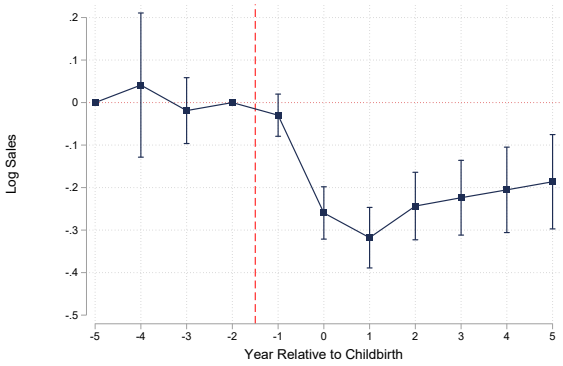
Notes: The graphs show differences in firm survival between firms owned by mothers and a matched sample of control firms owned by women with zero observed fertility. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure 5: Firm outcomes by firm's life cycle
Panel A: Firms of all ages

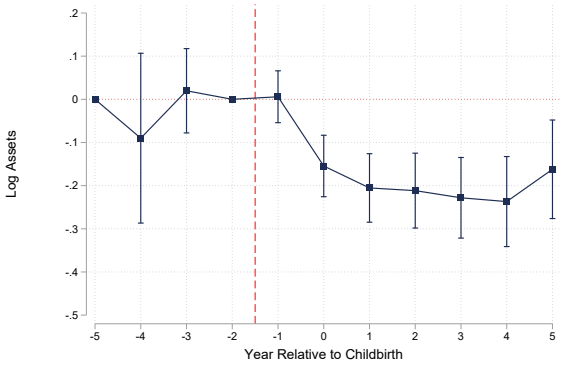


Panel B: Young startups

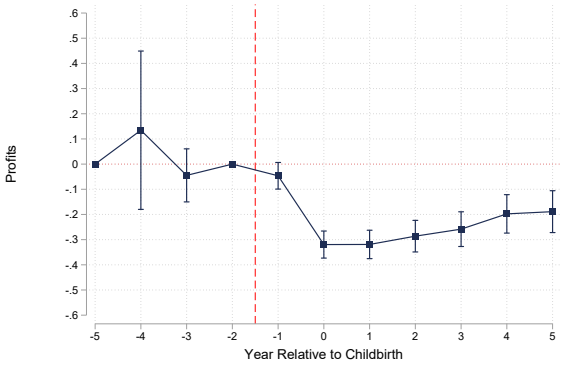
(a) Sales



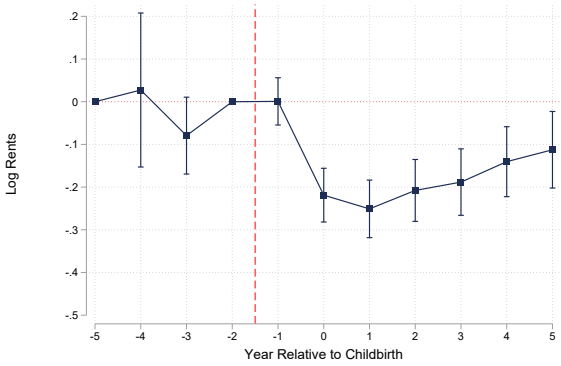
(b) Assets



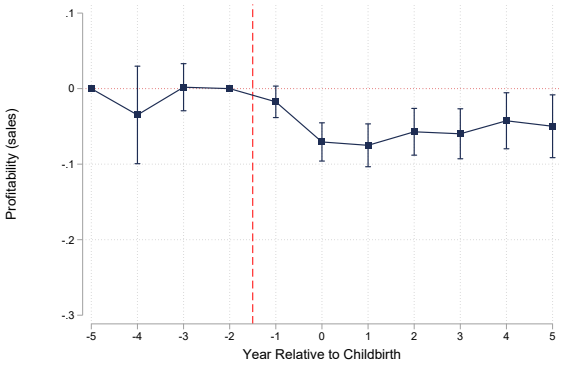
(c) Profits



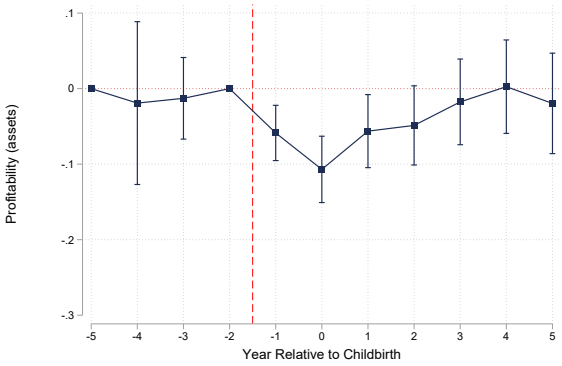
(d) Entrepreneurial rents



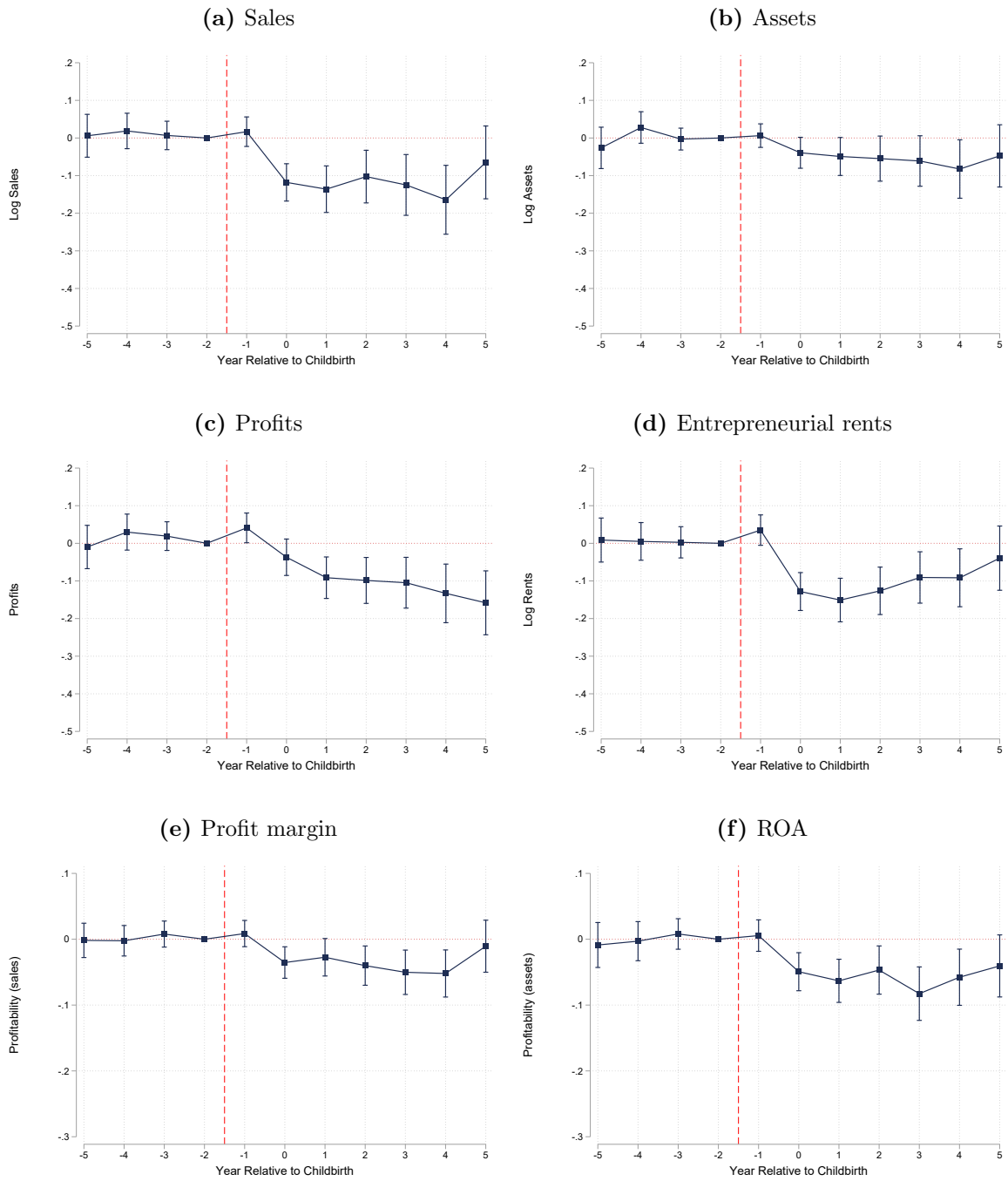
(e) Profit margin



(f) ROA

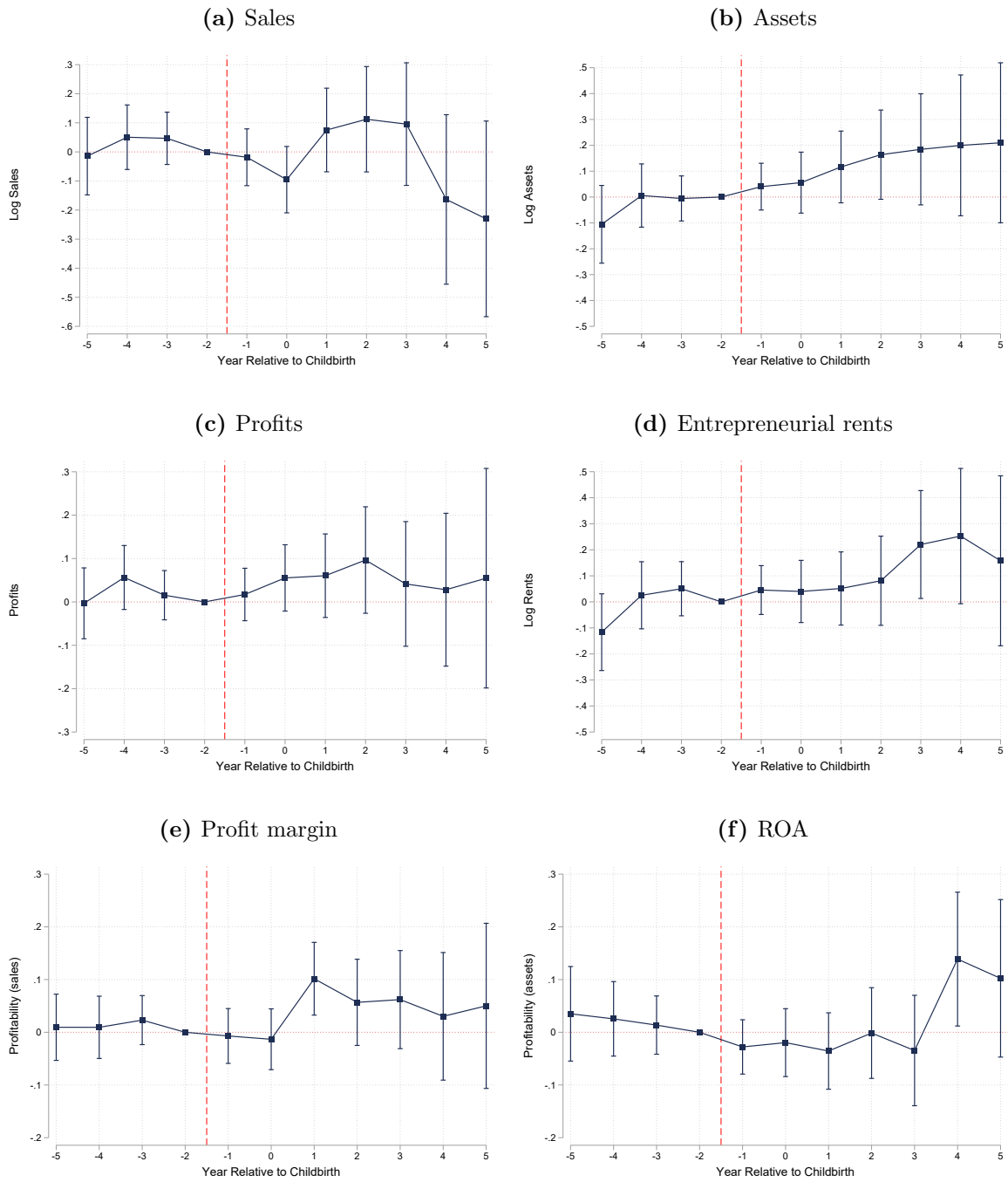


Panel C: Older firms



Notes: The graphs show event time coefficients β_τ estimated from equation 2, separately by firm age. Panel A includes firm of all ages, regardless of founder status. Panel B shows results for firms that experienced the founder's childbirth shock when they were at most 5 years old. Panel C includes firms that were older than 5 when the founder had their first child. The control group is a matched sample of firms owned by women with zero observed fertility. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

