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Abstract

This paper studies tax evasion and the contribution-benefit link in the context of maternity benefits in Hungary. Earnings and employment patterns suggest pre-pregnancy underreporting, followed by formalization of some earnings and employment during pregnancy to increase benefits. Reported earnings in small, domestic, and less productive firms bunch at the minimum wage before pregnancy and the benefit-maximizing threshold during pregnancy. Using a policy reform, the paper shows that the size of the reporting response tracks changing reporting incentives. Increases in pre-childbirth reported earnings are partially sticky after maternity leave. The results indicate that linking benefits to contributions can reduce tax evasion and improve formalization.

Keywords: contribution-benefit link, social security, tax evasion, parental benefits
JEL codes: H26, H55, J46

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1 Introduction

In most countries, social security benefits depend on an individual's earnings history. This contribution-benefit link creates a trade-off between the incentive to report higher earnings to increase the amount of future benefits (Fitzpatrick, 2017; French et al., 2022; Dean et al., 2024) and the incentive to report lower earnings to decrease the amount of taxes owed (Mortenson and Whitten, 2020; Bjørneby et al., 2021; Bíró et al., 2022). This trade-off is important for both the design of social security systems and approaches to combating tax evasion and encouraging formalization.

This paper studies the relationship between tax evasion and the contribution-benefit link in the context of maternity benefits among private sector workers in Hungary. We analyze reported earnings and employment before and after childbirth in an environment where the amount of maternity benefits received for two years after giving birth depends on earnings over a narrow time window before childbirth. Benefits are 70% of average earnings calculated over a reference period and are uncapped for six months and capped at 140% of the monthly minimum wage thereafter. In 2015, the incentive to report higher earnings became much stronger as the contribution period used to determine benefits changed from 12 months in the most recent calendar year to the first six months of pregnancy. Using detailed administrative data on employment, earnings, benefits, and health, we show that in response to these incentives, reported earnings and formal employment increase during pregnancy and that this response is much stronger after 2015.

Before 2015, the earnings of expectant mothers working in firms with fewer than 50 employees increased by 1.8% between the second and sixth months of pregnancy. This increase was much larger, 5.3%, after reporting incentives became stronger in 2015. In firms with fewer than 10 employees, the increase was even more pronounced, 3.0% before and 7.6% after 2015, while pre-birth earnings declined during pregnancy both before and after 2015 in firms with over 50 employees. Decreasing earnings in larger firms suggest that pregnancy negatively affects earnings, possibly due to health concerns, discrimination, or other factors. At the same time, increasing earnings in smaller firms suggest that another mechanism dominates in those firms: formalization of some previously informal earnings to obtain higher maternity benefits. That we detect this in smaller firms is in line with tax evasion being more likely and employer-employee coordination easier than in larger firms. Big increases in reported earnings are also more common in less-productive and domestic firms, also known to be more prone to tax evasion than more productive and foreign-owned firms (Bíró et al., 2022). Before large pre-birth earnings increases, earnings are concentrated at the monthly minimum wage (46% of women working in small firms earn either the minimum wage or the skilled minimum wage before pregnancy, decreasing to 2.5% during pregnancy). After large increases, they are concentrated at the benefit-maximizing threshold (27% of women working in small firms earn at the benefit-maximizing threshold, up from 3.3% before pregnancy) given the benefit cap, consistent with pre-pregnancy under-reporting and an adjustment just large enough to qualify for higher maternity benefits.

We also document an extensive-margin formalization response to maternity benefit incentives.

While, consistent with discrimination, health concerns, or decreased labor supply, the probability of transitioning into formal employment in a firm with over 50 employees decreases by 1.7 percentage points during pregnancy, women are about 0.2 percentage points more likely to appear to join small firms during the first trimester than before pregnancy. In the second and third trimesters, the decline in the probability of transitioning into formal employment in smaller firms is much slower than in larger firms. Conditional on transitioning into formal employment, the share of transitions into smaller, domestic, and less-productive firms increases relative to larger, foreign, and more-productive firms. For example, conditional on a formal employment transition, the probability of finding a new job in a smaller firm is up to 41% higher during pregnancy, with an analogous decrease for larger firms. This suggests that smaller, domestic, and less-productive firms formalize some of their informal employees during pregnancy to give them access to maternity benefits.

