How Infant Health Shapes Maternal Earnings

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Research Article

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How Infant Health Shapes Maternal Earnings *

Abdel-Hamid Bello†

Abstract

Parenthood remains a major driver of economic inequality between men and women, yet little is known about how differences in infant health at birth shape this gap. This paper examines whether early-life health endowments — specifically low birth weight and preterm birth — affect mothers' long-term earnings trajectories and intra-household income composition. Using linked Canadian administrative data covering all births from 2006 to 2015 and annual family tax files, I estimate the causal impact of poor infant health with a matched event study design. The results show that mothers of infants in poor health earn about 1.6% less one year after birth, rising to over 3.5% by year seven, mainly due to increased labor force exit. Affected mothers are 3.4% less likely to contribute at least 40% of household income six years after birth, widening intra-household inequality. While partners experience similar short-term earnings effects, these fade in the longer term, highlighting how the burden of poor infant health increasingly falls on mothers. Importantly, this asymmetry is not explained by differences in couple dissolution patterns. Mediation analysis suggests that caregiving demands linked to childhood health vulnerabilities — rather than declines in mothers' own health — are the dominant channel. Variation across provinces further suggests that generous family policies, such as Quebec's parental leave program, mitigate the penalty only in the short term. These findings highlight how improving infant health at birth can complement family policies aimed at closing the gender earnings gap.

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JEL Classification: J13, J22, I14

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1 Introduction

Economic inequality between men and women is strongly shaped by the disruptions associated with parenthood (Kleven et al. 2019). A large literature quantifies the "child penalty" in women's labor market outcomes (e.g., Lundborg et al., 2017; Kleven et al., 2021) and evaluates the role of family policies such as parental leave and subsidized childcare (e.g., Baker et al., 2008; Rossin-Slater et al., 2013; Patnaik, 2019). However, less attention has been paid to how heterogeneity in infant health at birth contributes to this penalty. Yet this source of heterogeneity could offer insights into alternative ways to reduce the economic burden of parenthood. For example, a large body of research shows that well-designed prenatal health interventions can improve birth outcomes, including nutrition programs like the U.S. Supplemental Nutrition Program for Women, Infants, and Children (WIC) (e.g., Currie and Rajani 2015) or targeted cash transfers and prenatal care incentives (e.g., Almond et al. 2011; Almond and Currie 2011). If poor infant health imposes persistent caregiving demands that lower maternal earnings, then improving health at birth could complement traditional family policies by addressing the roots of the gender earnings gap.

This paper asks whether early-life health endowments — specifically low birth weight (below 2,500 grams) and preterm birth (before 37 weeks) — affect mothers' earnings trajectories and intra-household income composition in the years following childbirth. While the fetal origins literature has extensively documented how early-life health shocks influence children's later outcomes (e.g., Eeles et al. 2022; Currie and Moretti 2007; Black et al. 2007; Royer 2009; Figlio et al. 2014), the economic spillovers for parents, particularly mothers, are less well understood. Recent studies using Scandinavian administrative data (e.g., Eriksen et al. 2021; Breivik and Costa-Ramón 2024; Vaalavuo et al. 2023; Adhvaryu et al. 2023; Gunnsteinsson and Steingrimsdottir 2019; Chen et al. 2023; Cheung et al. 2025) show that child health shocks can reduce parental earnings, but few focus specifically on health at birth.[1]

I address this gap using rich Canadian administrative data that link all births from 2006 to 2015 with annual family tax records. Canada provides a compelling setting for this question: while its universal healthcare and family support systems are generous by international standards, there is substantial subnational variation in family policies — particularly parental leave provisions and child benefits — which allows me to examine how policy generosity moderates the infant health penalty. This longitudinal dataset enables me to track mothers' labor market earnings, household income, and related transfers from four years before to seven years after childbirth. To estimate the causal impact of poor infant health, I implement a two-step matching procedure that pairs each mother of a low-birth-weight or premature infant with a mother of a healthy infant, exactly matched on key demographics and health history, and selected based on pre-birth income trajectories. I then apply an event study design centered on childbirth to compare outcomes over time, and show that the results are robust to alternative matching specifications, matching methods, and

[1]This paper is mainly related to the literature on the impact of children's health on their parents' economic outcomes (e.g., Porterfield 2002; Powers 2003; Corcnan et al. 2005; Frijters et al. 2009; Wasi et al. 2012; Burton et al. 2017; Zhu 2016). Most of those studies say very little about the dynamic effect of child health, mostly due to data limitation. While recent studies such as Gunnsteinsson and Steingrimsdottir (2019), Chen et al. (2023) and Cheung et al. (2025) have examined the consequences of the birth a child with disability from child'birth onwards, these conditions are relatively rare and may capture only the most severe health shocks. In contrast, this paper focuses on early health endowments at birth—specifically, low birth weight and prematurity—which affect a significantly larger share of births. For instance, only 0.33% to 0.87% of children were affected in the sample of Gunnsteinsson and Steingrimsdottir (2019), whereas more than 7% of births in Canada each year are low birth weight or preterm births, similar to the mean in OECD countries.

the choice of covariates included in the matching process.

The estimates reveal a persistent "infant health penalty" for mothers: mothers of low-birth-weight or premature infants earn about 1.6% less one year after birth, rising to over 3.5% by year seven, driven largely by increased labor force exit. This caregiving burden reduces mothers' role as earners within the household: treated mothers are 3.4% less likely to contribute at least 40% of total family income six years after childbirth, widening intra-household income inequality. While total household income declines less than maternal earnings, suggesting that family transfers and spousal income partially compensate for mothers' losses, the penalty is far from eliminated. Notably, the results suggest that mothers' partners experience similar short-term income reductions in the first three to four years following birth, but these effects fade in the longer term, while the effects for mothers persist. This pattern points to a nuanced role of child health endowments at birth in shaping the gender earnings gap: fathers initially share the income impact but the long-run burden disproportionately falls on mothers. This asymmetry is not explained by differences in couple dissolution, as I find no significant differences in marital partnership patterns between affected and unaffected mothers in the years following birth.

To shed light on why this penalty persists, I document mechanisms using a simple household labor supply model and a mediation analysis. The analysis shows that mothers of infants in poor health are more likely to receive benefits related to both child disability and their own health conditions in the years following birth, pointing to increased caregiving demands and psychological strain as key channels. However, a mediation analysis suggests that childhood health vulnerabilities contribute to a greater extent to the persistence of the infant health penalty, highlighting caregiving demands as the dominant mechanism rather than declines in mothers' own health.

I also exploit Canada's provincial policy variation to test whether generous family supports moderate the penalty. For example, Quebec's more generous parental leave policies appear to slightly reduce the earnings gap in the first three years after birth but have no measurable effect on longer-term trajectories, consistent with evidence that the benefits of leave taper off over time (e.g., Lalive and Zweimüller 2009; Rossin-Slater et al. 2013).

Taken together, these findings show that heterogeneity in infant health at birth is a meaningful and underappreciated source of the child penalty and intra-household gender inequality. By combining large-scale administrative data with a robust matched event study design, this paper contributes to the literatures on early-life health shocks (e.g., Almond and Currie 2011), the intergenerational transmission of disadvantage, and household labor supply behavior (e.g., Grossbard 2015). The results underscore the value of expanding the policy toolkit beyond parental leave and childcare to include prenatal health interventions that improve birth outcomes — a complementary lever for reducing the long-run economic disruption of parenthood for women.

2 Context and data

2.1 Institutional setting

Canada is characterized by a generous social insurance system that offers a variety of supports to families, compensating families for income loss due to parental responsibilities, and helping parents achieve a work-life balance. While certain programs are uniformly implemented across provinces, others vary significantly from province to province. This heterogeneity within the same country provides a unique opportunity to examine how varying institutional contexts can influence the infant health penalty on families' income.