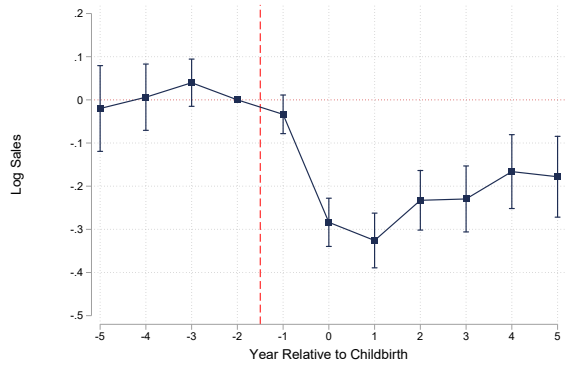
Figure 6: Placebo test: angel investors



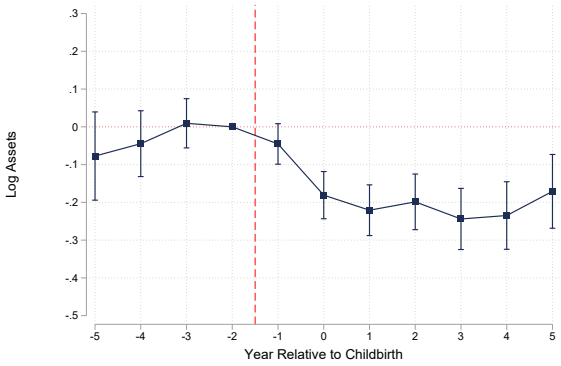
Notes: The graphs show results from a placebo test on angel investors, defined as firm owners who are not founders and are never actively involved in the firm. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure 7: Firm outcomes by business cycle
Panel A: Having a child during booms

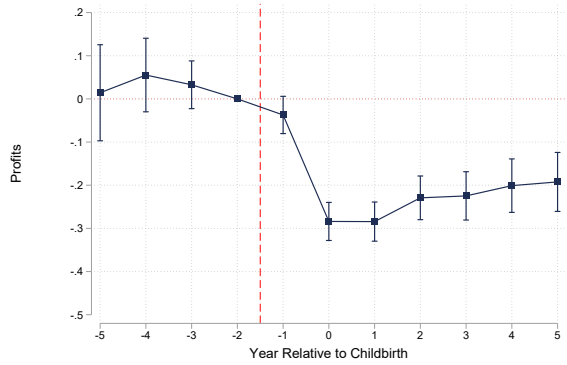
(a) Sales



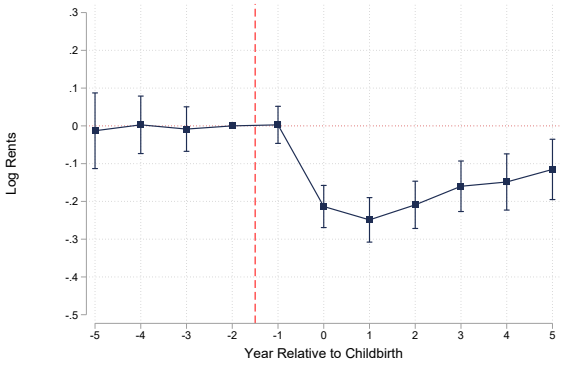
(b) Assets



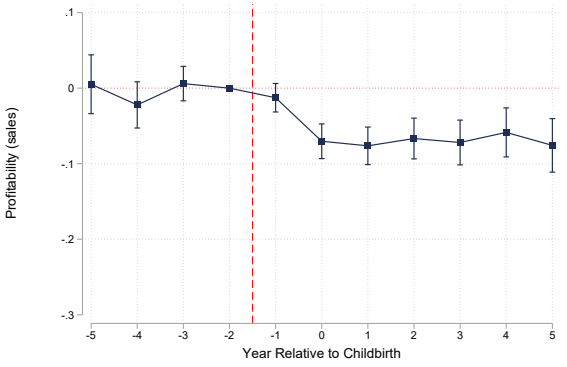
(c) Profits



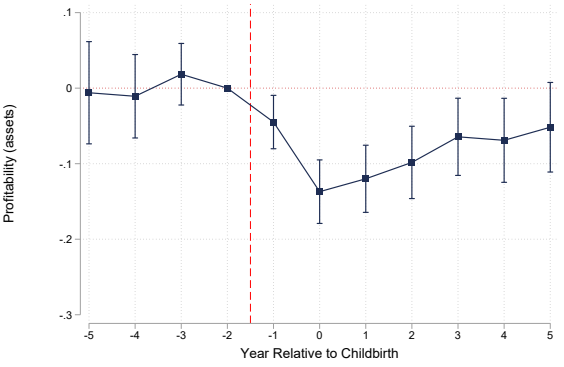
(d) Entrepreneurial rents



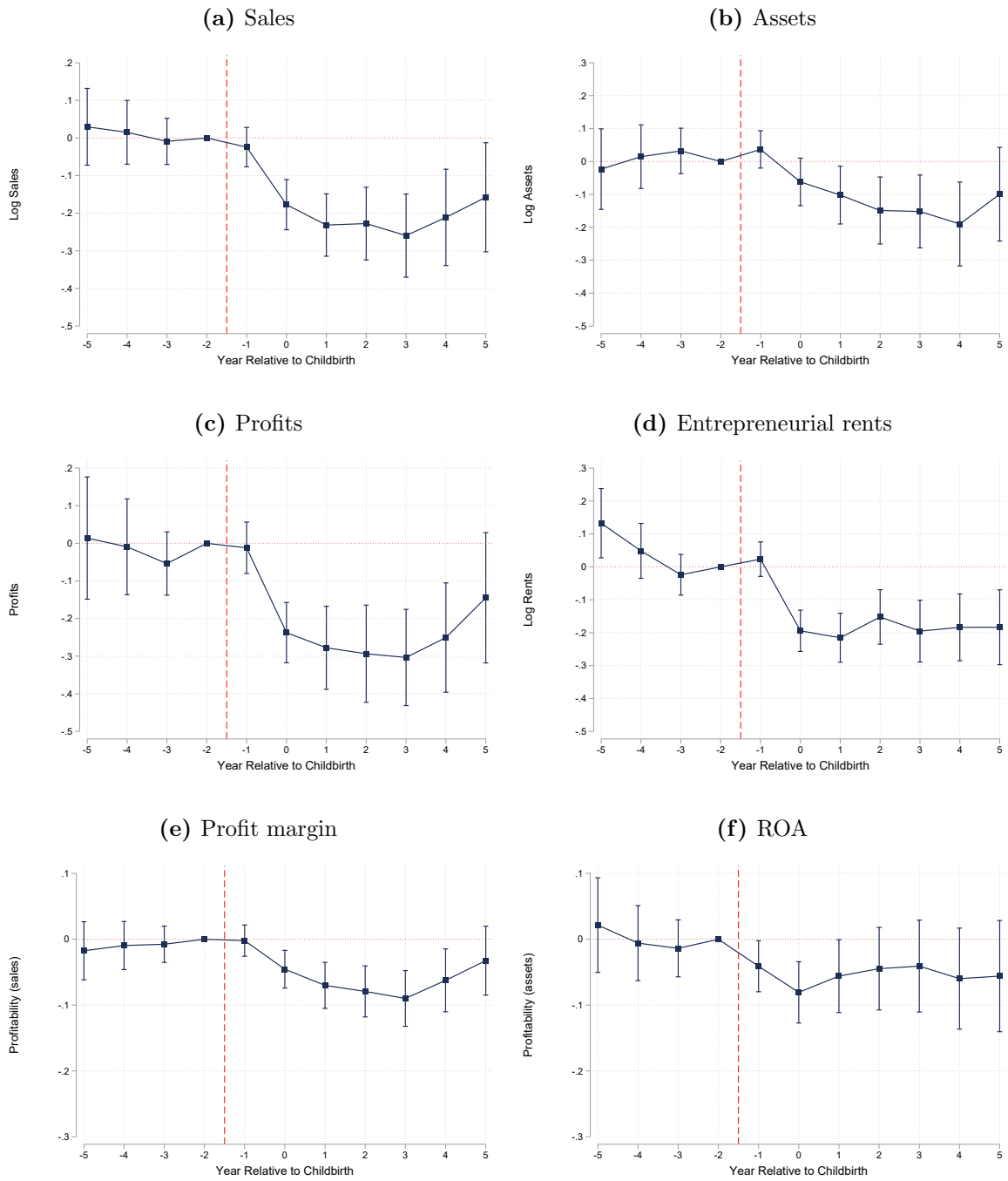
(e) Profit margin



(f) ROA



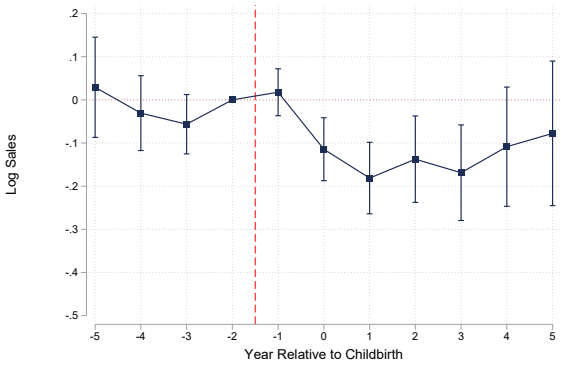
Panel B: Having a child during busts



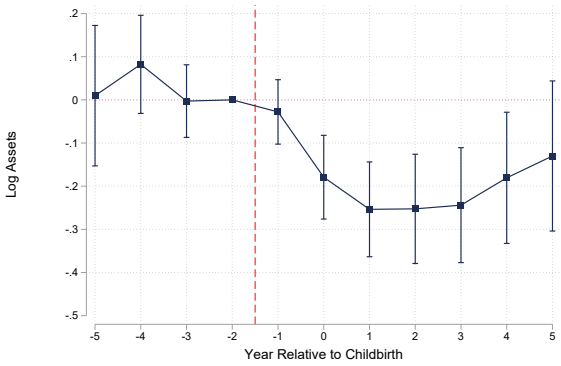
Notes: The graphs show event time coefficients β_τ estimated from equation 2 by industry performance in the year of the first childbirth. Booms are periods in which industry sales growth ranks in the upper tercile of all industry-years, while busts are periods of growth in the lower tercile. Only firms owned by male entrepreneurs are used to construct the terciles. The control group is a matched sample of firms owned by women with zero observed fertility. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure 8: High quality firms
Panel A: Employer firms