Examining post-birth earnings, we find that large pre-birth increases are associated with higher reported earnings in the longer term. Women who receive large reported wage increases during pregnancy also continue to report higher wages when returning from maternity leave. Higher post-birth wages result from "sticky" wages: nominal (reported) wage decreases are rare, and about half of women who reported a wage increase to the benefit-maximizing threshold before birth have the same wage after returning from maternity leave even as the benefit-maximizing threshold itself adjusts with increases in the minimum wage (while about a quarter of women return to work at the minimum wage).

Our results highlight that tax evasion is responsive to the incentives created by the contribution-benefit link: individuals report higher earnings to receive higher benefits. These responses are "sticky" at least in the medium term. Thus governments could use the social security benefit system to lower tax evasion. However, if benefits were more responsive to contributions to encourage tax compliance, they would redistribute less from high to low earners, an important objective of most social security systems.

Our work contributes to four strands of the literature. First, we contribute to the literature that investigates the impact of incentives in the social security system on reported earnings in the context of pensions (Fitzpatrick, 2017; Kumler et al., 2020; French et al., 2022; Dean et al., 2024), health insurance (Bergolo and Cruces, 2014), and unemployment insurance (Le Barbanchon, 2024). To the best of our knowledge, along with Jascisens and Zasova (2021), we are the first to focus on maternity benefits. An important feature of maternity benefits is that they are received with near certainty just months after reported earnings change, unlike some other social insurance programs where myopia can dampen any potential effect. We highlight the role of evasion and formalization and document the longer-term positive effect of benefit incentives on reported earnings.

Second, we contribute to the recent literature on tax evasion (Artavanis et al., 2016; Kumler et al., 2020; Mortenson and Whitten, 2020; Al-Karablieh et al., 2021; Bjørneby et al., 2021; Bíró et al., 2022; Gavoille and Zasova, 2023*a*,*b*) that has demonstrated that earnings are often under-reported even in the presence of third-party reporting. We show that incentives represented by the benefit system can meaningfully decrease under-reporting and encourage formalization.

Third, we contribute to the literature on informal employment and taxation.[1] Recent work (de Mel et al., 2013; Bergolo and Cruces, 2014; De Andrade et al., 2014; Kuehn, 2014; Meghir et al., 2015; Rocha et al., 2018; Ulyssea, 2018; Kumler et al., 2020; Gerard and Gonzaga, 2021) has focused on policy interventions to improve formalization. We find that contribution-dependent benefits can help formalize the employment and earnings of some workers.[2]

Fourth, our work is related to the literature on parental leave and benefit policies and child penalties.[3] Recent work on parental leave policies (e.g., Rossin-Slater et al., 2013; Carneiro et al., 2015; Stearns, 2015; Baum and Ruhm, 2016; Stearns, 2018; Bana et al., 2020; Ginja et al., 2023; Bartel et al., 2024) suggests that generous leave and benefit policies positively impact women's labor market outcomes and children's long-run outcomes. The recent literature on child penalties (e.g., Angelov et al., 2016; Lundborg et al., 2017; Kleven et al., 2019; Andresen and Nix, 2022; Kleven, 2022; Kleven et al., 2024*a*,*b*) also documents large and ubiquitous decreases in women's post-birth earnings in most countries. Hungary's maternity leave policy is among the most generous in the world (OECD, 2024) and at 40%, its child penalty is among the highest (Kleven et al., 2024*a*). Our work suggests that in countries where under-reporting of earnings and informality are common, the design of parental leave and benefit policies should take tax evasion responses into account.

2 Background

2.1 Tax and Benefit System

During our study period, at 49% (vs. 35% OECD average), Hungary had the fourth highest tax wedge among OECD members.[4] Hungary's high tax wedge is explained by a flat tax with all earnings taxed at the same marginal rate, high social security contributions, and no personal allowance (from 2012).[5] The flat personal income tax rate was 16% between 2011 and 2015 and is 15% since 2016. Employee social security contributions have been 18.5% since 2012, and employer social security contributions were 27% between 2010 and 2016 and have been 22% since 2017. In this paper, in line with the standard OECD definition "taxes" are defined as the sum of personal income tax and social security contributions.

Hungary has three types of parental benefits: (1) the parental leave benefit (PLB), (2) the child care benefit (CCB), and (3) the child care allowance (CCA). The PLB is payable for

[1]For a recent review on informality and development, see Ulyssea (2020).