Maternity and Parental Leave Policies. Prior to 2006, the parental insurance system in Canada was federally managed, offering new mothers up to 15 weeks of leave with 55% wage replacement, and additional 10 weeks of shared parental leave. In 2006, at the beginning of my sample, Quebec diverged from this federal scheme, introducing the Quebec Parental Insurance Plan (QPIP), which enhanced the replacement rate and implemented an extensive paternity leave. While this study follows a post-QPIP cohort and, therefore, cannot directly ascertain the causal impact of QPIP on our findings, a comparison between Quebec and the rest of Canada may shed light on the program's potential effects. For instance, if, as shown by Patnaik (2019), the QPIP increases father participation in household tasks, it could imply that infant health may have a more pronounced effect on fathers' earnings in Quebec compared to other provinces.

Child care programs. Quebec also stands out from the rest of Canada for its universal childcare policy. In 2000, the Quebec government began subsidizing eligible childcare facilities, making childcare affordable for all parents of children aged 0 to 5, at a low cost of $5 per day.[2] While it is clear how this program influences the motherhood penalty (e.g., Haeck, Lefebvre and Merrigan 2015; Karademir, Laliberté and Staubli 2024), it is not clear how it might influence my findings.

Health Care and Child Disability Benefits. Families in Canada may be eligible for the Canada Child Benefit and Child Disability Benefit (CDB), providing further financial support to families in need. These benefits are designed to provide additional support to families who may be facing financial challenges due to a child's severe mental or physical health problems or disabilities. It could be argued that the prospect of receiving these benefits can encourage mothers to work less (benefit effect versus child health effect).

2.2 Data Source, and Sample Construction

This study leverages a unique data integration project from Statistics Canada called "The Impact of Preterm Birth on Socioeconomic and Educational Outcomes of Children and Families (IPB)".[3] The IPB links vital statistics for all births in Canada between 1983 and 1996 (long-term cohort) and between 2006 and 2015 (short-term cohort) with several administrative data on mothers and families, including individual and family tax files (T1 Family File)[4], vital statistics on deaths and post-secondary information data. My analysis focuses on short-term cohorts (that is, children born between 2006 and 2015) due to better linking accuracy.

[2] In fact, the program was first implemented in 1997 covering only children aged 4. The age eligibility was gradually reduced between 1997 and 2000.

[3] This project is available on request and can be obtained from a Statistics Canada Research Data Center.

[4] Which are equivalent to W2 records in the US.

Administrative data on mothers and families contain valuable information on mothers' labor force outcomes. The annual individual and family tax files provide information on individual labor market earnings, total employment insurance benefits received, marital status, family size, and total family income. An interesting feature of these tax files is that they include information on tax credits received for children's disabilities and for one's own, separately. These variables are good proxies for detecting any differences in terms of the arrival of health shock between treated and comparison mothers. From these annual tax files, I construct a balanced panel of mothers from 2002 to 2018.[5] This time period is chosen so that you have labor market information at least four years before and three years after the child's birth for the 2006-2015 cohort. I convert the income data into dollars of 2015. In order to mitigate the influence of extreme outliers, I also topcode all monetary values at the 99.75th percentile in each year. The point estimates are not affected by topcoding but turn out to be slightly more precise. Working hours are not included in the tax files, so the analysis uses only earnings to estimate the impact on labor outcomes.

The births and deaths datasets contain information on the child's exact date of birth, province of birth, birth outcomes, parental age, and country of birth. I use the parents' country of birth to determine the immigration status of the parent. I restrict the sample to mothers aged 20-45 years to eliminate young mothers who are likely to be students with unstable incomes, eliminate births with missing information on gestation length and birth weight, and limit the sample to mothers giving birth to one child only during the observation period. Therefore, the analysis focuses on the impact of that focal birth.[6] Additionally, I use information on the date of death to limit the sample to children who survived during the period covered by the panel data, to ensure that grief and sorrow do not confound the results. Although this concerns less than 3% of the sample, it could be argued that the analysis ignores child mortality from the definition of the health consequences of low birth weight and preterm births. I explore the sensitivity of the results to this in Section 6.

Lastly, the post-secondary education data contain information on all mothers who graduated or enrolled in a public post-secondary institution in Canada. From this dataset, I construct a mother's pre-childbirth educational attainment. Since information on the year and post-secondary program in which the mother is enrolled (or from which she graduated) is available, I consider the highest program level in which the mother is enrolled by the year of the child's birth to represent the mother's pre-childbirth education level. However, the education variables will be less precise since I do not have any information on the mother's postsecondary education if she attended postsecondary education abroad or in a private Canadian institution. The latter is less of a concern since postsecondary education is largely public in Canada.

Applying all these restrictions, I obtain approximately 680,000 unique pairs of mother/infant observations, of which 54,500 are treated (low birth weight or prematurity)[7].

[5] The first tax year available in the project is 1985 and the last year is 2018.

[6] Focusing on mothers who give birth only once during the study period increases the likelihood of isolating the impact of that specific birth. However, this does not exclude mothers who have given birth before the study period.

[7] In the interests of data confidentiality, I have been asked to round off the figures.

3 Research design

3.1 Comparison group construction

To construct a counterfactual that accurately represents the outcomes of mothers whose infant is low-weight or premature if they had given birth to a healthy child, I employ a matching design. This approach consists of pairing each treated mother with a mother who gives birth at term and to a baby weighing at least 2500 grams, but with, otherwise identical key demographic characteristics at child's birth and a comparable average income in the four years preceding the child's birth. Specifically, I carry out the matching design based on the following variables:

- Child outcomes: dummy for male child, dummy for being the first child ever born to the mother, year and province of birth;
- Maternal characteristics at childbirth: dummies for the mother holding a university degree, having no post-secondary education, being Canadian born, and being married or in common law relationship, and a continuous measure of age;
- Paternal characteristics: continuous measure of age, and a dummy for being Canadian born;
- Maternal and family economic variables averaged over the four years before the birth of the child: labor market income, share of years receiving unemployment insurance, share of years with non-zero labor income, and total family income.

Exact matching is often assumed to be the matching procedure that is more likely to ensure that balance in both covariates and unobserved factors is achieved between treated and control groups. However, it is unlikely to successfully find an exact for each of the treated mothers along all dimensions due to the so-called *curse of dimensionality*. For this reason, I use a matching procedure which combines exact and propensity score matching, similar to what is suggested by Rubin and Thomas (2000) and implemented by Stepner (2019), for example.

Since life cycle and health history can play an important role in determining future income and offspring health, I first match exactly on the child's year of birth, province, whether the mother becomes a mother (first child) and whether she has ever received a disability tax credit, to approximate health history. It should be noted that I match on first motherhood rather than age in order to capture the life-cycle trend. One simple reason is that exact matching on a continuous variable such as age would yield very few matched units. Furthermore, even with coarsed matching on age, the difference in child parity between treated and control mothers could result in a difference in response, irrespective of the difference in child birth outcome. In fact, Online Appendix Table C.3 shows that maternal age does not have predictive power on postnatal earnings, whereas first motherhood has a higher predictive power. I also exactly match on a dummy variable indicating whether information on post-secondary education is missing. I do this because this variable could either indicate a level of education equivalent to upper secondary or lower, or indicate that post-secondary education is missing for some other reason.[8] This step generates a set of control mothers for each mother with unhealthy child.

Next, I use a logistic regression to estimate the propensity score, which is the conditional probability of being treated given maternal and family economic variables prior to the event, as defined above. Finally, the best match for each treated mother is basically the one with the closest propensity score. This approach ensures that the comparison mothers have identical life-cycle trend but also similar pre-event earnings.

In a sensitivity analysis (Section 6), I compare the main results with those obtained using a more parsimonious matching approach.