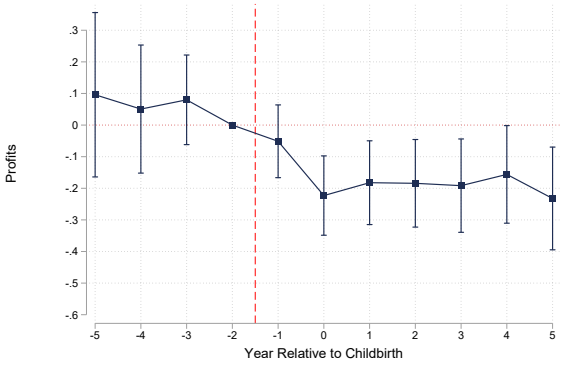
(a) Sales



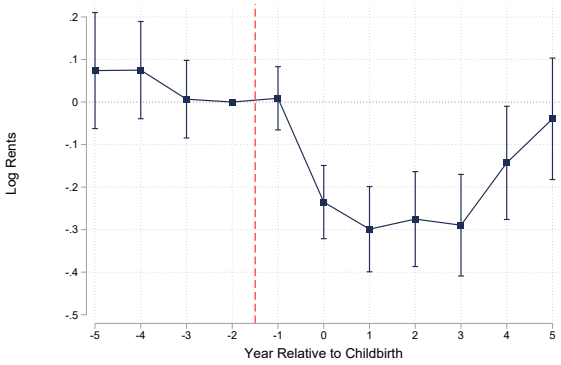
(b) Assets



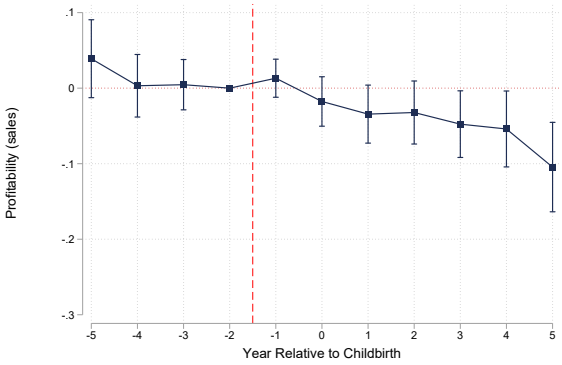
(c) Profits



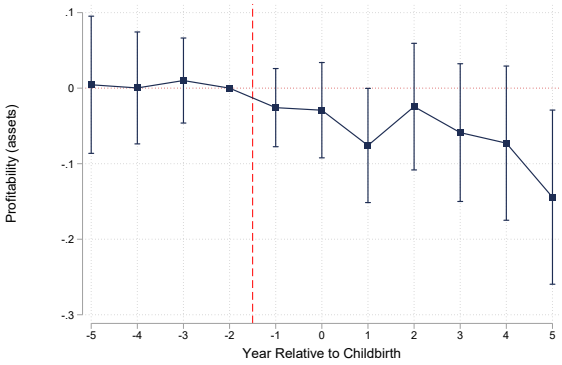
(d) Entrepreneurial rents



(e) Profit margin

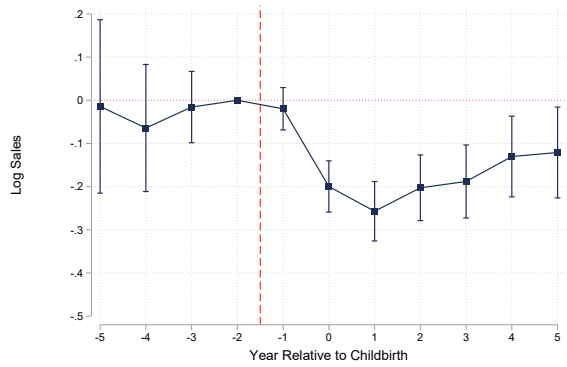


(f) ROA

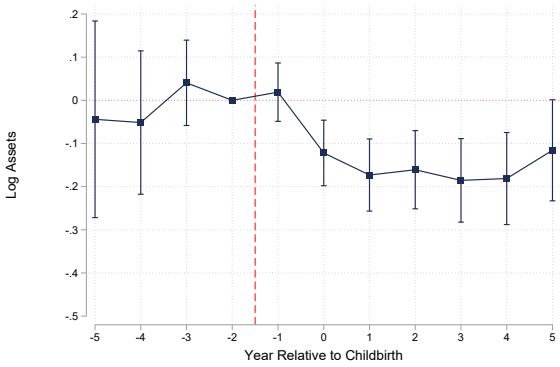


Panel B: Firms above median performance

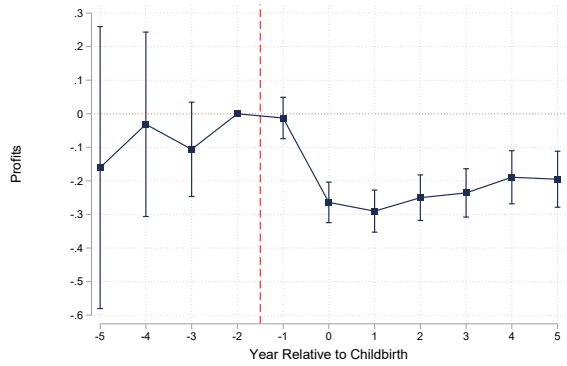
(a) Sales



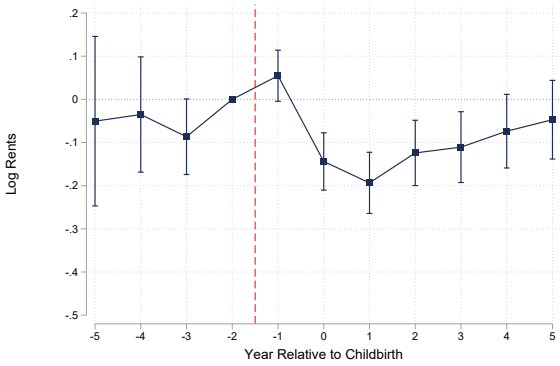
(b) Assets



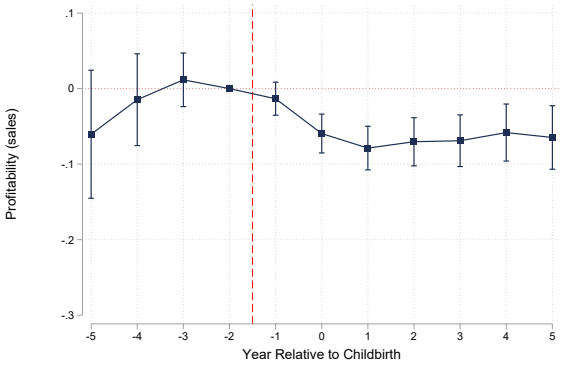
(c) Profits



(d) Entrepreneurial rents



(e) Profit margin



(f) ROA

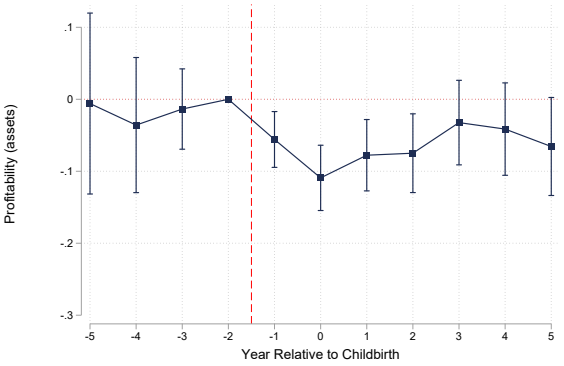
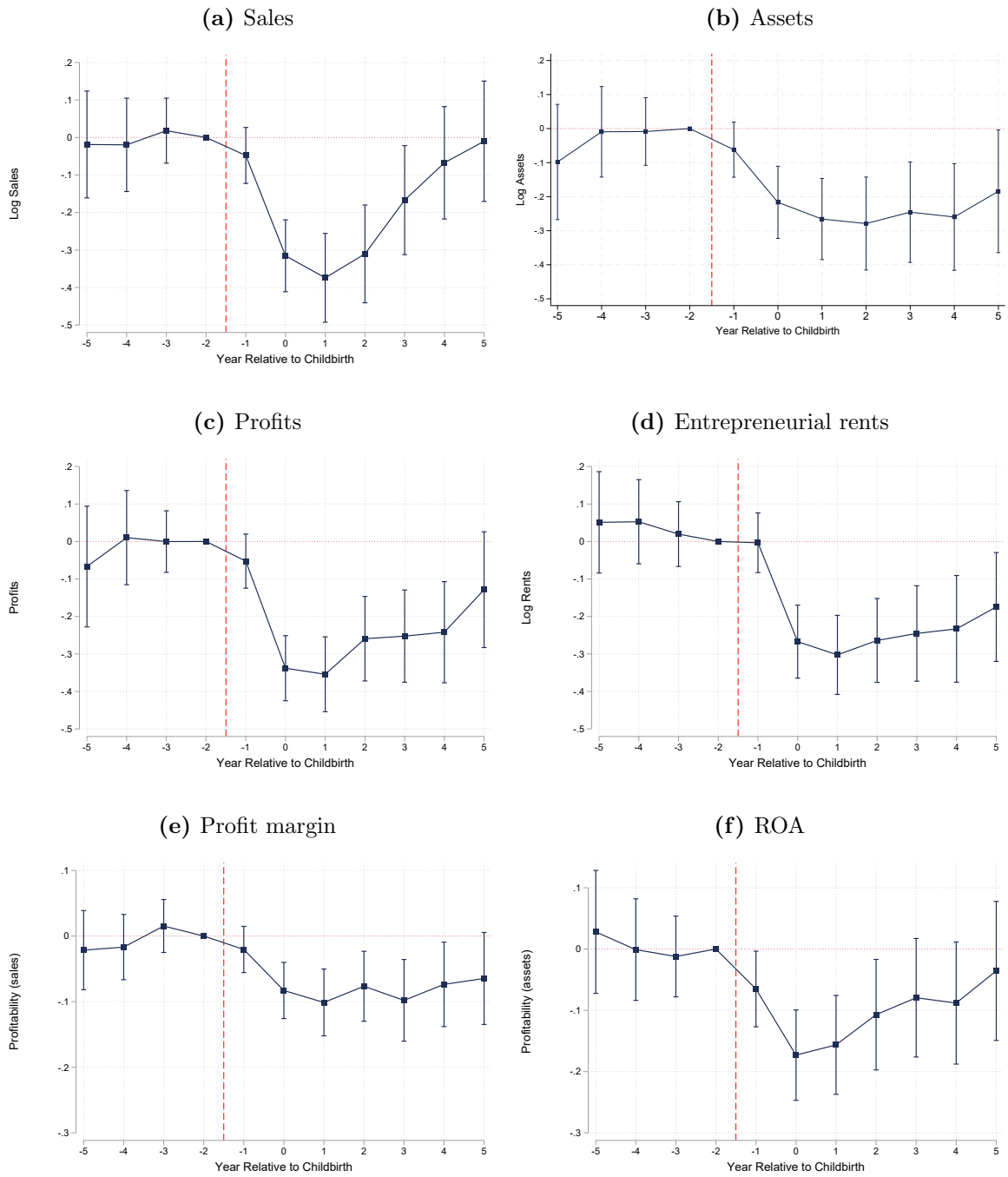
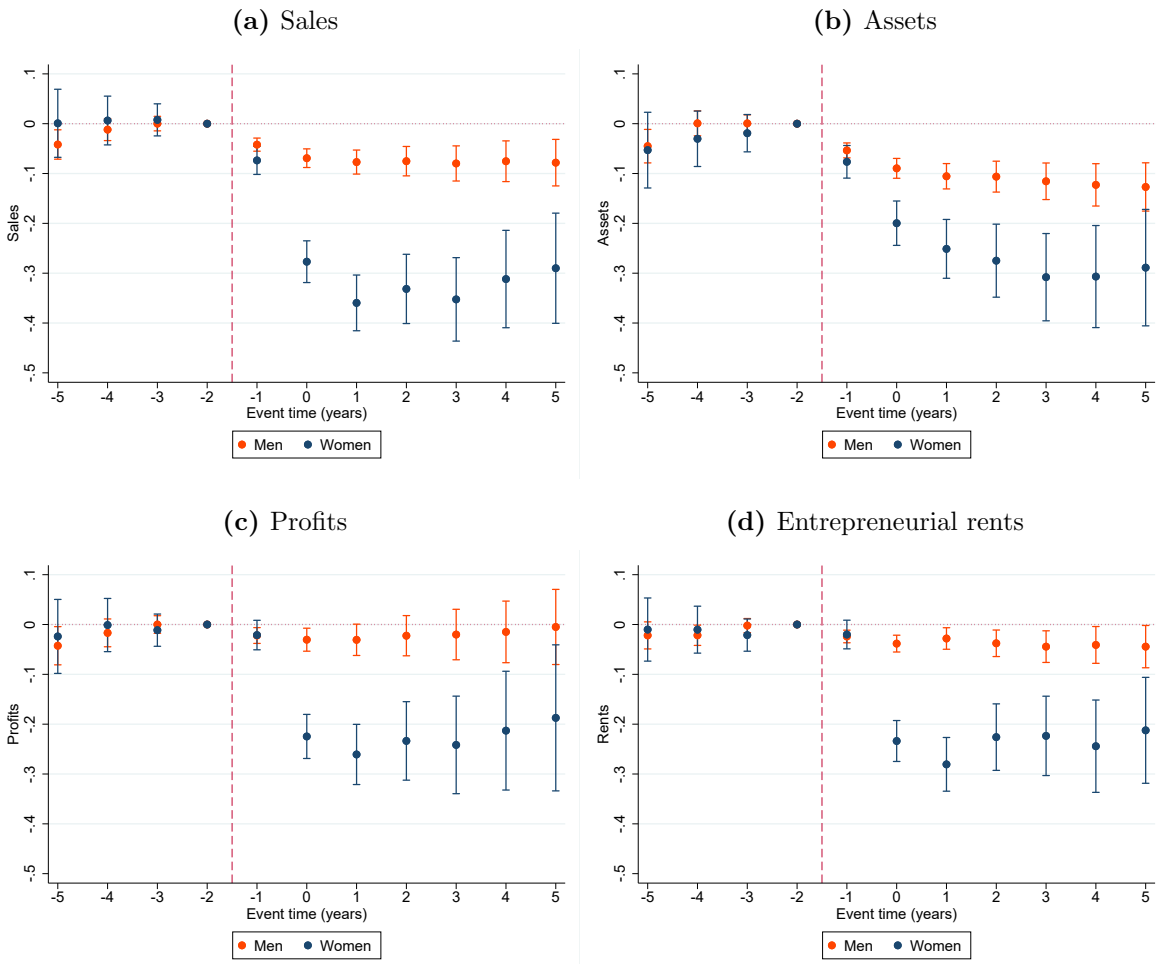