[2]The informal economy and pay misreporting is sizable not only in low- and middle-income countries but in the high-income countries of Central and Eastern Europe, where some estimates put the size of the informal economy to 20% of GDP (Williams, 2013; Williams and Padmore, 2013; Paulus, 2015).

[3]For reviews of the literature on parental leave policies, see Olivetti and Petrongolo (2017) and Rossin-Slater (2018). For a review on the role of children in the gender wage gap, see Cortés and Pan (2023).

[4]The tax wedge is defined as the ratio between the amount of taxes paid by an average single worker (a single person at 100% of average earnings) without children and the corresponding total labor cost for the employer (OECD, 2023).

[5]Parents with children receive a family tax allowance.

twenty-four weeks (starting from up to four weeks prior to birth), the CCB is payable after the PLB period ends for up to two years after birth, and the CCA is payable after the PLB and the CCB periods end for up to three years after birth. The PLB and the CCB are based on prior employment and earnings, while the CCA is a fixed allowance equal to the minimum old-age pension (less than two-thirds of the PLB/CCB of minimum wage earners), available regardless of labor market history. Mothers who are not eligible for the PLB and the CCB receive the CCA for up to three years after giving birth.

We focus on the PLB and the CCB which had similar conditions with the benefit amount equal to 70% of pre-birth earnings. The only major difference between the two is that while the PLB is not capped, the maximum amount of the CCB is 140% of the monthly minimum wage. Thus any social security contributions paid based on earnings above twice the minimum wage do not further increase the amount of the CCB. Since 96% of beneficiaries are women and our data does not allow us to identify fathers because we rely on records of giving birth in health data, we refer to the PLB and the CCB as "maternity benefit" and study only mothers, though, for the CCB, the same eligibility conditions apply to fathers if they are the primary caregiver.

To be eligible for maternity benefits, the mother must be insured for social security for at least 365 days during the two years before giving birth. Until December 2014, the monthly benefits were set at 70% of a woman's average monthly earnings over the last calendar year before benefit receipt.[6] Since January 2015, by default, the amount of the benefit is 70% of average earnings over the 180-day period preceding the third month before giving birth. For example, for a woman who gave birth on October 1, 2014, the reference period was January to December 2013; but for a woman who gave birth on October 1, 2016, the reference period was January to June 2016. This modification was enacted by Parliament in December 2014, one month before it took effect, ruling out anticipation effects. For births between January and October 2015, part of the pregnancy took place before the policy change, so we focus on births after October 2015 when analyzing the post-reform period.

2.2 Contribution-Benefit Link

Table 1 shows the costs and benefits of a $1 increase in (reported) monthly gross earnings during the benefit calculation window. The first and third columns show a scenario with no tax evasion. Panel (a) shows that a $1 increase in gross earnings costs the employer $1.27, while the employee receives an extra $0.66 in net earnings. Panel (b) shows that as a result of higher earnings, before December 2014, the employee would have received $0.26 of extra gross benefits ($0.20 net), which increased to $0.70 ($0.54 net) from January 2015. The difference arises because (i) before December 2014, the benefit calculation window was twelve months (the calendar year before the receipt of benefits), while since January 2015, it has been six months (the first six months of the pregnancy) and (ii) before December 2014, increasing reported earnings only impacted benefits if the birth took place in the next calendar year. Thus an

[6] If someone did not have at least 180 insurance days in that calendar year, then her average earnings over the 180 days before benefit receipt served as the basis for the calculation.

extra dollar of reported earnings translates into significantly more benefits since 2015. Panel (c) shows that aggregating costs over six months (for comparability between the two periods), the total cost to the employer is $7.62 ($3.93 in net earnings and $3.69 in taxes). Panel (d) shows that aggregating over twenty-four months the employee gained $4.82 in net benefits before December 2014 and $12.85 after January 2015. Panel (e) shows that in total the employee gained $8.75 ($3.93 in net earnings and $4.82 in net benefits) before December 2014 and $16.78 ($3.93 in net earnings and $12.85 in net benefits) from January 2015. Also displayed in panel (e), the difference between the cost paid by the employer and the gain to the employee ($1.13 before December 2014 and $9.16 after January 2015) is a transfer from the government to the employee.