3.2 Event study specification

To estimate the gap in motherhood penalty due to infant health, I build upon the literature using an event study design and matched comparison group.[9] To do so, I consider the following specification:

$$y_{ik} = \alpha_i + \sum_{-4,k\neq-1}^{7} \beta_k + \sum_{-4,k\neq-1}^{7} \gamma_k Unhealthy_i + \epsilon_{ik}. \tag{1}$$

In each period k relative to the birth, this equation estimates the penalty for mother i of giving birth to a low-birth-weight or / and a preterm baby on the outcomes y (e.g., earnings, participation in the labor force). α_i is an individual fixed effect that allows each mother to have a different level of results y due to characteristics not included in the model. β_k estimates secular changes in the mean outcome y among mothers in the comparison group. The event time $k = -1$ is omitted so that the changes are relative to the year preceding the child's birth. The parameters of interest are γ_k that evaluate the gap in the outcomes between mothers whose child is born unhealthy and mothers whose child is born healthy.

The dependent variables in the regression (1) are in level instead of logarithmic to keep zeros due to non-participation in the data set.[10] Therefore, γ_k evaluates the causal effect in levels. To have a percentage measure of the infant health penalty, I construct a measure in the same spirit of recent estimates of the child penalty (e.g., Kleven, Landais and Søgaard 2021; Artmann, Oosterbeek and van der Klaauw 2022; Andresen and Nix 2022):

$$ATT_k = \frac{\gamma_k}{E[\widetilde{y_k} \mid k]}, \tag{2}$$

where $\widetilde{y_k}$ is the predicted counterfactual outcome in year k since the child's birth.[11] Therefore, ATT_k should be interpreted as the percentage change in the outcome at relative year k of mothers of poor health children compared to what they would have obtained if their child had been born healthy. I compute robust standard errors by randomly resampling the match pairs with replacement and reestimating the event study regressions using 250 bootstrapped samples. To account for within pair correlation, I cluster the standard error at that

[8] As mentioned in Section 2, this post-secondary education could be missing if the mother attends post-secondary institution abroad.

[9] See Sarsons (2017), Stepner (2019) and Jäger and Heining (2022) for example.

[10] Given that the data include negative values for earnings, I further test the robustness of my findings by restricting the sample to observations with non-negative earnings and applying a log transformation to the dependent variable. The results remain consistent with this approach.

[11] Basically, I obtain those predictions by running the following regression: $\widetilde{y_{ik}} = \alpha_i + \sum_{-4,k\neq-1}^{7} \beta_k$.

level.[12]

The identification assumption is that within the matched sample, giving birth to low-birth-weight or preterm child is *as good as random*. Consequently, there would not have been a differential impact of childbirth on income in the absence of child health problems. For this assumption to be more likely to hold, the parameters ATT_k should not be statistically significant for $k < 0$ (i.e., before the event). This ensures that any observable differences in earnings can be attributed to the health issues of the newborn rather than preexisting trends or disparities between mothers. In Section 6, I discuss how this could be violated even if the parallel trend is verified.

4 Main estimates

4.1 The infant health penalty

I begin by presenting the effect of giving birth to a low-birth-weight or premature child on the trajectory of both maternal and family monetary outcomes. Figure 1 plots the evolution of the gap between mothers who had given birth to an unhealthy child and mothers who had given birth to a healthy child from four years before to seven years after the event. Each dot in the figure gives the percentage transformation of the earnings gap estimates in each time k (relative to the year before the event $k = -1$) based on the specification in 1-2.

First, Figure 1 shows that there is virtually no apparent gap between treated mothers and mothers in the comparison group before the child is born, while the years following the event are marked by a gap, either in market income (in panel (a)), total income (in panel (b)) or total family income (in panel (c)). Because there is no statistically significant difference before the child's birth, the penalty observed afterward is less likely to be driven by preexisting difference.

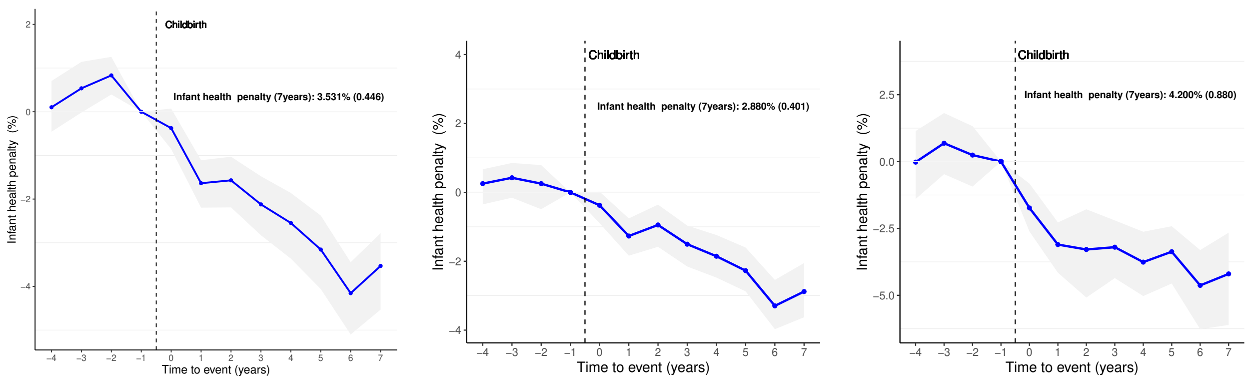
Looking at market earnings, I find that there is an increasing infant health penalty over the event study time window that becomes significant one year after the birth. Seven years after the birth of the child, mothers with unhealthy newborns earn 3.53% less on average than their counterparts with healthy newborns. Although the penalty seems to increase at a constant rate overall, the rate of increase appears to be highest in years 1 and 6. In year 1 the gap is 1.64%, while it was almost zero in the year of birth. Similarly, the gap is 4.16% in year 6, compared to 3.16% in year 5 (see the point estimates in online Appendix Table D.4). This heterogeneity in the timing of the effect could mask the relationship between infant health and the child's development stage. Firstly, low-birth-weight or premature babies may require more medical assistance in the first year of life, which could force mothers to take more time off work to care for their child. If the infant's health is accompanied by disability (or repeated health shocks) during childhood, this could be particularly difficult for parents, especially at the age of school entry (around age 6), resulting in a greater penalty.

Panel (b) depicts the same pattern as panel (a). There is an increasing gap between mothers who had an unhealthy baby and mothers who had a healthy infant in total income. Compared to mothers in the matched comparison group, mothers who have a child with a ill health at birth have a 2.88% loss in their

[12] De Chaisemartin and Ramirez-Cuellar (2024) show this level of clustering ensures robust inference in match pair design. However, the results are robust to clustering at the individual level.

total income seven years after the child's birth. Compared to the penalty on market earnings, the effect on total income is smaller. This could suggest that government benefits or transfers compensate for some of the loss of income due to the child's health.

Looking at the household total income which consists of both partners income suggest a potential infant health penalty on fathers too.[13] The gap between the treated and untreated mothers is 4.2% seven years after the child's birth which is slightly larger than the gap in market earnings. Even tough it could suggest an effect on fathers too, the penalty might not be in the same magnitude as on mothers. For example, from year 1 to year 5, the gap tends to be quite stable around 3.3%, while it was increasing for both labor market income and total income for mothers.



(a) Earnings (b) Mother's income (c) Family income

Figure 1: Infant health penalty: Main estimates

Notes: This figure shows the income gap (ATT_k in equation 2) between mothers of infants in poor health and their matched counterparts. Panel (a) reports the gap in labor market earnings; (b) total maternal income; and (c) family income. Gaps are tracked from four years before to seven years after birth. Standard errors are clustered at the matched-pair level using 250 bootstrap replications.