Figure 9: Firm outcomes: women over 35



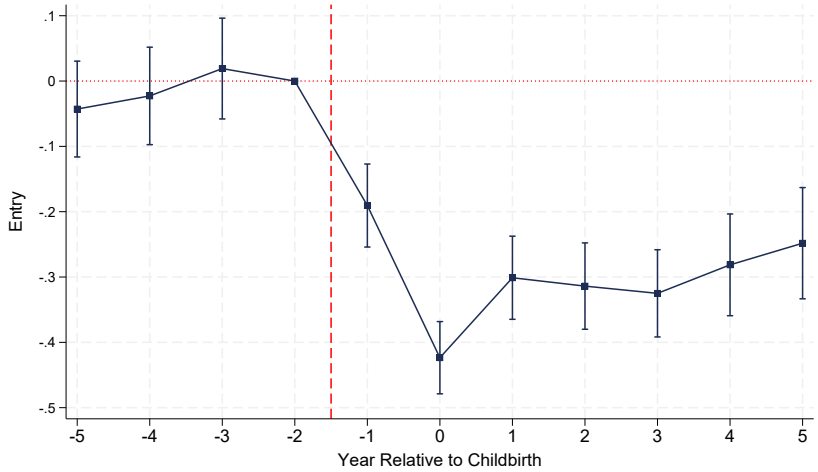
Notes: The graphs show event time coefficients β_τ estimated from equation 2. The sample is restricted to women who had their first child at 35 or after and were single (not married or cohabiting) when they started their firm. The control group is a matched sample of firms owned by women with zero observed fertility. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure 10: Firm outcomes



Notes: The graphs show event time coefficients α_τ estimated from equation 4, separately for mothers and fathers. The control group is a sample of firms owned by fathers. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

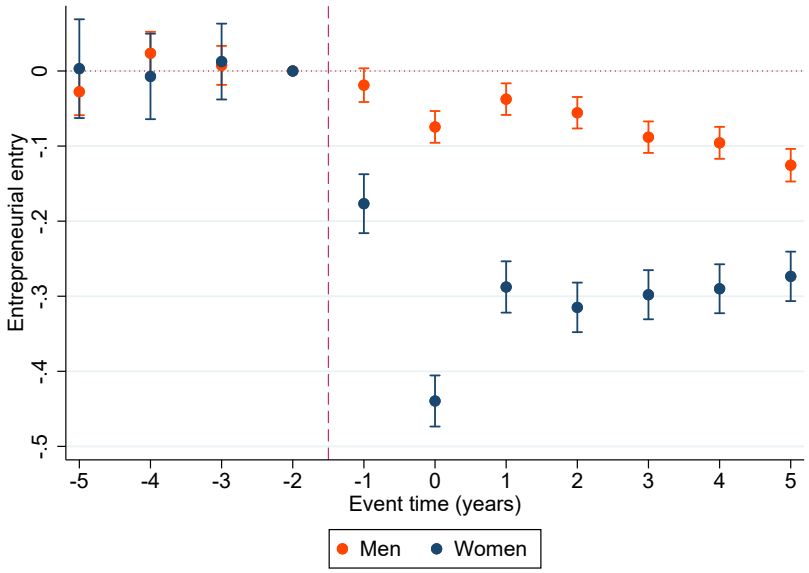
Figure 11: Entry into entrepreneurship



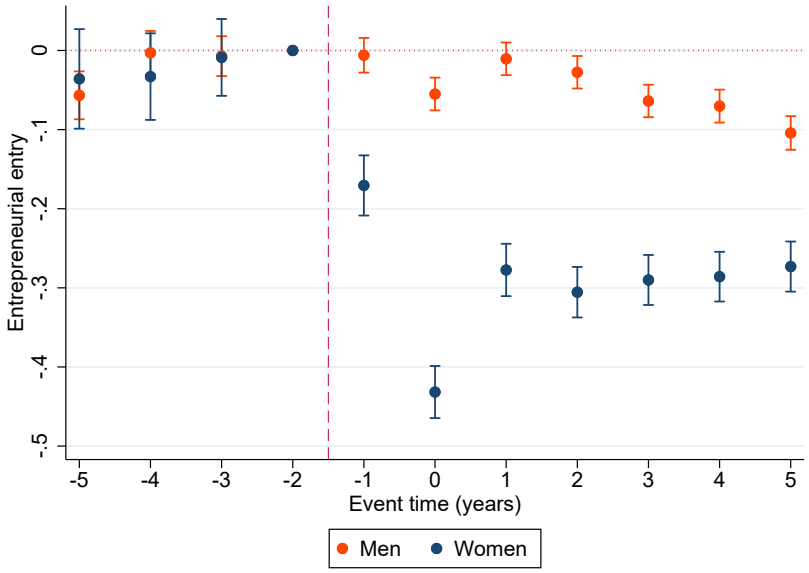
Notes: The graphs show differences in firm founding rates between mothers and a matched sample of women with zero observed fertility. Individual effects are included. I report 95% confidence intervals based on standard errors which are clustered at the individual level.

Figure 12: Entry into entrepreneurship: the gap relative to fathers

(a) Entry

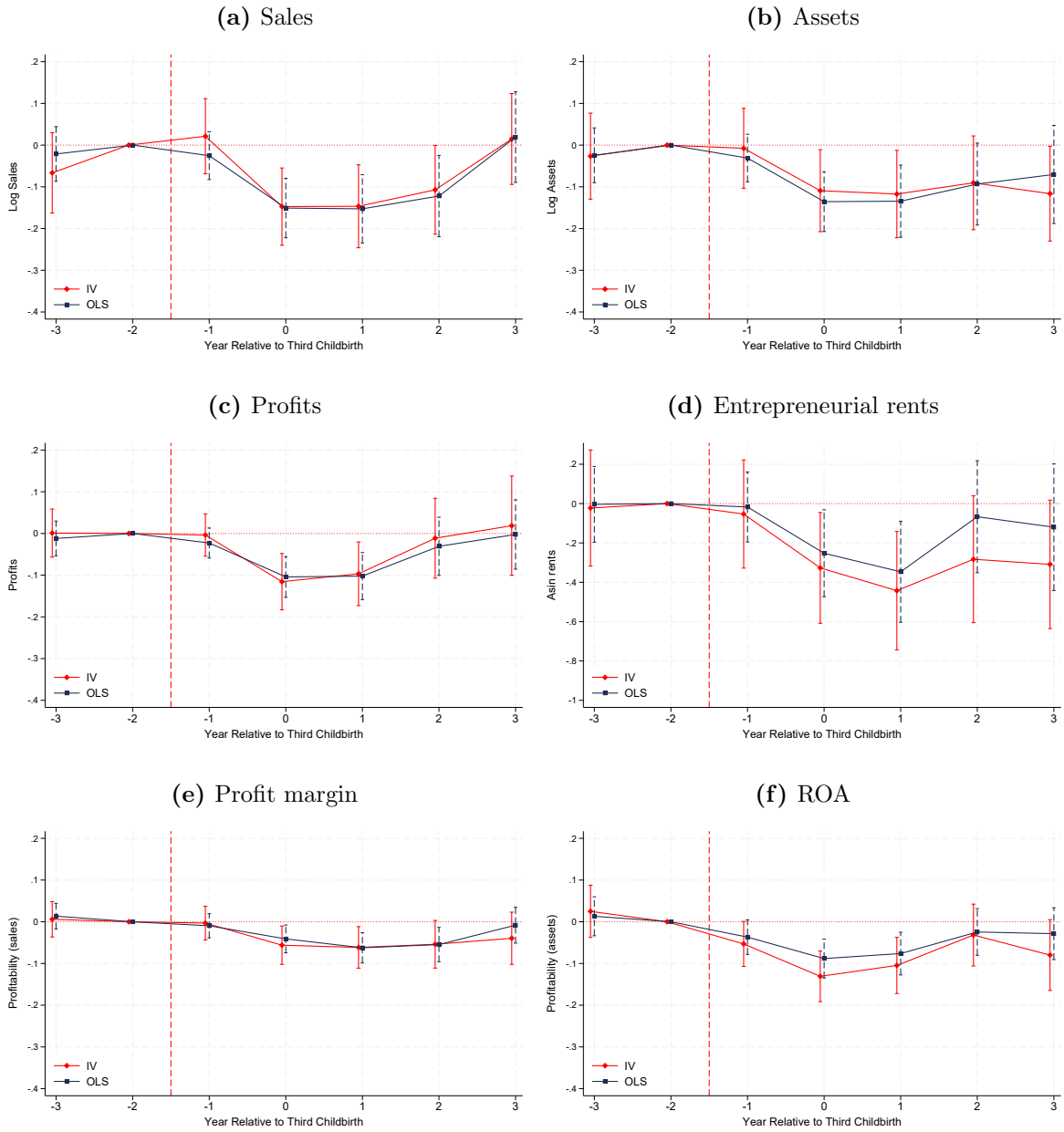


(b) Entry (including spousal teams)



Notes: The graphs show event time coefficients α_τ estimated from equation 3, separately for mothers and fathers. Panel A reports results for entry into entrepreneurship excluding firms owned by spouses. Panel B includes firm owned by spouses, assigning them to the spouse with majority ownership. I report 95% confidence intervals based on standard errors which are clustered at the individual level.

Figure 13: Firm outcomes: sibling sex mix IV vs OLS



Notes: The graphs compare estimates from the sibling sex mix instrument and an OLS event study around third childbirth. For the IV approach, I report event time coefficients α_τ estimated from equation 5. The instrumental variable specification is based on the sex mix of the first two children as instrument for the birth of a third child. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, marital status, a dummy to indicate whether the individual already had their first child, and binned event time dummies with respect to the second child. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Tables

Table 1: Descriptive statistics

Panel A: firms

Variables		Raw	Treated	Control	Standardized difference	Variance ratio
Firm age	mean					
	SD					
No. owners	mean	1.53	1.48	1.40	0.09	
	SD	0.89	0.76	0.78		0.95
Equity share	mean	78.20	80.42	83.22	-0.10	
	SD	29.09	28.14	26.78		1.10
Sales (log)	mean					
	SD					
Assets (log)	mean	10.78	11.00	10.93	0.03	
	SD	2.68	2.47	2.46		1.01
Net income (000)	mean	30.54	40.70	40.03	0.01	
	SD	82.44	90.85	90.43		1.01
N		20,233	11,292			

Panel B: entrepreneurs

Variables		Raw	Treated	Control	Standardized difference	Variance ratio
Age	mean					
	SD					
Total income (000)	mean	64.46	71.13	70.57	0.01	
	SD	115.97	111.63	98.54		1.28
Family income (000)	mean	127.71	133.58	132.46	0.01	
	SD	205.50	190.19	234.70		0.66
Married	%	65	59			
N		20,865	11,484			

Notes: This table presents summary statistics for start-ups (Panel A) and entrepreneurs (Panel B) for the full sample of entrepreneurs who are mothers, for the treated sample, and for the control sample. To construct the control sample, I match mothers at the earliest available date between $t-2$ and $t-1$ to never-mothers using caliper matching. The algorithm performs exact matching on the 4-digit industry classification, marital status, and year and fuzzy matching on firm age, entrepreneur's total income, family income, and age. Summary statistics are reported at the earliest between $t-2$ and $t-1$. The last two columns report the standardized mean difference between the treated (T) and the control (C) samples, calculated as $\frac{\bar{x}_T - \bar{x}_c}{\sigma}$, and the variance ratio, calculated as $\frac{\sigma_T^2}{\sigma_C^2}$.

Table 2: Children's sex mix and family size

Panel A: family size

	Third child	**Third child**	**Third child**	**Second child**
Same sex	0.047			
	(0.006)			
Two sons		0.045		
		(0.008)		
Two daughters		0.049		
		(0.008)		
First-born daughter			0.001	0.002
			(0.002)	(0.004)
Controls	Yes	Yes	Yes	Yes
Province × year effects	Yes	Yes	Yes	Yes
R^2	0.020	0.020	0.042	0.207
Number of observations	77,260	77,260	253,500	253,500

Panel B: descriptive statistics

		Same sex	**Different sex**
Married	%	84.0	83.9
Age	mean	33.8	33.7
	SD	5.0	5.0
Age at first childbirth	mean	30.0	30.0
	SD	3.1	3.1
Age at second childbirth	mean	32.8	32.8
	SD	3.3	3.2
Individual income	mean	68,911	69,624
	SD	99,975	126,787
Family income	mean	155,693	160,529
	SD	211,794	324,260
Number of observations		62,760	63,370

Notes: This table provides evidence on the same-sex instrumental variable. Panel A examines the effect of children's sex mix on family size. Column (1) shows the effect of having the first two children of the same sex on the probability of having a third child, for a sample of female entrepreneurs with at least two children. Column (2) decomposes the the effect in column (1) into the effect of having two sons vs. two daughters. Column (3) and (4) show the effect of having a first-born daughter on the probability of having a third and second child, respectively, for the whole sample of female entrepreneurs who are mothers. Controls include marital status and a polynomial for age. Standard errors are reported in parenthesis and are clustered at the individual level. Panel B shows descriptive statistics for the sample of women with two children, separately by the sex mix of the first two children.