The second and fourth columns show a scenario in which income taxes are evaded. Gross reported earnings can be increased, resulting in higher income tax and social security contributions without changing net earnings, assuming the same net earnings were previously paid as unreported (envelope) wage, a common phenomenon in Hungary and the broader region (Elek et al., 2012; Williams and Padmore, 2013; Paulus, 2015; Bíró et al., 2022; Gavoille and Zasova, 2023*a*,*b*). Panel (a) shows that increasing reported monthly earnings by $1 costs $0.62 in taxes and contributions each month. Panel (b) shows that before December 2014, the employee received $0.20 of extra net benefits each month, which increased to $0.54 from January 2015. Panel (c) shows that aggregating costs over six months, the total cost to the employer is $3.69 (solely due to previously unpaid taxes and contributions). Panel (d) shows that aggregating benefits over twenty-four months, the employee gains $4.82 before December 2014 and $12.85 from January 2015, solely due to higher benefits as net wages do not change.

The gains of the employee from a (reported) earnings increase during the reference window always exceeded the costs to the employer, but they became 1.9-2.7 times higher after 2015. If the earnings increase was only a change in reporting behavior without a change in net earnings, then its costs to the employer were lower (only higher taxes, but not higher wages), but the benefits to the employee were also lower by the same magnitude (higher benefits but not higher wages), while the total cost to the government was the same in the two scenarios (government costs depend on taxes and benefits, but not directly on wages). The cases displayed in Table 1 are edge cases: they assume either no tax evasion or that the marginal dollar of extra gross earnings comes fully from an adjustment to envelope wages. Intermediate cases are also possible, with some adjustment to both net earnings and the envelope vs. official share in compensation.

3 Data and Sample

We use administrative data from Hungary on employment, earnings, benefits, education, and health for a 50% random sample of the population, defined in January 2003 and followed until December 2017. We observe employment status and type (private sector employee, public sector employee, or self-employed) for each month. For private sector employees, we observe firm, occupation, and industry. For double-bookkeeping firms, we observe the annual average firm size from tax records, which we estimate for single-bookkeeping firms from our data. We observe earnings used for benefit calculation, allowing us to trace the impact of reported earnings on expected benefits.[7] We focus on the 2012 to 2017 period because in our data earnings before 2012 were smoothed within employment spells by employer-employee-year. We limit to individual-month observations with at most 5 sick days and no maternity payments. We adjust monthly earnings for sick days and to their full-time equivalent, using contractual work hours.

We observe the month of each birth between 2009 and 2017, defined by International Classification of Diseases (ICD-10) inpatient diagnosis codes in the health records. We focus on the first observed birth by each woman.[8] We restrict our sample to women who gave birth between ages 20 and 40 (90% of first childbirths in our data). We create a control group of women who did not give birth by 2017 and assign them a placebo childbirth date between ages 20 and 40 and years 2012 and 2017.

Our baseline sample consists of women working in the private sector who had a non-missing full-time equivalent wage of at least 90% of the monthly minimum wage each month between thirty to four months before giving birth or the placebo birth. Table 2 suggests that the two groups are broadly comparable, though women who give birth are somewhat more likely to have higher wages and to work in higher-skill occupations and in services.

4 Reporting Responses to the Contribution-Benefit Link

4.1 Main Results on Reported Earnings

In this section, we start by examining the evolution of reported earnings among expectant mothers. We document several patterns consistent with the formalization of previously under-reported earnings to increase maternity benefits.

We estimate an event study regression following Kleven et al. (2019) to characterize the time pattern of reported earnings among expectant mothers relative to otherwise similar women who do not give birth:

$$W_{it} = \sum_{j=-30}^{-4} \alpha_j \mathbb{1}[E_{it} = j] + \sum_{j=-30}^{-4} \beta_j \mathbb{1}[E_{it} = j] \cdot B_i + \mathbf{A}_{it}\theta + \gamma_i + \delta_t + u_{it}, \quad (1)$$

where i indexes individuals, t indexes calendar time, E_{it} indicates event time, W_{it} is the log of reported monthly earnings, $\mathbf{A}_{it}$ is a vector of age dummies, γ_i captures individual fixed effects, δ_t captures calendar month effects, and B_i is a binary indicator for giving birth in the sample. Event time for women who did not give birth is defined by randomly assigning a placebo birth year and month. The coefficients of interest are the β_j, which capture the differential evolution of log monthly earnings for women who gave birth relative to women who did not. We set $\sum_{j=-30}^{-13} \beta_j = 0$, thus the estimated coefficients show the deviation from the average (conditional)

[7]For a comprehensive overview of the administrative data, see Sebők (2019).