Fathers vs mothers. The data do not contain the earnings of the fathers. Instead, I infer the earnings of the spousal as the difference between the family total income and the mother's total income. Then, to avoid measurements error in the spousal earnings, I restrict the sample to dual-earner households. In Figure 2, I show the penalty for infant health for mothers and mothers' partners. I find a somewhat surprising result. Fathers suffer the same or worse income penalty in the first four years of a child's life. After the age of 4, there appears to be no statistically significant difference in income between the partners of mothers whose child is in poor health and the partners of mothers whose child is in good health at birth. However, the gap between mothers never fades during the seven-year period. This suggests that the infant's health conditions may affect both partners equally in the short term, but that the incomes of mothers will not ultimately return to their pre-birth levels, while fathers could.

[13]This corresponds to 70% of the sample.

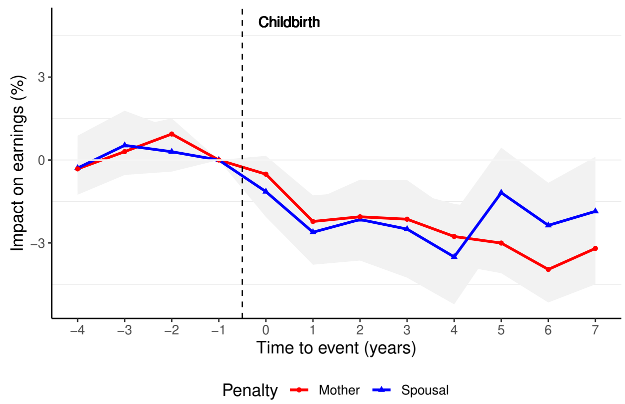


Figure 2: Infant health penalty: Fathers vs. mothers

Notes: The figure shows the percentage income gap (ATT_k defined in equation (2)) between mothers with an unhealthy child and mothers in the matched comparison group in red, and the same difference for the spouses in blue. The sample is limited to dual-income families, as the difference between total household income and the mother's income is more likely to reflect the *father*'s income. Standard errors are clustered at the matched-pair level and calculated using 250 bootstrap replications.

4.2 Determinant of the earnings penalty

Conceptually, a decrease in earnings can be decomposed into changes in employment status (extensive margin) or changes in earnings among employed (intensive margin). In this section, I investigate the role of each of these two components in explaining the infant health penalty. Without information on hours worked or wages, restricting the analysis to the sample with non-zero market earnings can provide insight into the intensive margin[14] while the probability of receiving non-zero market earnings can help think about the labor supply at the extensive margin. Figure 3 presents the event studies for the intensive margin labor supply (panel (a)) and for the extensive margin labor supply (panel (b)).

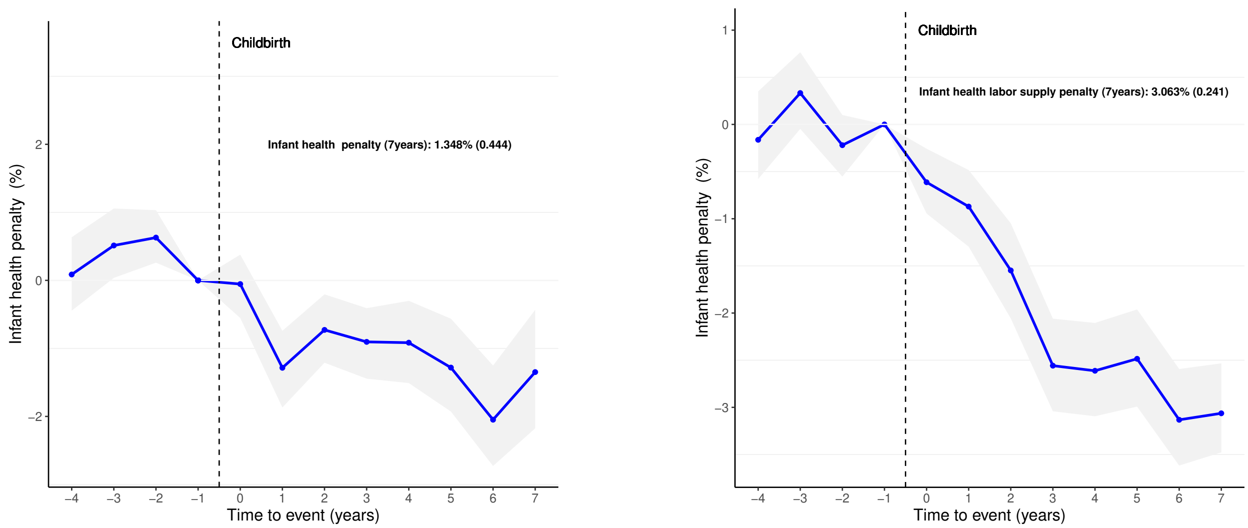
Consider first the intensive margin (panel (a)). After the birth year, there is a sharp decrease in the earnings of treated mothers compared to mothers in the comparison group. In year 1, mothers with an unhealthy baby earn around 1.3% less than their counterpart mothers with a healthy baby, which is identical to the penalty for the whole sample. This gap narrows from the second year onward, remaining stable around 0.85%. This gap is not consistent with the trend observed for the whole sample, indicating that the response to infant health may not be at the intensive margin. However, the trend of penalty for the sample of working mothers (i.e., with non-zero earnings) is similar to Figure 1 at key points. Specifically, at school entry age (around age 6), the gap is highest, as it is for the whole sample.

With regard to the probability of nonzero income, panel (b) shows no gap before the birth of the child and a continuous overall increase in the gap from the year of the event onward. In particular, from the child's birth onward, mothers of low-birth-weight or preterm children are continuously less likely to have a nonzero income (i.e., to work) than mothers in the matched comparison group. This suggests that mothers' response to their child's initial health status is to not participate in the labor market. The fact that this penalty increases could be justified by the fact that, as the child grows, it becomes difficult to reconcile work

[14]However, the choice to work is clearly endogenous in the sense that treated mothers might choose to continue participating in the market if the child's health problem is not serious.

and family life, especially if the initial endowment is a precursor to repeated health problems.

Overall, given that the effect on labor market participation is closely similar to the pattern of infant health penalties, it is more likely that the extensive margin is the main driver of the penalty. However, the intensive margin could also play a non-trivial role, particularly so at one and six years after the child's birth.



(a) Earnings penalty among employed

(b) Penalty on labor force participation

Figure 3: Components of the infant health penalty

Notes: This figure shows the infant health penalty (ATT_k from equation 2) for each year relative to birth. Panel (a) reports the earnings gap for mothers with positive labor market income. Panel (b) shows the penalty on the probability of having nonzero income (proxy for labor force participation). Standard errors are clustered at the matched-pair level and computed using 250 bootstrap replications.

4.3 Does infant health affect the transition to poverty?

An interesting question is whether the child health gap translates into a transition to low socioeconomic status for mothers and potentially to the family. To test this, I use the probability that maternal income falls into the bottom quartile of the income distribution in a given calendar year as the outcome in my event study specification. Figure 4 shows the result of this exercise.

As for the other outcomes, Figure 4 shows that there is no significant difference between treated and untreated mothers before the child was born. From the year of birth to seven years after the focal child's birth, mothers whose children were born prematurely or at low birth weight are more likely to have their earnings fall in the low-earning label compared with their counterparts whose newborns are healthy. By year 7, treated mothers are about 10% more likely to have their earnings in the bottom earnings quartile of the earnings distribution. This result suggests that infant health can also influence income inequalities between women.