Table 3: Cultural norms

Panel A: mothers, founders

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Traditional	-0.256	-0.042	-34,205	-0.246	-0.141	0.007
	(0.123)	(0.150)	(4705)	(0.155)	(0.061)	(0.075)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.800	0.818	0.762	0.712	0.680	0.612
Number of observations	8,525	9,130	9,475	9,545	8,525	9,270

Panel A: mothers, all owners

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Traditional	-0.253	-0.078	-18,000	-0.303	-0.081	0.081
	(0.088)	(0.107)	(3582)	(0.155)	(0.028)	(0.097)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.822	0.858	0.812	0.718	0.652	0.6102
Number of observations	15,670	17,535	18,020	18,120	15,670	17,730

Panel C: fathers, founders

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Traditional	0.176	0.102	-1952.81	0.138	0.027	0.092
	(0.070)	(0.037)	(5718)	(0.069)	(0.033)	(0.045)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.793	0.791	0.703	0.741	0.600	0.535
Number of observations	31,430	34,385	34,845	34,385	31,430	34,220

Notes: This table examines the effect of cultural norms. The sample includes second-generation immigrant entrepreneurs,i.e., individuals who were born in Canada from foreign-born parents. Post is an indicator equal to 1 in the year of birth of the first child or after. Traditional is equal to 1 if the entrepreneur's parents immigrated from a country with traditional gender norms. The construction of the gender norms progressivity index is detailed in Appendix B. Panel A shows results for mothers who are founders; Panel B for all mothers who are business owners. Panel C shows results for fathers who are founders. Controls include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Standard errors are reported in parenthesis and are double clustered at the firm and country of origin level.

Table 4: Specialization within the household

Panel A: firm outcomes

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Mother	-0.345	-0.245	-0.295	-16,486	-0.078	-0.117
	(0.034)	(0.037)	(0.028)	(1523)	(0.012)	(0.021)
Post × Mother × Main earner	0.153	0.116	0.149	-5987	0.021	0.060
	(0.045)	(0.049)	(0.038)	(2516)	(0.016)	(0.028)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.800	0.820	0.770	0.802	0.658	0.641
Number of observations	86,110	92.630	62,345	93,745	86,110	92,400

Panel B: firm outcomes (IPW)

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Mother	-0.348	-0.256	-0.304	-22,310	-0.077	-0.134
	(0.035)	(0.034)	(0.029)	(2016)	(0.011)	(0.020)
Post × Mother × Main earner	0.143	0.075	0.120	1111	0.014	0.063
	(0.048)	(0.048)	(0.039)	(2704)	(0.017)	(0.030)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.800	0.831	0.768	0.810	0.657	0.642
Number of observations	80,125	83,280	57,920	83,945	80,125	83,155

Panel C: income

	Household income	**Individual income**	**Spouse income**	**Breadwinner**
Post × Mother	0.073	-0.069	0.122	-0.070
	(0.016)	(0.039)	(0.017)	(0.009)
Post × Mother × Main earner	-0.067	-0.130	0.022	-0.064
	(0.024)	(0.047)	(0.028)	(0.013)
Controls	Yes	Yes	Yes	Yes
Individual effects	Yes	Yes	Yes	Yes
Province × year effects	Yes	Yes	Yes	Yes
R^2	0.522	0.454	0.626	0.522
Number of observations	227,195	225,440	133,570	137,350

Notes: This table examines the effect of household specialization. The sample is restricted to entrepreneurs who were married or cohabiting the year before giving birth to their first child. Main earner is an indicator equal to 1 if the mother earned more than 50% of the household income the year before childbirth. Panel A examines firm outcomes for main vs. secondary earners. In Panel B, observations are reweighted to achieve a balanced firm distribution between main and secondary earners. Panel C examines the effect on income, regardless of whether the individual remains an entrepreneur. Controls include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status in Panel A and B; a polynomial for individual age, and interaction between main earner status and marital status to account for potential marriage dissolution in Panel C. Standard errors are reported in parenthesis and are clustered at the firm level (Panel A and B) and at the individual level (Panel C).

Table 5: Informal childcare

Panel A: mothers

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Close to grandparents	0.133	0.036	5,728	0.212	0.071	0.042
	(0.035)	(0.037)	(2287)	(0.104)	(0.024)	(0.021)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.803	0.810	0.756	0.740	0.584	0.598
Number of observations	49,770	54,185	54,820	55,155	54,020	49,770

Panel B: fathers

	Sales	**Assets**	**Profits**	**Rents**	**Profit margin**	**ROA**
Post × Close to grandparents	0.019	0.019	-3748	0.126	0.007	0.015
	(0.019)	(0.019)	(1338)	(0.055)	(0.012)	(0.009)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry × province × year effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.766	0.776	0.670	0.685	0.472	0.498
Number of observations	236,635	257,775	259,890	261,850	256,840	236,635

Notes: This table examines the effect of proximity to grandparents as a proxy for the availability of informal childcare through family networks. Post is an indicator equal to 1 in the year of birth of the first child or after. Close to grandparents is equal to 1 if the grandparents live in the same municipality as the parent. Panel A shows results for firms owned by mothers; Panel B for firms owned by fathers. Controls include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Standard errors are reported in parenthesis and are clustered at the firm level.

A Theoretical framework

Model of occupational choice

From the production function we can derive the profit-maximizing first-order conditions (FOC) for firm inputs:

$$f_n(z, h, n) = W$$
$$f_h(z, h, n) = (H - h)^{-\gamma}.$$

Given the FOC on labor demand, if $f_n(z, h, n)$ is strictly decreasing and continuous in n, then we can invert f_n to obtain the unique n that solves the first order condition:

$$n(h; z, W) = f_n^{-1}(W, z, h).$$

The implicit function theorem applied to the first order condition for n shows that n_z is positive:

$$\frac{\partial n(h; z, W)}{\partial z} = -\frac{\frac{\partial (f_n(z,h,n)-W)}{\partial z}}{\frac{\partial (f_n(z,h,n)-W)}{\partial n}} = \frac{-f_{nz}(n, z, h)}{f_{nn}(n, z, h)} > 0$$

Substituting this function $n(\cdot)$ into the FOC for h, we obtain:

$$G(h, z, W) \equiv f_h(h, n(h; z, W), z) - (H - h)^{-\gamma} = 0.$$

The solution to this equation — the optimal h^* — is unique if f_h crosses $(H - h)^{-\gamma}$ from above[20].

Entrepreneurs face a trade-off between profits and leisure. Higher productivity increases entrepreneurial labor supply h^*: the substitution effect prevails over the income effect.

To see that entrepreneurs' hours worked are increasing in productivity, we apply

[20] Since G is decreasing in h (see the next paragraph) and $(H-0)^{-\gamma} < +\infty$, a standard Inada condition on f_h ($\lim_{h\to 0^+} f_h = +\infty$) is sufficient here.

the implicit function theorem to G to get:

$$\frac{\partial h^*}{\partial z} = -\frac{\frac{\partial G}{\partial z}}{\frac{\partial G}{\partial h^*}} = \frac{-f_{hz}(n(h;z,W),z,h) - f_{hn}(n(h;z,W),z,h)\frac{\partial n(h;z,W)}{\partial z}}{f_{hh}(n(W;z,h),z,h) - \gamma(H-h)^{-\gamma-1} + f_{hn}(n(h;z,W),z,h)\frac{\partial n(h;z,W)}{\partial h}}.$$

The assumption that all inputs and idiosyncratic productivity are complementary implies the numerator is negative. The first two terms of the denominator are negative by previous assumptions, while the last term is positive: by the implicit function theorem, we have

$$n_h = \frac{-f_{nh}}{f_{nn}} > 0 \rightarrow f_{hn}(n(h;z,W),z,h)\frac{\partial n(h;z,W)}{\partial h} = f_{hn}n_h = \frac{-(f_{nh})^2}{f_{nn}} > 0.$$

Using the fact that $f_{nn}f_{hh} - f_{hn}f_{nh} = f_{nn}f_{hh} - (f_{hn})^2 > 0$, we obtain $f_{hh} - \frac{(f_{nh})^2}{f_{nn}} < 0$ because $f_{nn} < 0$. Both the numerator and the denominator are therefore negative and so $\frac{\partial h^*}{\partial z} > 0$.

Entrepreneurial labour supply from an entrepreneur with productivity z is $h^*(z,W)$ and their labour demand is $n(h^*;z,W) = n^*(z,W)$. Optimal revenue for the entrepreneur is then $f(z,h^*(z,W),n^*(z,W))$ which we rewrite as $f^*(z,W)$.

Given the entrepreneur's optimal policies, returning to the first stage problem, individuals solve:

$$V(z,W) = \max_{x\in\{0,1\}} \left\{ (1-x)\left[W + \frac{(H-h_w)^{1-\gamma}}{1-\gamma} \right] + x\left[f^*(z,W) - Wn^*(z,W) + \frac{(H-h^*(z,W))^{1-\gamma}}{1-\gamma} \right] \right\}.$$

Entrepreneurship is optimal if and only if:

$$W + \frac{(H-h_w)^{1-\gamma}}{1-\gamma} \leq f^*(z,W) - Wn^*(z,W) + \frac{(H-h^*(z,W))^{1-\gamma}}{1-\gamma}.$$

Proof of Proposition 1. It suffices to show that entrepreneurs' utility is monotonically increasing in z. We need to verify that:

$$f_z^*(z,W) - Wn_z^*(z,W) - (H-h^*(z,W))^{-\gamma}h_z^* > 0.$$

From the result we derived earlier, we know that entrepreneurial labour supply is increas-

ing in z, so the third term is negative. Now we need to differentiate the first two terms, which are similar but subtly different to what we did above. By the chain rule, if we expand the first term we get:

$$f_z^*(z, W) = f_z(h^*, n^*, z) + f_n(h^*, n^*, z)n_z^* + f_h(h^*, n^*, z)h_z^*.$$

The second and third terms cancel with the second and third terms above because they are exactly the first order conditions (this is the envelope theorem), so we end up with:

$$f_z^*(z, W) - Wn_z^*(z, W) - (H - h^*(z, W))^{-\gamma}h_z^* = f_z(h^*, n^*, z) > 0.$$

That is, revenue from an entrepreneurial business is increasing in productivity, which is true by assumption.

Alternatively, consider that the first order conditions are sufficient to solve for the optimal combination of h' and n' with a concave objective. Then, holding h and n fixed, the entrepreneur's utility is strictly increasing in z through f. We can make a simple argument to show that the maximized utility is strictly increasing in z. Pick an arbitrary pair of distinct z_L and z_H with $z_L < z_H$. Then we have:

$$\begin{aligned}
&f(h'(z_L, W), z_L, W) - Wn(h'(z_L, W); z_L, W) + \frac{(H - h'(z_L, W))^{1-\gamma}}{1-\gamma} < \\
&f(h'(z_L, W), z_H, W) - Wn(h'(z_L, W); z_L, W) + \frac{(H - h'(z_L, W))^{1-\gamma}}{1-\gamma} \leq \\
&f(h'(z_H, W), z_H, W) - Wn(h'(z_H, W); z_H, W) + \frac{(H - h'(z_H, W))^{1-\gamma}}{1-\gamma}
\end{aligned}$$

The first inequality follows from the definition of $f(\cdot)$, and the second inequality follows from the optimality of $h'(\cdot)$ and $n(h'(\cdot); ...)$. Since this holds for all z_L and z_H, the value function of an entrepreneur with children is strictly increasing in z_L and z_H. Thus there is a unique $\hat{z}(W)$.

Model with children

In order to exclude several problematic edge cases I make the following assumption. Since workers are unable to modulate their work hours, it is possible that h_2 achieves a sufficiently better trade-off between labour and leisure that all workers have children. In

order to prevent this, I assume that a worker with the minimum possible benefit $\underline{b}$ would not want children:

$$wh_1 + \frac{(H-h_1)^{1-\gamma}}{1-\gamma} > wh_2 + \underline{b} + \frac{(H-h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2).$$

Note that this inequality depends upon w, which is an endogenous variable, so we are constraining the set of possible equilibria by making this assumption[21].

If entrepreneurs decide to have children, they manage the firm optimally *given the presence of children.* So, they decide their labor supply to the firm h' using their new first order condition:

$$f_h(h,n,z) - (H-h)^{-\gamma} - \phi_h(h) = 0.$$

I show that entrepreneurial labour supply decreases—given z and W—if the entrepreneur chooses to have children, so that $h' < h^*$. The same result obtains if instead of an additional cost of hours worked $\phi(h)$ we assume that total hours available are reduced to $H' < H$ due to childcare responsibilities[22]. With that in mind, in this section I restrict attention to the case with the additive disutility term $-\phi(h)$. In addition, I show that h' is increasing in z as before.