[8]We do not consider a childbirth as first if we observe a prior maternity payment receipt. While we do not have information on births before 2009, maternity benefit data are available for 2003-2017.

outcomes 13 to 30 months prior to childbirth. We exclude the last three months before birth because sick leave is prevalent, and it is also possible to claim maternity benefits four weeks before giving birth.

Panel (a) of Figure 1 displays the event study coefficients β_j from equation (1) separately for 2012-2014 and 2015-2017 and for smaller (1 to 50 employees) and larger (more than 50 employees) firms. The earnings of mothers and non-mothers evolve similarly before pregnancy, both before and after the change of the reference period and in smaller and larger firms as well. Starting around the time when women become pregnant, the earnings of expectant mothers in smaller and larger firms start to diverge. In the 2012-2014 period, in smaller firms, expectant mothers' reported earnings were 2.1% higher 4 months before giving birth (and on average 1.8% higher between the second and sixth months of pregnancy) than those of women in the control group. This effect was even larger at 6.8% (and 5.3% on average) after the reporting incentive became much stronger in the 2015-2017 period. In larger firms, the earnings of expectant mothers declined by 2.9% relative to the control group over the same period. This decrease could be driven by women's partial withdrawal from the labor market, health concerns, or discrimination. While the increase in reported earnings in small firms is 3 times larger in the 2015-2017 period than in the 2012-2014 period, reflecting the stronger reporting incentives, the decrease in earnings in larger firms is very similar in the two periods.

Panel (b) of Figure 1 displays the estimated event study coefficients β_j from equation (1) using an indicator for top-percentile earnings increases as the outcome variable. This indicator captures large and rare earnings increases: it equals one if an earnings change is in the top percentile of the year-specific distribution of monthly earnings changes, excluding earnings increases where a large earnings increase already took place in the previous month or there is an earnings decrease in the subsequent month.[9] Conditional on experiencing such an increase, earnings jumped on average by around 40% among women who gave birth between 2012 and 2014 and by around 50% among women who gave birth between 2015 and 2017. This figure suggests that before pregnancy, the probability of receiving such a large earnings increase evolves similarly among women who give birth and those who do not, both in smaller and larger firms in both of the time periods. Then, in the first half of pregnancy, there is a divergence between smaller and larger firms. In larger firms, there is no change in the probability of top-percentile wage increases. In smaller firms, the probability of large wage increases was up to 1.5 percentage points higher among expectant mothers during pregnancy between 2012 and 2014 and up to 3.5 percentage points higher between 2015 and 2017.

Panel (c) of Figure 1 re-estimates equation (1) using an indicator for reporting earnings within 10% of twice the monthly minimum wage, the benefit-maximizing threshold. Compared to the control group, the probability of reporting at threshold increases by up to 6.5 percentage

[9]More precisely, for all women aged 20-45, we calculate the monthly wage growth rate, conditional on the wage one month earlier being between 90% and 110% of the wage two months earlier. We define a monthly wage increase as a top-percentile change if the rate of increase is in the top 1 percentile of the year-specific distribution of wage increases, and the nominal wage does not decrease in the next month. We cannot define this indicator before 2012 because our data source smoothed earnings within employment spells by employer-employee-year observations.

points before giving birth among women working at small firms, while there is no change among those working at large firms. The response is again more pronounced in the 2015-2017 period, reflecting the stronger reporting incentive.

In Panel (a) of Figure 2, we examine heterogeneity in the probability of experiencing a large earnings increase by worker and firm characteristics. Women whose reported earnings were at or close to the monthly minimum wage are the most responsive to the reporting incentive. The response is pronounced for skilled workers and managers, for whom low reported earnings are likely to reflect under-reporting, and in small, less-productive, domestic firms, which are known to be more prone to under-reporting and tax evasion (Bíró et al., 2022).