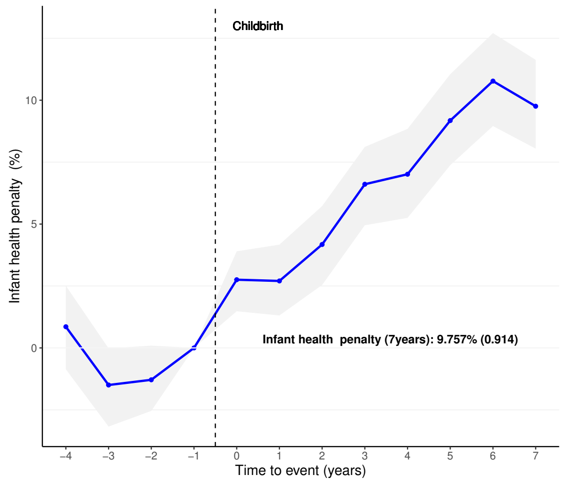


Figure 4: Impact of health status at birth on earnings inequality

Notes: The figure shows the infant health penalty for income inequality from four years before to seven years after the child's birth. The penalty measures the percentage gap in the probability of income falling in bottom quartile of earnings distribution between mothers with an unhealthy baby and mothers with a healthy baby. Standard errors are clustered at the matched-pair level, and computed using 250 bootstrap iterations.

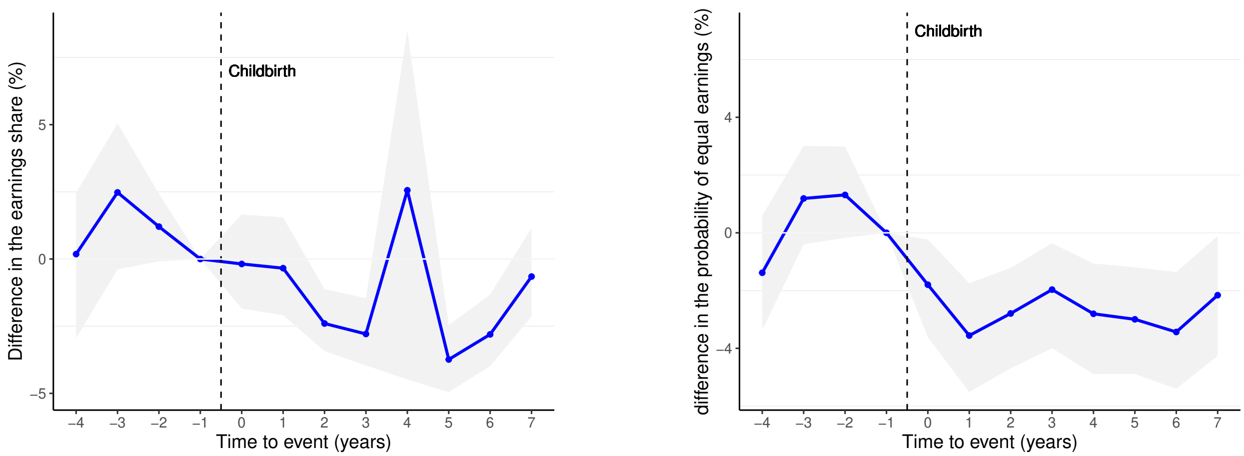
4.4 Infant health penalty within the household

I next examine how infant health influences the gender gap within the household. To explore this, I first compare mothers' share of the household's income between families with treated (mothers of unhealthy infants) and untreated (mothers of healthy infants) status. Then, I look at the probability that the earnings of a mother account for at least 40% of the total income of the household. Figure 5 presents the results.

Panel (a) presents the result of the event study when the outcome is the mothers earnings share in the household. It shows a mixed impact of child health at birth on the evolution of the mothers' earnings share in the household. There is no difference between mothers with unhealthy and mothers with healthier infant in this outcome in the first two years of the child life.[15] Relative to mothers with healthier newborns, the share of household income of mothers with unhealthy babies tends to be reduced by 3% two to three years after the child's birth. However, this gap disappears one year later, when the child turns 4. At the child-school entry age, around 5 and 6, the gap is now around 4%-3%. While panel (a) shows little evidence of the impact of infant health on the gender earnings gap in the household, panel(b) shows a more pronounced impact of infant health on the probability of egalitarian earnings within the household. There is a persistent gap in the probability that mothers' earnings account for at least 40 % of the total earnings in the household between mothers with healthy babies and mothers with unhealthy babies. The gap is more important in two periods: the first year of life of the child and at his school entry age (age 6). One year after the birth of their respective child, the mother whose child is born unhealthy is 3.56% less likely to have her earnings accounting at least 40 percent of the total family income, while this gap is 3.43% 6 years after the birth of their respective child. These findings suggest that the disparity in income share between wives and husbands may not be solely attributed to gender identity norms (see Bertrand, Kamenica and Pan, 2015; Doumbia

[15]This is consistent to the the big effect on fathers' income in those years.

and Goussé, 2021), but also to caregiving responsibilities often assumed by mothers.



(a) Mothers earnings share in the household

(b) Equal earners in the household

Figure 5: Impact of infant health on the intra-household income gap

Notes: The figure is constructed from the sample of dual-earner households in Figure 2. Its purpose is to study the role of infant health on the intra-household income gap. Panel (a) shows the penalty of child health on the share of mothers' income in total family income, while panel (b) shows the penalty on the probability that mothers' labor market income represents at least 40% of total family income. As in the other figures, the penalty measures the difference in outcomes between mothers of a low-weight or premature child and mothers in the matched comparison group from year 4 before to year 7 after the child's birth. Standard errors are clustered at the matched-pair level, and calculated using 500 bootstrap replications.

5 Potential mechanisms

The simple model proposed in online Appendix B suggests three drivers of the infant health penalty: gender norms, productivity shocks, and child care time needs. This section investigates the relationship between poor health at birth and these outcomes.

5.1 Couple dissolution

Infant health or children's health in general could influence exposure to gender norms if it changes the family structure. In this regard, Kvist et al. (2013) find that parents with children diagnosed with attention deficit and hyperactivity disorder (ADHD) are more likely to terminate their relationship, while Eriksen et al. (2021) and Breivik and Costa-Ramón (2024) do not find any relationship between child disability and dissolution of the couple. Since annual tax files also contain information on individuals' marital status, the probability of being divorced or separated as an outcome in equation (1) to test whether couple dissolution drives the findings.

Figure 6 shows that there is no conclusive evidence on the impact of low birth weight and prematurity on parental relationship outcomes. Mothers of unhealthy newborns and mothers of healthy newborns seem to have a similar dissolution pattern over the time window. While the point estimates could suggest a higher probability of marriage dissolution following a low birth weight or premature birth, most of the coefficients are not statistically different from zero.

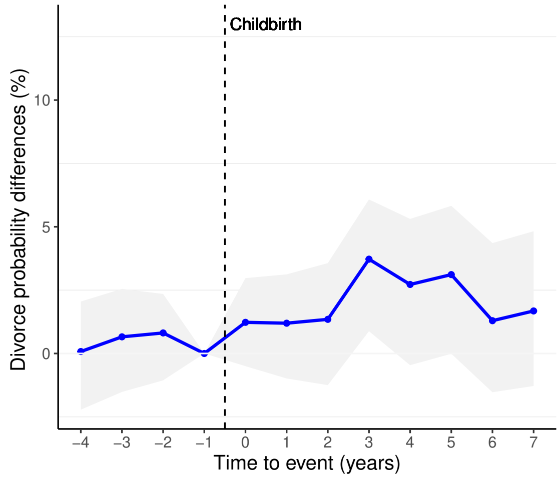


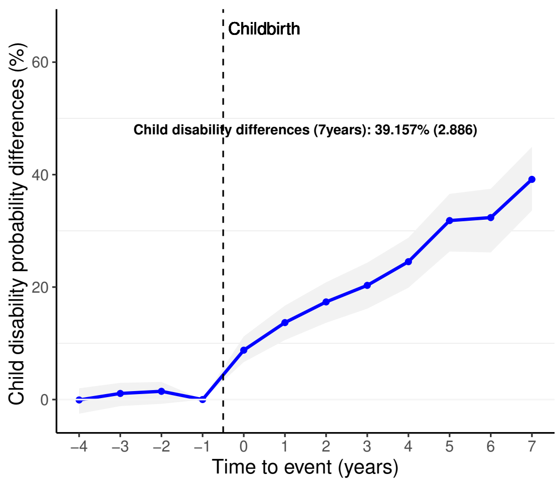
Figure 6: Couple dissolution differences

Notes: The figure shows estimates based on the equation (2) of the difference in the probability of being divorced or separated between mothers with an unhealthy child and mothers in the matched comparison group. Standard errors are clustered at the matched-pair level, and computed using 250 bootstrap replications.