We can show that entrepreneurial labor supply decreases in the presence of children under the assumption that women incur an additional disutility of work $\phi(h')$ or that total hours available are reduced to $H' < H$.

Case 1, additional disutility of work $\phi(h')$: Since $\phi(h)$ is assumed to be weakly convex and strictly increasing, $-\phi(h)$ maintains the concavity of the overall objective and

[21]This adds another restriction upon the range of feasible W in equilibrium (see previous footnote). This inequality is equivalent to:

$$w > \frac{\underline{b} + \frac{(H-h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2) - \frac{(H-h_1)^{1-\gamma}}{1-\gamma}}{h_1 - h_2}.$$

. Combining this and the preceding restriction implies $\underline{b} < \phi(h_1)$.

[22]In fact, reduced total available hours can be seen as a special case of adding the additional disutility term $-\phi(h)$, where

$$-\phi(h) = -\frac{(H-h)^{1-\gamma}}{1-\gamma} + \frac{(H'-h)^{1-\gamma}}{1-\gamma}$$

with

$$\phi_h(h) = (H-h)^{-\gamma} - (H'-h)^{-\gamma} > 0.$$

the first order conditions remain sufficient.

The FOC for labor demand is

$$f_n(z, h, n) = W.$$

For labour demand, the first order conditions are identical with and without children, and we again use the concavity of f in n to obtain:

$$n(h; z, W) = f_n^{-1}(h; z, W).$$

And similarly substitute this into the new first order condition for h':

$$G'(h'; z, W) \equiv f_h(h', n(h'; z, W), z) - (H - h')^{-\gamma} - \phi_h(h') = G(h'; z, W) - \phi_h(h') = 0.$$

By a similar argument to before, h' is the unique optimum if G' is monotonically decreasing—it equals 0 at most once for any given W and z. Since G is monotonically decreasing, a sufficient (although not necessary) condition for G' to be strictly decreasing is that $-\phi_h(h')$ is non-increasing, implying that $\phi(h')$ is weakly convex. If $\phi(h')$ is not linear, we cannot directly employ implicit differentiation to determine that h' is lower than h^*, though, so we work with G' and G directly.

If we substitute in the solution for the entrepreneur without children, h^*:

$$G'(h^*; z, W) = f_h(h^*, n(h^*; z, W), z) - (H - h^*)^{-\gamma} - \phi_h(h^*) = 0 - \phi_h(h^*) < 0.$$

Since $\phi_h(\cdot) > 0$ for all $h > 0$, h^* exceeds the optimum h' in the presence of children because of the additional marginal dis-utility of entrepreneurial work. Since G' is monotonically decreasing, $h' < h^*$.

Case 2, reduced total hours available $H' < H$: In this case, we can similarly define the new G' as follows:

$$G'(h'; z, W) \equiv f_h(h', n(h'; z, W), z) - (H' - h')^{-\gamma} = G(h'; z, W) - (H' - h')^{-\gamma} + (H - h')^{-\gamma} = 0.$$

G' is strictly decreasing if and only if G is (at least for $h' < H'$), so it has a unique optimal

solution h'. However, $h^* > h'$ because at h^* the marginal disutility of work is too high.

$$G'(h^*; z, W) = f_h(h^*, n(h^*; z, W), z) - (H' - h^*)^{-\gamma} = G(h^*; z, W) - (H' - h^*)^{-\gamma}$$
$$+ (H - h^*)^{-\gamma} = -(H' - h^*)^{-\gamma} + (H - h^*)^{-\gamma} < 0.$$

The last inequality follows since:

$$(H' - h^*)^{-\gamma} > (H - h^*)^{-\gamma} \quad \Leftrightarrow \quad (H' - h^*)^{\gamma} < (H - h^*)^{\gamma} \quad \Leftrightarrow \quad H' < H$$

and $\gamma > 0$.

To show that h' is increasing in z as in the model without fertility decisions, again we use the implicit function theorem on G':

$$\frac{\partial h'}{\partial z} = -\frac{\frac{\partial G'}{\partial z}}{\frac{\partial G'}{\partial h'}} = \frac{-f_{hz}(n(h; z, W), z, h) - f_{hn}(n(h; z, W), z, h)\frac{\partial n(h;z,W)}{\partial z}}{f_{hh}(n(W; z, h), z, h) - \gamma(H - h)^{-\gamma-1} + f_{hn}(n(h; z, W), z, h)\frac{\partial n(h;z,W)}{\partial h} - \phi_h(h)}.$$

The numerator is negative for exactly the same reasons as before. The denominator is also negative, since we add $-\phi_h(h)$ to an already negative expression. Thus, h' is strictly increasing in z.

The optimal threshold $\hat{z}(W)$ will also change once an potential entrepreneur has the choice of having children. If, in the second period, a woman chooses not to have children, she becomes an entrepreneur if $z \geq \hat{z}(W)$. We relabel $\hat{z}(W)$ as $\hat{z}_1(W)$, because we will show that there is a similar threshold if a woman chooses to have children.

In the second period, a woman with children chooses to become an entrepreneur if and only if:

$$wh_2 + \frac{(H - h_2)^{1-\gamma}}{1 - \gamma} - \phi(h_2) \leq f(h'(z, w), z, w) - wn(h'(z, w); z, w)$$
$$+ \frac{(H - h'(z, w))^{1-\gamma}}{1 - \gamma} - \phi(h'(z, w))$$

Proof of Proposition 2. We need to show that the utility derived from being an entrepreneur with children, relative to a worker with children, is strictly increasing in z. Since b is constant in terms of z, the utility directly from children has no impact on the threshold. Writing $n'(z, W) = n(h'(z, W); z, W)$ and $f'(z, W) = f(h'(z, W), n'(z, W), z)$ we

need to show that:

$$f'_z(z,W) - Wn'_z(z,W) - (H - h'(z,W))^{1-\gamma} h'_z(z,W) - \phi_h(h'(z,W))h'_z(z,W) > 0$$

The first term's chain rule expansion is:

$$f'_z(z,W) = f_z(h',n',z) + f_n(h',n',z)n'_z + f_h(h',n',z)h'_z$$

Because h' and n' satisfy the first order conditions, we can use the envelope theorem to cancel their matching terms in the main expression, so we get:

$$f_z(h',n',z) > 0.$$

Alternatively, using the same argument as in Preposition 1, pick an arbitrary pair of distinct z_L and z_H with $z_L < z_H$. We have:

$$\begin{aligned}
&f(h'(z_L,W),z_L,W) - Wn(h'(z_L,W);z_L,W) + \frac{(H - h'(z_L,W))^{1-\gamma}}{1-\gamma} - \phi(h'(z_L,W)) < \\
&f(h'(z_L,W),z_H,W) - Wn(h'(z_L,W);z_L,W) + \frac{(H - h'(z_L,W))^{1-\gamma}}{1-\gamma} - \phi(h'(z_L,W)) \leq \\
&f(h'(z_H,W),z_H,W) - Wn(h'(z_H,W);z_H,W) + \frac{(H - h'(z_H,W))^{1-\gamma}}{1-\gamma} - \phi(h'(z_H,W))
\end{aligned}$$

Since this holds for all z_L and z_H, the value function of an entrepreneur with children is strictly increasing in z_L and z_H. Thus there is a unique $\hat{z}_2(W)$.

Strategy when $\hat{\mathbf{z}}_\mathbf{2}(\mathbf{W}) < \hat{\mathbf{z}}_\mathbf{1}(\mathbf{W})$: when $z \in [\hat{z}_2(w), \hat{z}_1(w))$ and $\hat{z}_2(w) < \hat{z}_1(w)$, the individual becomes an entrepreneur if she has children. Put formally:

$$x(z,y(b)) = \begin{cases} 1 & \text{if } z \geq \hat{z}_1(w) > \hat{z}_2(w) \\ 1 & \text{if } z \in [\hat{z}_2(w), \hat{z}_1(w)) \ \& \ y(b) = 1 \\ 0 & \text{if } z \in [\hat{z}_2(b), \hat{z}_1(w)) \ \& \ y(b) = 0 \\ 0 & \text{if } z < \hat{z}_2(w) \end{cases}$$

Between $\hat{z}_2(w) and \hat{z}_1(w)$ the threshold value of b for having children depends on the comparison between being an entrepreneur with children and a worker without children.

In this instance:

$$b\big(\hat{z}_2(w) \le z < \hat{z}_1(w)\big) \equiv wh_1 - \frac{(H-h_1)^{1-\gamma}}{1-\gamma} - f_2(z)$$

This threshold is *decreasing* in z. The complete strategy is:

$$(x,y) = \begin{cases} (1,1) & \text{if } z \ge \hat{z}_1(w) \ \&\ b \ge f_1(z) - f_2(z) \\ (1,0) & \text{if } z \ge \hat{z}_1(w) \ \&\ b < f_1(z) - f_2(z) \\ (1,1) & \text{if } z \in [\hat{z}_2(w), \hat{z}_1(w)) \ \&\ b > wh_1 - \frac{(H-h_1)^{1-\gamma}}{1-\gamma} - f_2(z) \\ (0,0) & \text{if } z \in [\hat{z}_2(w), \hat{z}_1(w)) \ \&\ b \le wh_1 - \frac{(H-h_1)^{1-\gamma}}{1-\gamma} - f_2(z) \\ (0,1) & \text{if } z < \hat{z}_2(w) \ \&\ b \ge w(h_1-h_2) + \frac{(H-h_1)^{1-\gamma}-(H-h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2) \\ (0,0) & \text{if } z < \hat{z}_2(w) \ \&\ b < w(h_1-h_2) + \frac{(H-h_1)^{1-\gamma}-(H-h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2) \end{cases}$$

Solution details:

This completes the description of the second period optimal strategy. The complete strategy is:

$$(x,y) = \begin{cases} (1,1) & \text{if } z \ge \hat{z}_2(w) \ \&\ b \ge f_1(z) - f_2(z) \\ (1,0) & \text{if } z \ge \hat{z}_2(w) \ \&\ b < f_1(z) - f_2(z) \\ (1,0) & \text{if } z \in [\hat{z}_1(w), \hat{z}_2(w)) \ \&\ b < f_1 - wh_2 - \frac{(H-h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2) \\ (0,1) & \text{if } z \in [\hat{z}_1(w), \hat{z}_2(w)) \ \&\ b \ge f_1 - wh_2 - \frac{(H-h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2) \\ (0,1) & \text{if } z < \hat{z}_1(w) \ \&\ b \ge w(h_1-h_2) + \frac{(H-h_1)^{1-\gamma}-(H-h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2) \\ (0,0) & \text{if } z < \hat{z}_2(w) \ \&\ b < w(h_1-h_2) + \frac{(H-h_1)^{1-\gamma}-(H-h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2) \end{cases}$$

Or more concisely, using the function $b(z)$ piecewise defined above:

$$(x, y) = \begin{cases} (1,1) & \text{if } z \geq \hat{z}_2(w) \ \& \ b \geq b(z) \\ (1,0) & \text{if } z \geq \hat{z}_2(w) \ \& \ b < b(z) \\ (1,0) & \text{if } z \in [\hat{z}_1(w), \hat{z}_2(w)) \ \& \ b < b(z) \\ (0,1) & \text{if } z \in [\hat{z}_1(w), \hat{z}_2(w)) \ \& \ b \geq b(z) \\ (0,1) & \text{if } z < \hat{z}_1(w) \ \& \ b \geq b(z) \\ (0,0) & \text{if } z < \hat{z}_2(w) \ \& \ b < b(z) \end{cases}$$

1. marginal entrepreneur for parents must be indifferent between being an entrepreneur or a worker. There exists $\hat{z}_2$ such that

$$wh_2 + \frac{(H - h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2) = \pi(h', n', \hat{z}_2) + \frac{(H - h')^{1-\gamma}}{1-\gamma} - \phi(h')$$

2. marginal entrepreneur for non-parents must be indifferent between being an entrepreneur or not: there exists $\hat{z}_1$ such that

$$wh_1 + \frac{(H - h_1)^{1-\gamma}}{1-\gamma} = \pi(h, n, \hat{z}_1) + \frac{(H - h)^{1-\gamma}}{1-\gamma}$$

3. marginal parent for workers must be indifferent between being a parent or not: there exists $\hat{b}_W(z)$ such that

$$\hat{b}_W = w(h_1 - h_2) + \frac{(H - h_1)^{1-\gamma}}{1-\gamma} - \frac{(H - h_2)^{1-\gamma}}{1-\gamma} + \phi(h_2)$$

4. marginal parent for entrepreneurs is indifferent between having a child or not. Denoting profits as $\pi(\cdot)$, for each z, there exists $\hat{\beta}_E(z)$ such that

$$\hat{b}_E(z) = \pi(h, n, z) + \frac{(H - h)^{1-\gamma}}{1-\gamma} - \pi(h', n', z) - \frac{(H - h')^{1-\gamma}}{1-\gamma} + \phi(h')$$

5. Labor markets clear: number of workers (non-parents + parents) is equal to sum

of labor demand from entrepreneurs (non-parents+parents)

$$\int_{\underline{z}}^{\hat{z}_1}\int_{\underline{b}}^{\hat{b}(z)} h_1 dF(z)d\Theta(b) + \int_{\underline{z}}^{\hat{z}_2}\int_{\underline{b}}^{\hat{b}(z)} h_2 dF(z)d\Theta(b) = \int_{\hat{z}_1}^{\overline{z}}\int_{\underline{b}}^{\hat{b}(z)} n^*(z,w)dF(z)d\Theta(b) + \int_{\hat{z}_2(w)}^{\overline{z}}\int_{\hat{b}(z)}^{\bar{b}} n^*(z,w)dF(z)d\Theta(b).$$

Extension: Dynamic model

Now consider a version of the model in which entrepreneurial exit is not free; entrepreneurs who shut down "prematurely" and go back to wage work incur a cost c. The exit cost can be interpreted in several ways: start-ups can take years before they turn a profit, making too-short entrepreneurial spells economically unviable; assets might be specialized, reducing their redeployment value; returning entrepreneurs might face penalties on the labor market. Individuals make their first occupational choice taking into account their second-period decisions about fertility and occupation.