Our results so far suggest that the reported earnings of women who give birth change in a way that is consistent with the under-reporting of earnings before pregnancy and a reaction to reporting incentives created by the maternity benefit system. First, earnings of expectant mothers start increasing eight months before giving birth, when the women likely learn that they are pregnant. Second, earnings only increase in smaller firms where tax evasion is known to be more common and employer-employee coordination is easier. Third, the response is also concentrated in domestic and less productive firms, which are more prone to tax evasion. Fourth, the pre-pregnancy earnings distribution shows bunching around the monthly minimum wage, while during pregnancy, the reported earnings of expectant mothers bunch around the benefit maximizing threshold, but only among those working in smaller firms. Fifth, these effects became much stronger when the reporting incentive was strengthened in 2015.

4.2 Additional Results on Reported Earnings

To confirm that our results are indeed driven by women in smaller firms who give birth, Panels (a) and (b) of Appendix Figure A1 show the underlying evolution of log monthly earnings, separately for women who give birth and the control group. We present year-by-year plots in Appendix Figure A2, which confirm that the divergence between mothers and the control group was the strongest for smaller firms and childbirths in 2015-2017, the years after the change in the reference period. Appendix Figure A3 shows that the results are robust to implementing the estimator of Sun and Abraham (2021), which allows for the presence of treatment effect heterogeneity across cohorts. Appendix Figure A4 shows that the estimation results change little if we use a broader estimation sample, consisting of women who had non-missing wages in each month between eighteen months to four months before giving birth.

Appendix Figure A5 considers the smallest firms with fewer than 10 employees separately. The increase in reported earnings during pregnancy was even larger at these firms, consistent with high levels of earnings under-reporting in the smallest firms. Appendix Figure A6 adds public sector employees (including civil servants) as a further comparison group. The pattern for public sector employees shows declining earnings during pregnancy, similar to employees of larger private firms. This is consistent with tax evasion being unlikely in the public sector. Appendix Figure A7 shows results from estimating equation (1) with reported weekly working hours as the dependent variable. Women employed at smaller firms reported an increase in weekly working hours during pregnancy by up to 0.5 hours (1.3%) in the 2012-2014 period and by up to 0.8 hours (2.0%) in the 2015-2017 period, with no change for employees in larger firms. This suggests that most of the adjustment in reported earnings is realized through reported hourly wages rather than reported working hours.

Appendix Figures A8 and A9 provide further evidence on the distribution of wages and the role of the benefit maximizing threshold in the reporting response. Appendix Figure A8 shows that the earnings of women who work in small firms and receive large wage increases are concentrated around the minimum wage 12 months before giving birth but around the benefit maximizing threshold of twice the minimum wage 4 months before giving birth. This response is only present in smaller private-sector firms but not in larger firms or the public sector. Appendix Figure A9 shows a binned scatterplot of wage changes for expectant mothers and women who do not give birth, separately for smaller and larger firms and the 2012-2014 and 2015-2017 periods. It suggests that in larger firms, the relationship between wage changes is the same for expectant mothers and the control group in both time periods, but in smaller firms, expectant mothers earning around the minimum wage are much more likely to see wage growth, a pattern that is more pronounced in the 2015-2017 period.

4.3 Employment Formalization

The incentives generated by maternity benefits may lead not only to higher reported earnings before childbirth but also to an increase in formal employment and a decrease in informal work. To understand these formalization responses, we estimate a modified version of equation (1) with employment indicators as outcome variables, excluding individual fixed effects but including county fixed effects[10] to adjust for local labor market conditions. We restrict the sample to women who did not have formal employment and did not receive benefits during the previous month.

Panels (d) and (e) of Figure 1 show regression results for the probability of non-employment to employment transitions, separately for smaller and larger firms and the 2012-2014 and 2015-2017 periods. Panel (d) shows unconditional transitions, while panel (e) shows transitions into smaller and larger firms, conditional on a transition. Transition probabilities for expectant mothers and the control group trend similarly in both smaller and larger firms and in both time periods until pregnancy. Once women are pregnant, the probability of entering formal employment decreases in larger firms. In smaller firms, it initially increases and then starts to decrease but at a significantly slower rate. Entering formal employment in a smaller firm is 0.5-0.7 percentage points more likely seven months before giving birth than in the control group, while 1 percentage point less likely in a larger firm. Three months before giving birth, the decrease in the likelihood of entering formal employment is 1.3 percentage points in smaller firms but 2.2-2.6 percentage points in larger firms.