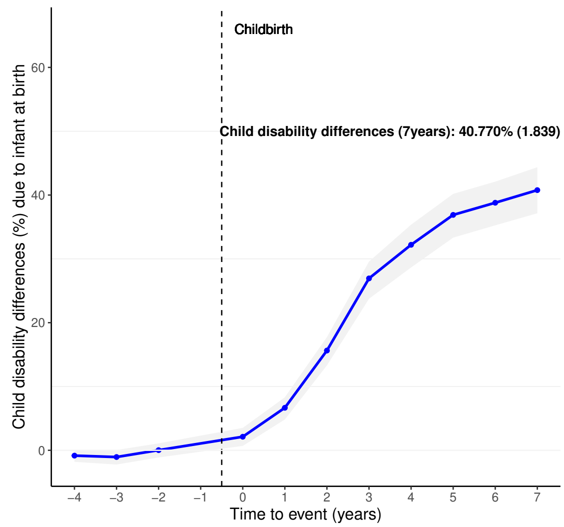
5.2 Childhood disability

Existing medical and economics studies emphasize the role of prematurity and low birth weight in determining future health trajectories. This relationship could explain the persistence of the infant health penalty. That is, low birth weight and prematurity could set the stage for health vulnerability during childhood, which would require important care time later. To test this mechanism, I focus on the probability that mothers receive a tax credit for any dependent disability and the probability that she receives a child disability benefit.[16] As discussed in Section 2.1, Canadian families with a child under 18 years of age with severe or prolonged impairment of physical or mental functions are eligible for the child disability benefit. Thus, using this benefit as a proxy for the onset of health conditions in childhood offers insight into the relationship between health at birth and health in childhood. However, it is important to note that these outcomes may not fully capture the less severe day-to-day care time needs, which detailed health records could provide.

[16]Readers should note that the tax credit and the disability benefit are two different things. The latter is paid to parents in addition to the former (i.e., disability reimbursement). In the absence of taxable income, eligible parents can still benefit from the child disability benefit.



(a) Tax credit for a dependent disability



(b) Child disability benefit

Figure 7: Impact of health at birth on the trajectory of disability in childhood

Notes: This figure aims to highlight how low birth weight and prematurity are related to health vulnerability in childhood. To do this, I use the probabilities of receiving dependent tax credit and disabled child benefit as outcomes in the event study. Panel (a) shows the difference in the probability of obtaining a dependent tax credit, while panel (b) shows the difference in receiving a disabled child benefit between mothers with an unhealthy child and their counterparts in the matched comparison group. Standard errors are are clustered at the matched-pair level and computed using 250 bootstrap iterations.

The results of this event study are presented in Figure 7. I find striking evidence of the difference in probability of receiving a dependent tax credit (panel (a)) or a disabled child benefit (panel (b)) between treated mothers and mothers in the matched comparison group. Firstly, as there is no statistically significant difference before birth, it is reassuring that there is no difference in the outcomes of previous children. Secondly, I find that mothers whose newborns are low birth weight and/or born before term are increasingly likely to receive a dependent tax credit or a disabled child benefit from the year of the child's birth onwards, compared with their counterparts whose children were born healthy. Interestingly, the difference is almost identical for both outcomes in the seventh year after birth, suggesting that I am capturing the child's disability instead of any other family-dependent disability with both outcomes. In particular, the gap is 39% and 40.7% respectively. This result strongly suggests that childhood health conditions may be the an important driver of the persistent earnings gap between mothers with unhealthy and healthy infants.[17]

5.3 Maternal earnings capacity

Poor pregnancy outcomes can give rise to long-lasting health shocks, constituting an important productivity shock. To investigate the impact of poor infant health on the health trajectories of mothers, I utilize the likelihood of receiving a tax credit for disability for themselves as the outcome measure in my event study. This tax credit is granted when medical practitioners certify that an individual has prolonged limitations in mental functions, mobility, hearing, or other similar constraints. While this measure may not capture every

[17] For interested readers, online Appendix Table E.5 provides a non-exhaustive list of health conditions eligible for the Child Disability Benefit, along with references to studies that show their association with low birth weight and preterm births.

nuance of an individual's daily health challenges, it serves as a broad indicator of significant health impairments such as fatigue, burnout, or mental health challenges that may arise from the stress and exhaustion of having a health impaired child.

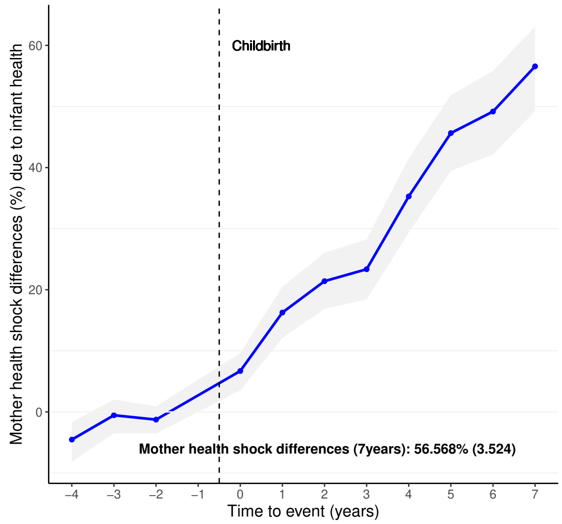


Figure 8: Impact of child's health status at birth on mothers work limitations

Notes: This figure aims to highlight the influence of poor infant health outcomes on the mother's health trajectory. To do this, I use the probability of the mother receiving a tax credit for her own severe limitations in physical or mental function as the outcome in the event study. Standard errors are clustered at the individuals level, and computed using 250 bootstrap iterations.

Figure 8 shows that the trajectory of the probability of major health shocks between mothers of unhealthy infants and those in the comparison group mirrors the trajectory of children's disability probability. Importantly, there is no observable difference in these probabilities before the birth, which supports the robustness of the study design in controlling for preexisting health conditions that could influence employment outcomes post-birth.

From the birth of the child to the end of the event study window, mothers of unhealthy infants increasingly become more likely to receive a tax credit for their own disabilities compared to mothers in the comparison group. In the seventh year, this gap expands to 56.57%, highlighting a substantial increase in disability claims among affected mothers. This finding aligns with the hypothesis that the emotional stress of caring for a child with health problems can significantly impact a mother's mental and physical health.[18] Supporting this, Breivik and Costa-Ramón (2024) find that adverse child health events, such as death or hospitalization, are associated with a more than 55% increase in mother's hospital visits for mental health issues within one year after the event.[19]

[18]A relevant question is what happens to fathers. Unfortunately, the available data do not allow us to answer this.

[19]Another interesting piece of evidence comes from Burton, Lethbridge and Phipps (2008), which shows that Canadian mothers of disabled children rate their health status generally poor.

5.4 Labor force attachment

It is possible that a mother whose child is born in poor health spends more time off work during the postnatal period, leading to a depreciation of her human capital. To explore this, I use the length of maternity leave as both a continuous variable and a dummy variable to take the full 15 weeks of entitled maternity leave as outcomes in a linear regression similar to 3.[20] The results are presented in online Appendix Table J.8. I find that giving birth to a low-weight or preterm child is associated with an additional 0.12 weeks of maternity leave. The effect is more pronounced when considering the probability of taking the maximum number of weeks of maternity leave. I find that a mother whose child is born in poor health is 18% more likely to take the full 15 weeks of entitled maternity leave.