We solve the model by backward induction. Given the solution to the second-period problem, individuals in the first period solve the following problem:

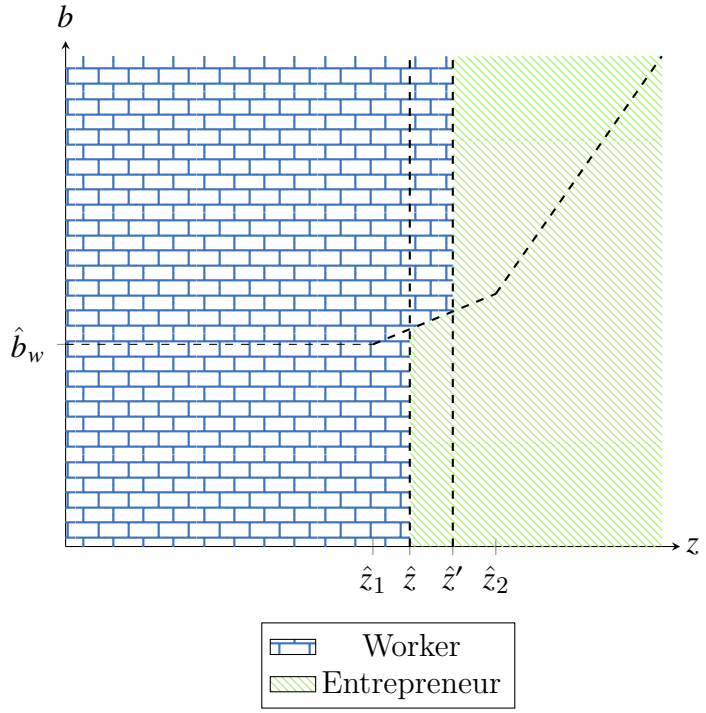
$$V(z,w,w',b) = \max_{x\in\{0,1\}}\left\{(1-x)\left[W + \frac{(H-h_w)^{1-\gamma}}{1-\gamma}\right] + x\max_{n,h}\left[f(z,h,n) - Wn + \frac{(H-h)^{1-\gamma}}{1-\gamma} - c\,\mathbb{I}_{x_1=0}\right]\right\} + \beta V_1^*(z,w',b).$$

The threshold for entrepreneurial entry is now:

$$\hat{z} = \begin{cases} wh_1 + \frac{(H-h_1)^{1-\gamma}}{1-\gamma} = f(\hat{z}) & \text{if } z \geq \hat{z}_2(w) \ \vee \ \hat{z}_1 \leq z < \hat{z}_2 \ \& \ b \leq b(z) \\ wh_1 + \frac{(H-h_1)^{1-\gamma}}{1-\gamma} = f(\hat{z}) - c & \text{if } z < \hat{z}_1(w) \ \vee \ \hat{z}_1 \leq z < \hat{z}_2 \ \& \ b > b(z) \end{cases}$$

It's easy to see that the equilibrium level of entrepreneurship in this case is lower than under the benchmark case: some women, anticipating that they will have children and switch to wage work in the next period, choose wage work in period 1 to avoid paying the cost c. Suppose this was not the case, i.e., there are more entrepreneurs now that under the benchmark. Then, labor supply would be lower and labor demand would be higher, increasing equilibrium wages; since the value of being a worker is now higher, the threshold $\hat{z}$ (for individuals who are entrepreneurs next period) would also be higher

Figure 14: Example of first-period equilibrium with $\hat{z}_2 > \hat{z}_1$



than before. Since $\hat{z}' > \hat{z} > \hat{z}_{benchmark}$, we run into a contradiction. Note that if c is large enough that $\hat{z}' \geq \hat{z}_2$, the equilibrium in the first period is identical to the equilibrium in the second period. So, there won't be entry or exit dynamic. Also, I assume that there can't be renegotiation: individual can't make the second period choice in order to avoid paying c. As such, this solution is not renegotiation-proof.

THE RENEGOTIATION-PROOF SOLUTION

In the second period, individuals will want to deviate and choose entrepreneurship if:

$$f_2(z) > wh_2 + \frac{(H - h_2)^{1-\gamma}}{1-\gamma} - c$$

This defines a new threshold for entrepreneurs with children, $\hat{z}_2' < \hat{z}_2$. Anticipating this deviation (the fact that individuals cannot commit to the optimal policy of entrepreneurship in the first period and wage work in the second period), in the first period individuals evaluate whether it is best to choose wage work or entrepreneurship in both periods.

They will choose work in both periods if:

$$wh_w + \frac{(H - h_w)^{1-\gamma}}{1-\gamma} + \beta\left[wh_2 + \frac{(H - h_2)^{1-\gamma}}{1-\gamma} - \phi(h_2)\right] > f(z) + \beta f_2(z),$$

where $f(z)$ denotes the utility from entrepreneurship in the first period. Denote by ζ the threshold where the individual is indifferent between wage work in both periods and entrepreneurship in both periods (conditional on becoming a parent); note that $\hat{z} < \zeta < \hat{z}_2$. Three things can happen:

1. c is low $\rightarrow \zeta < \hat{z}_2' < \hat{z}_2$. Then the solution to the first period problem is unchanged relative to the baseline: individuals become entrepreneurs iff $z > \hat{z}$. In the second period, mothers become entrepreneurs iff $z > \hat{z}_2'$. In addition, the threshold for having a child for "switchers" is equal to $\hat{b}(z) + c$.

2. c is moderate $\rightarrow \hat{z} < \hat{z}_2' < \zeta$. In this case, the solution to the first period problem is as follows:

$$x = \begin{cases} 0 & \text{if } z < \hat{z} \vee \hat{z}_2' < z < \zeta \ \& \ b > \hat{b}(z) \\ 1 & \text{otherwise} \end{cases}$$

   The threshold for children is now equal to $\hat{b}(z) + c$ when $\hat{z} < z < \hat{z}_2'$ and $\hat{b}(z) + \frac{1}{\beta}\left(f(z) - wh_w - \frac{(H-h_w)^{1-\gamma}}{1-\gamma}\right)$ when $\hat{z}_2' < z < \zeta$ (this last condition ensures that working both periods and having a child is better than being an entrepreneur both periods and not having a child).

3. c is high $\rightarrow \hat{z}_2' \leq \hat{z}$. In this case everyone who was an entrepreneur in the first period wants to be an entrepreneur also in the second period. the solution to the first period problem is as follows:

$$x = \begin{cases} 0 & \text{if } z < \hat{z} \vee z < \zeta \ \& \ b > \hat{b}(z) \\ 1 & \text{otherwise} \end{cases}$$

   And the threshold becomes $\hat{b}(z) + \frac{1}{\beta}\left(f(z) - wh_w - \frac{(H-h_w)^{1-\gamma}}{1-\gamma}\right)$ when $\hat{z} < z < \zeta$. When c is high, the entire effect of the second period in terms on occupational choice is already incorporated in the first period. So there is no entry/exit dynamic between period 1 and 2.

In conclusion, when exiting entrepreneurship is costly, the attractiveness of staying an entrepreneur after having a child increases. This can explain why exit rates are relatively low. In the model, entrepreneurship can be interpreted both as the same start-up in both periods, or starting a different firm in each period.

B Variables Definition

B.1 Gender Progressivity Index

The World Values Survey (WVS) includes several questions designed to gauge individuals' attitudes toward gender roles. These questions may ask respondents to agree or disagree with statements related to gender equality, traditional gender roles, and women's roles in society. I consider the following questions or statements:

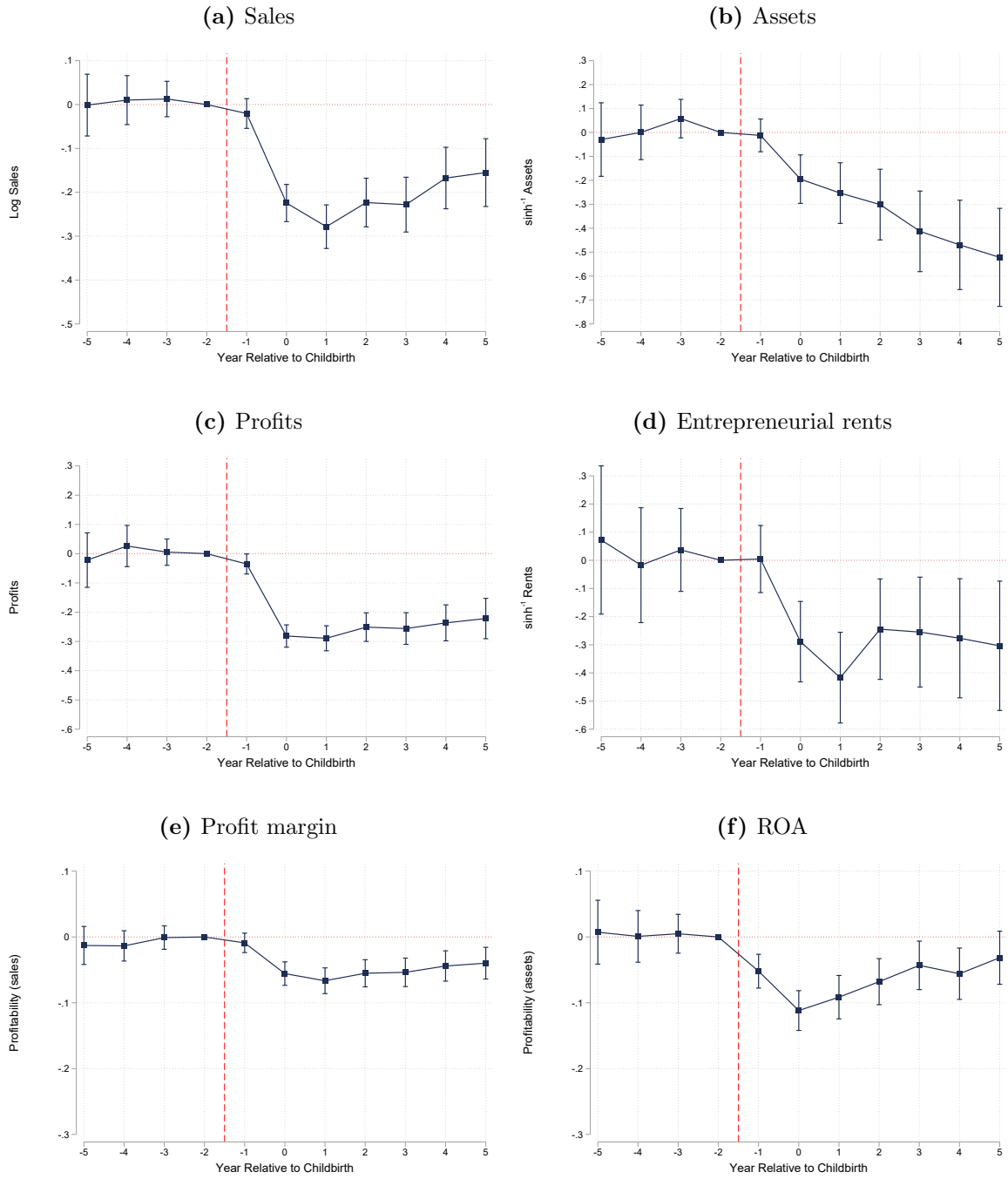
1. A working mother can establish just as warm and secure a relationship with her children as a mother who does not work.
2. Both the husband and wife should contribute to household income.
3. When jobs are scarce, men should have more right to a job than women.
4. On the whole, men make better political leaders than women do.
5. A university education is more important for a boy than for a girl.
6. On the whole, men make better business executives than women do.
7. If a woman earns more money than her husband, it's almost certain to cause problems.
8. When a mother works for pay, the children suffer.
9. Do you think that a woman has to have children in order to be fulfilled or is this not necessary?