5.5 Mediation analysis

The results point to the care time load and possibly the mental load to explain the persistence of the infant health penalty. In this section, I attempt to understand the contribution of each of these mechanisms in each year after the child's birth. To do so, I apply the decomposition method proposed by Gelbach (2016). The mediation analysis is based on the idea that infant health has both direct and indirect effects on a mother's earnings. The indirect effects are reflected in the impact of infant health on future child and mother health shocks, as predicted by the model in online Appendix B. The empirical equivalent of the equation 6 in online Appendix B is :

$$\underbrace{\frac{\mathrm{d}Y_{ik}}{\mathrm{d}\mathbb{1}\{t-c_i=k\}Unhealthy_i}}_{\textbf{total effect}} = \underbrace{\sum \frac{\partial Y_{ik}}{\partial M_{ik}} \frac{\partial M_{ik}}{\partial \mathbb{1}\{t-c_i=k\}Unhealthy_i}}_{\textbf{indirect effects}} + \underbrace{R_{ik}}_{\textbf{unexplained part}},$$

where M_{ik} is either an indicator of mother i receiving tax credit for her own or for her child disability in time k (the mediators).[21] To estimate the contribution of each mediator, I then estimate two additional specifications.

First, I estimate specification 1 augmented with the vectors of the two mediators:

$$y_{ik} = \alpha_i + \sum_{-4,k\neq-1}^{7} \beta_k + \sum_{-4,k\neq-1}^{7} \gamma_k Unhealthy_i + \delta^j M_{ik} + \epsilon_{ik}.$$

Second, I estimate the effect of the treatment(infant health) on each of the two mediators:

$$M_{ik}^j = \alpha_i + \sum_{-4,k\neq-1}^{7} \beta_k + \sum_{-4,k\neq-1}^{7} \lambda_k^j Unhealthy_i + \epsilon_{ik}.$$

[20] This analysis is based solely on the sample of mothers from all provinces, except Quebec. Maternity leave in Quebec is not managed by the federal employment system, which is the source of information on maternity leave.

[21] $\mathbb{1}\{t-c_i=k\}$ is a dummy variable indicating the number of years elapsed since or leading up to the child's year of birth, c_i.

Finally, the contribution of each of the mediator is given by the ratio :

$$\Delta_k^j = \frac{\delta^j \lambda^j}{\gamma_k}$$

The results of this exercise should be taken as suggestive, as I need an additional source of exogenous variation to examine the impact of the mediator on income trajectories. online Appendix Figure L.5 shows the evolution of the mediator's contribution to the estimated earnings penalty in panel (a) and for the participation penalty in panel (b). The results suggest that the roles of child disability benefits and tax credits for their own disability are limited, contributing less than 15% of the infant health penalty in any given post-birth year. Given the benefits eligibility criteria, which require serious health conditions, this modest contribution is understandable. However, a deeper examination of the figure reveals some interesting facts.

First, both panels show that childhood disability contributes more to the infant health penalty. For example, panel (a) reveals that child disability accounts for about 8% of the income gap, while disability related to the mother's mental or physical health contributes less than 4% in the seventh year after birth. This disparity might indicate that caregiving demands drive the penalty predominantly.

Second, the magnitude of the mediation power of childhood disability is in the same range as the mean of 9% of mothers with disabled children. This suggests that this speaks only to this group. I explore the validity of this point by estimating the penalty with a sample of mothers who never received the child's disability benefit. The results remain fairly unchanged.

Lastly, panel (b) suggests that the contributions of mother and child disabilities to the participation gap are identical in the year after birth, aligning with the typical onset period for postpartum depression, highlighting how infant health could trigger such conditions.[22]

6 Sensitivity analysis and robustness checks

Existing child health burden. Another issue of concern is the possible influence of existing fertility burden on the magnitude of the findings even if the mothers in the matched comparison group are matched on the base of parity. Specifically, mothers with unhealthy newborns may be more likely to have given birth to previously unhealthy children, which introduces a strong potential upward bias in the analysis. To address this issue, the sample was restricted to first-time mothers, thereby removing the confounding effects of previous childbirths or the health status of previous children. The results are invariant (see online Appendix Figure K.4).

No difference around the threshold. Another consideration is that the modest infant health penalty I observe may be due to minimal differences in later health outcomes for children just above and below the low birth weight threshold. To explore this, I incrementally exclude observations in bins of 100g, 200g, 300g, 400g, and 500g around the low birth weight threshold. The findings show that as the bin size increases, the penalty on mothers' earnings, mental or physical health becomes more pronounced. This supports the idea

[22] Postpartum depression commonly affects new mothers from four weeks to six months after childbirth (Miller, 2002).

that more severe health consequences from poor initial health lead to a greater infant health penalty.[23]

Different behavior during pregnancy. In this study, I intentionally do not match on economic variables, such as earnings, during the year of delivery. This is chosen to account for the possibility that differences in maternal behavior during pregnancy could influence birth outcomes, aligning with the fetal programming hypothesis. However, this approach introduces a potential confounding factor: the possibility that these pre-birth behaviors, rather than the health condition of the infant, might explain the observed income gap between the treated and control groups post-birth. Consider, for example, a scenario in which a mother chooses to work more during her pregnancy, perhaps in anticipation of taking time off after childbirth. This increased work-related stress could potentially contribute to the child being born prematurely or underweight. In such a case, what my study design might capture is not solely the infant health penalty, but also the impact of earlier labor supply decisions. As shown above, no penalty is observed in the year of the child's birth, which is reassuring. Additionally, when I include outcomes from the year of the child's birth as matching variables, I find no significant change in the results.

Alternatives comparison group. All the results of this study are based on the assumption that the trajectory of the comparison group reflects the trajectory that mothers whose child was born in poor health would have had if the child had had better birth outcomes. Here, I ask how sensitive the findings are to alternative ways of constructing the counterfactual. In this regard, I consider three alternative matching approaches: 1) I perform exact matching on the child's year of birth and province - which generates more than one unit of control mothers for each mother treated; 2) exact matching on year of birth, province, whether the mother is a first-time mother, whether she has ever received a disability tax credit; 3) one-step propensity score matching with all the variables described in Section 3 included. Online Appendix Figure F.2 shows the event study with these matching alternatives. In general, whichever way I construct the counterfactual, I find that there is an increasing child health penalty after childbirth. However, the magnitude of the penalty is not the same everywhere. The size is very similar in the case of exact one-step matching (panel (a) versus panel (b)). This suggests that matching on maternal health shock and birth parity does not change the result much. On the other hand, matching on other variables such as pre-birth economic outcomes seems to limit the influence of the bias described above, as panel (c) shows a slightly smaller effect. Nevertheless, I argue that the way I carry out the matching allows me to construct an appropriate counterfactual since compared with one-step propensity score matching (panel (c)), it is more likely to result in parallel pretrends.

7 Heterogeneity analysis

7.1 Varying institutional context

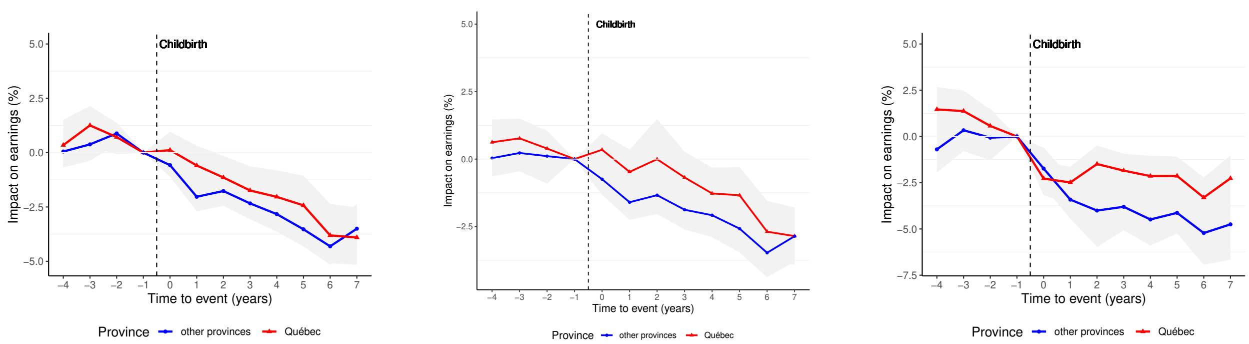
As discussed in Section 2.1, family policies vary significantly across Canadian provinces, with Quebec's policies being notably different from those in the rest of Canada.[24] To assess how these policy differences might influence the results, I re-estimate the infant health penalty separately for Quebec and the rest of Canada. Figure 9 shows the result for maternal earnings in panel (a) and for total income in panel (b).

[23]Corresponding figures are available upon request.

[24]It is not just about family policies but policies to combat poverty in general (see Van den Berg et al. (2017)).

In panel (a), one of the noticeable features is that the infant health penalty becomes apparent only after the first year after the child's birth for mothers in Quebec. In contrast, in the rest of Canada, this penalty is observable from the birth year onward and is larger in magnitude. However, this variation could be attributed to differences in sample size and sample composition. But the variation in the difference between Quebec and the rest of Canada over time — particularly its prominence in the postnatal period targeted by maternal leave policies — suggests that Quebec's more generous family programs may mitigate some of the impact of infant health earlier on in the child's life. This is an important consideration, even though the differences are not statistically significant across all time points, since the confidence intervals of the point estimates overlap.

Panel (b) tends to confirm this assumption. Indeed, the influence of the infant's health on the mother's total income does not appear until four years after the child's birth in Quebec. In contrast, in the rest of Canada, the economic penalty is evident immediately from the event year. This reinforces the fact that generous maternity leave policies are effective in compensating for the loss of income due to short-term pregnancy complications and/or that childcare policies reinforce mothers' participation in the labor market, even in the presence of shocks to children's health. However, in the long term I cannot draw such a conclusion, as the infant health penalty tends to be the same in all provinces.[25]



(a) Earnings (b) Mother's total income (c) Family income

Figure 9: Infant penalty: Quebec vs. rest of Canada

Notes: This figure compares the infant health penalty in Quebec and other provinces. (a) Labor market income; (b) Mother's total income; (c) Total family income.

7.2 Low birth weight or Prematurity?

To investigate which health conditions at birth matters the most in explaining the finding, one strategy would be to divide the sample into two groups: the low birth weight and premature births groups. However, this would lead to a loss of statistical power and, in many cases, both prematurity and low birth weight would be encountered, resulting in repeated observations across samples that would no longer be independent. To address this issue, I consider a model in which both the low birth weight and prematurity indicators are entered simultaneously as independent variables. By including both the low birth weight and prematurity

[25]There are some papers showing that parental leave policies have no long-term effect (e.g., Lalive and Zweimüller, 2009; Rossin-Slater, Ruhm and Waldfogel, 2013; Dahl et al., 2016).

indicators simultaneously in the model, I can disentangle the effect of each factor on post-pregnancy earnings. The regression based model takes the following form:

$$y_{ipymc} = \alpha D_{i(1-p)} + \beta_1 LBW_i + \beta_2 Preterm_i + \gamma Z_i + \lambda_c + \delta_m + \theta_s + \epsilon_{ipymc}, \tag{3}$$

where y_{ipcms} is the average earnings over the seven year after child's birth p of mother of child i born in year y, month m and in province c ; $D_{i(1-p)}$ is a vector of socio-economic variables including earnings, insurance benefits, family size and marital status averaged over the last four years before child's birth; Z_i contains demographics of mother and father at the time of the birth of child i ; LBW_i and $Preterm_i$ are respectively indicators for low birth weight and prematurity. By controlling for cohort fixed effects (λ_c), month of birth fixed effects (δ_m), and city of birth fixed effects (θ_s), I expect to capture the effect of health at birth on post-pregnancy earnings average over the medium and long term, net of any remaining unobservables shock to labor supply and health not netted out by the matching method.

In order to capture the precise relationship between these infant health metrics and post-pregnancy earnings, alternative specifications are also considered. These include flexibly controlling for birth weight and gestational age by employing dummy variables or treating them as continuous variables. The use of flexible controls allows for non-linear relationships between birth weight, gestational age, and post-pregnancy earnings, providing a more detailed understanding of how different levels of these factors affect earnings outcomes. On the other hand, treating birth weight and gestational age as continuous variables allows an examination of the incremental effects of these health metrics on earnings, considering the full range of values within the sample.

Simultaneous effects of low birth weight and prematurity. I begin with the results of the regression in which low birth weight and prematurity dummies enter simultaneously. Online Appendix Table I.7 shows that low birth weight is the health condition at birth that drives the infant health penalty. Specifically, giving birth to a low-birth-weight baby is associated with a loss of C\$1,333 in average post-birth earnings, representing a 4% reduction relative to the mean earnings. This finding is consistent with recent studies suggesting that birth weight plays a more critical role in determining school age disabilities than any other health condition at birth, including prematurity (e.g., Elder et al. 2020).

Effects of different birth weight level. Online Appendix Figure H.3 plots the coefficients on indicators of 500-gram birth weight bins. Each dot gives the effect of birth weight in a specific bin relative to birth weight greater than 3,500 grams. It shows an overall increasing linear relationship between post-birth earnings and birth weight, with significantly lower earnings associated with lower birth weights. Specifically, mothers of children weighing less than 2,500 grams across any of the 500-gram bins earn on average C\$2200 less following childbirth. The gap is particularly larger for mothers of children weighing less than 1,500 grams at birth.

8 Conclusion

When it comes to assessing the long-term impact of birth weight or gestational age, most studies focus on children without paying much attention to their parents. In this study, I provide the first evidence of the influence of a child's health at birth on their mother's earnings trajectory. To do so, I take advantage of a unique data integration project that links tax records of mothers having given birth between 2006 and 2015 in Canada to vital statistics and parental educational data. The results are compelling: a child's health at birth significantly reshapes the economic dynamics of the family. Compared to mothers of children born at a healthy weight and gestational age, mothers of low-weight or premature infants earn less, participate less in the labor market, are more likely to be in the bottom quartile of the income distribution, and are less likely to contribute 40% or more to the family's total income in the years following the child's birth. Two key factors contribute to this earnings penalty. First, low birth weight and prematurity are associated with subsequent health challenges that impose additional caregiving constraints on mothers. Second, mothers of children with health issues often experience physical and mental health limitations, further restricting their earning capacity. However, the data used to support these conclusions present a significant limitation. I used disability tax credits as a proxy for health status that might excludes less severe health problems that hospital or medical expense records could capture. Despite this caveat, the results align with studies demonstrating a causal relationship between low birth weight and future disability (e.g., Eeles et al. 2022), especially that I find this condition is driving the penalty.

This study suggests that improving health conditions at birth could also be a powerful means of helping mothers cope with the challenges of motherhood. For example, the results indicate that for every 100-gram increase in birth weight – a feasible policy target – mothers earn approximately C\$100 more in post-birth earnings, on average.

Declarations

Author Contribution

The author is solely responsible for the conceptualization, data analysis, interpretation of results, and writing of this manuscript.

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Competing Interests

The author has no competing interests to declare that are relevant to the content of this article.

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