Not all questions are asked in each survey wave, but all the questions I include were present in at least three waves. To create a single index, I aggregate the answers in several steps. First, I code the answers to all questions so that a higher score represents more egalitarian attitudes. Second, for each wave, I calculate a country's score as the standardized deviation from the average score of that wave. Using the deviation from the average helps account for changes in gender norms over time and ensure fair comparisons between countries surveyed in different years. Finally, for countries surveyed in multiple waves, I average the score across waves.

Cultural values are remarkably stable over time: the correlation of the index across different time periods within country is 86%. I alternatively compute the index only using questions 3, 4, and 5, which were included in each wave except the first. The correlation between the two indexes is 96%.

C Figures

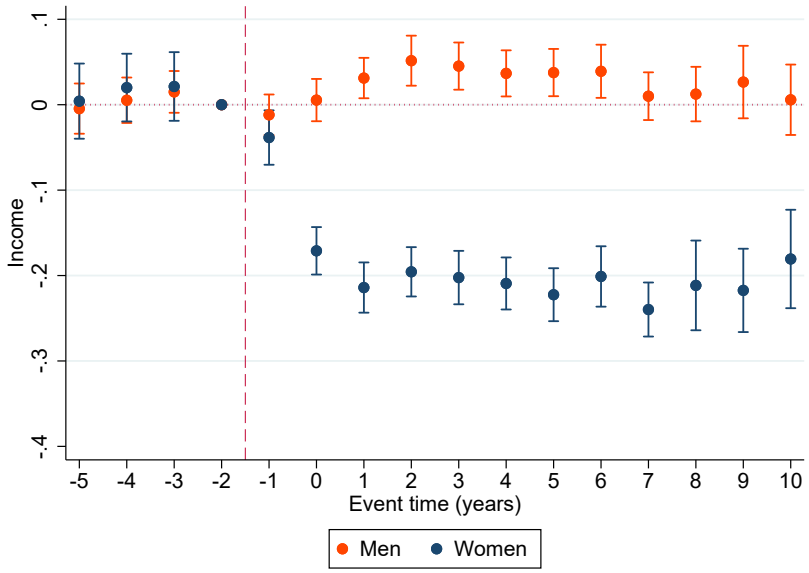
Figure C.1: Firm outcomes without conditioning on survival



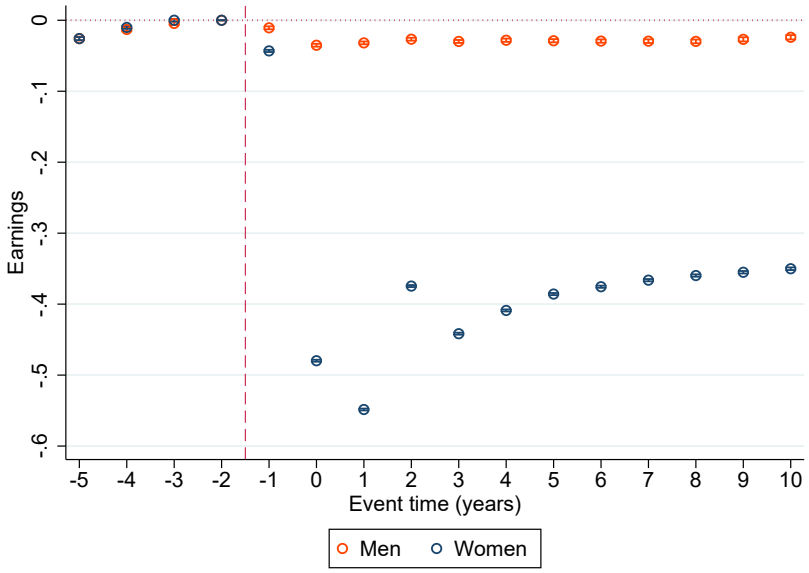
Notes: The graphs show event time coefficients β_τ estimated from equation 2, without conditioning on firm survival. Firms that go out of business remain in the sample and their outcomes are set to 0. Logs are replaced by inverse hyperbolic sine. The control group is a matched sample of firms owned by women with zero observed fertility. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure C.2: Income: entrepreneurs vs. workers

(a) Entrepreneurs



(b) Workers

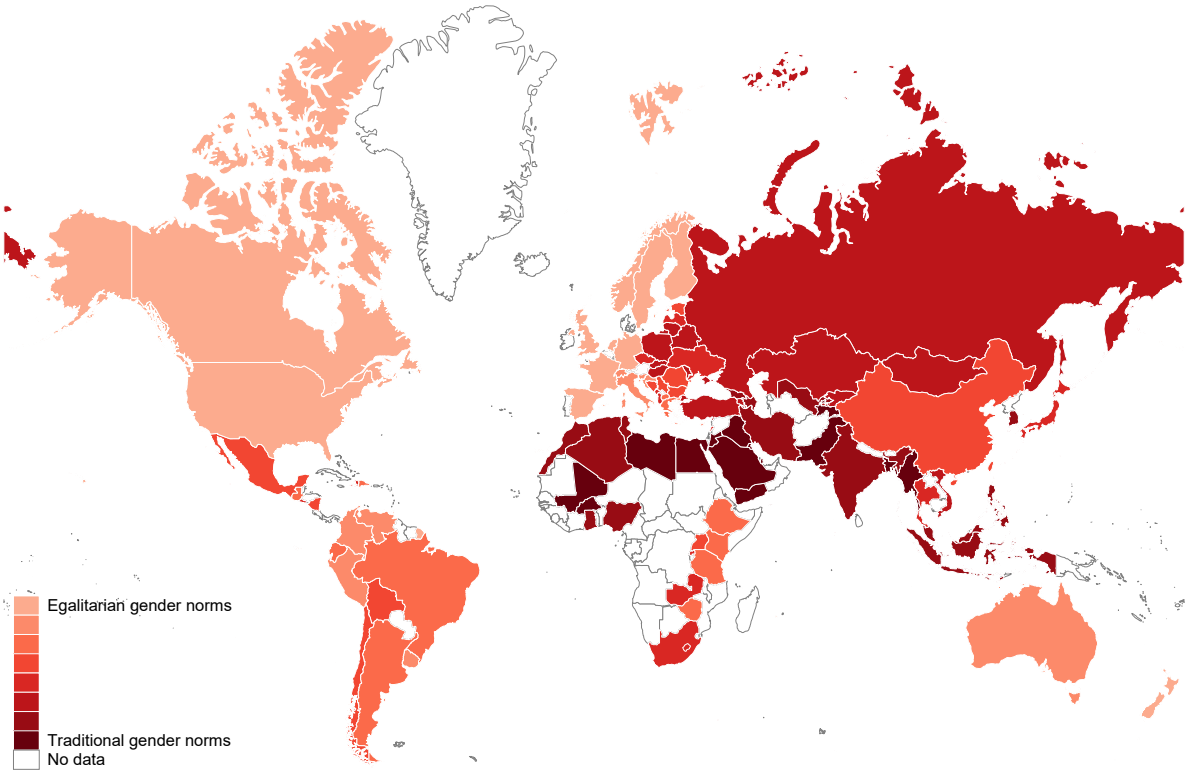


Notes: This figure reports the evolution of individual income for individuals who were entrepreneurs before childbirth in Panel (a) and earnings for individuals who were workers before childbirth in Panel (b).

Figure C.3: Firm outcomes: alternative control group

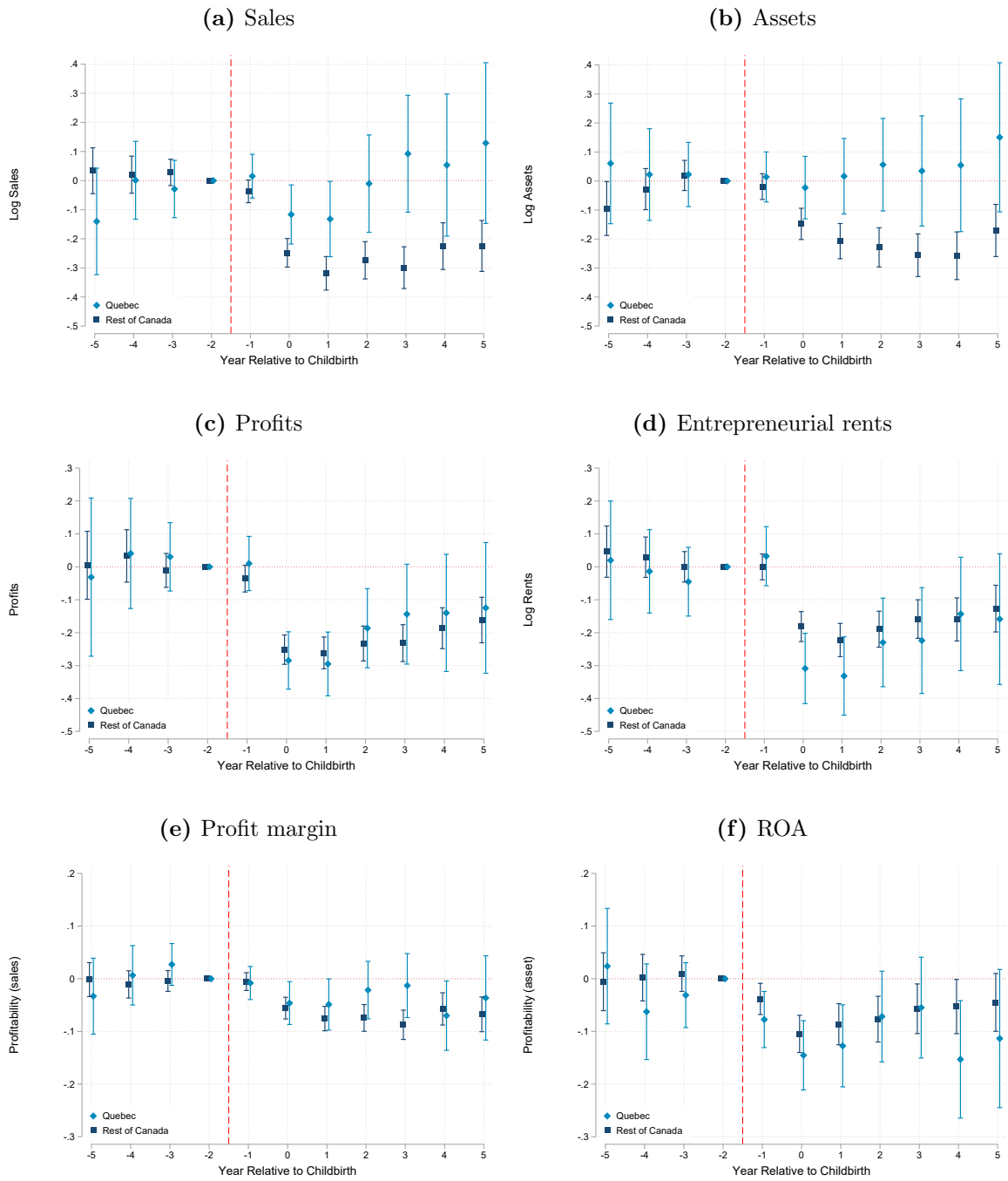
Notes: The graphs show event time coefficients β_τ estimated from equation 2. The control group is a sample of firms owned by women with zero observed fertility. The control group was randomly assigned placebo births based on the observed distribution of age at first child among mothers. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.

Figure C.4: Gender norms



Notes: This figure depicts values of a gender progressivity index calculated using values from the World Values Survey. See Appendix B for details on index construction.

Figure C.5: Firm outcomes: Quebec vs. other Canadian provinces



Notes: The graphs show event time coefficients β_τ estimated from equation 2 separately for mothers in Quebec and in the rest of Canada. The control group is a matched sample of firms owned by women with zero observed fertility. Coefficients for profits are reported as a percentage of the counterfactual outcome absent children. Control variables include indicators for firm age, the number of firm owners, a polynomial for individual age, and marital status. Firm effects and industry × province × year fixed effects are included. I report 95% confidence intervals based on standard errors which are clustered at the firm level.