The overall decrease in job finding by women during pregnancy may reflect discrimination, health concerns, or decreased job search effort. But as panel (e) shows, entry into formal

[10] Hungary consists of 19 counties and the capital city Budapest.

employment among the women who do enter shifts significantly towards smaller firms with an up to 41 percentage points increase in the probability of joining a smaller firm and an equivalent decrease in the probability of joining a larger firm. To confirm that these results are indeed driven by women who give birth, panels (c) and (d) of Appendix Figure A1 show the underlying evolution of new employment probabilities. Panel (b) of Figure 2 shows heterogeneity patterns in transitions into formal employment. It suggests that when expectant mothers find a formal job, it is disproportionately in smaller, domestic, and lower-productivity firms. The results on transitions into formal employment suggest that in response to the incentives generated by maternity benefits smaller, domestic, and less-productive firms formalize some of their previously informal employees.

4.4 Post-Childbirth Labor Market Outcomes

We also examine whether pre-childbirth wage increases are associated with higher wages post-childbirth. As the majority of women return to work three years after giving birth (they receive two years of maternity benefits and one year of child care allowance or three years of child care allowance), and because we only have four years of follow-up data for 2012 and 2013 births, we focus on births in these two years and the period 37 to 48 months after childbirth, re-estimating equation (1) with these post-childbirth months included.[11]

Panel (a) of Figure 3 shows the evolution of the earnings of women who give birth relative to the control group, separately for women who work in smaller and larger firms. It suggests that after returning from maternity leave, both groups of women earn less than women who do not give birth, which can be interpreted as a child penalty. The earnings decrease is 7.5% in smaller firms and 14.2% in larger firms. Although legal employment protections apply to all firms regardless of size, a bigger earnings decrease in larger firms could be consistent with different working conditions, less flexibility, more discrimination, or a more affluent workforce that can afford to work less.

In panel (b) of Figure 3, we consider separately women in small firms who experienced large pre-birth earnings increases. On average, unlike women in large firms and women in small firms who do not get a large earnings increase, they appear to experience a smaller child penalty relative to their pre-pregnancy earnings. This suggests some persistence of the reported earnings increase during pregnancy. Figure A10 shows that this finding is robust to considering top five percentile wage increases as "large," instead of top one percentile wage increases. Panels (c) and (d) of Figure 3 suggest that post-childbirth employment was similar among women working in smaller and larger firms, including those women who experienced large wage increases.

Panel (e) of Figure 3, Appendix Figure A11, and Appendix Table A1 provide suggestive evidence on the mechanism behind the divergence between women who experienced a reported earnings increase during pregnancy and others. One year before giving birth, 46% of women who would experience a large wage increase report earning either the monthly minimum wage

[11]Note that we consider only 24 months pre-birth period instead of 30 months to increase the estimation sample size.

or the skilled minimum wage. Four months before giving birth, 27% of them report earning twice the monthly minimum wage, corresponding to the benefit-maximizing threshold. When they return to work three years after giving birth, 13% still report earning at the same nominal level, even though the minimum wage increased by 13% over three years (2012 to 2015, or 2013 to 2016). This suggests that after large increases in pre-birth reported earnings move expectant mothers from the minimum wage to the benefit-maximizing threshold, the reported earnings of most women drop back to the minimum wage, but a substantial share remain at the same nominal wage level, consistent with some reported earnings being somewhat sticky in nominal terms.

5 Conclusion

This paper studies firms' and workers' tax evasion responses to incentives created by maternity benefits. Studying the dynamics of earnings and employment of Hungarian private sector workers, we document several patterns consistent with under-reported earnings before pregnancy, followed by an increase in reported earnings during pregnancy, and an employment formalization response. Reported earnings increase during pregnancy among women in small but not in larger firms. This response is much more pronounced after reporting incentives became stronger in 2015 and is also concentrated in less-productive and domestic firms. Among women receiving a large wage increase during pregnancy, the distribution of reported earnings bunches around the minimum wage pre-pregnancy and around the benefit-maximizing earnings level during pregnancy. Pregnant women appear to join small, domestic, and less-productive firms at higher rates during pregnancy, suggesting that these firms formalize their previously informal workers. We also find that reported wage increases during pregnancy in response to benefit incentives are sticky for many affected women, at least during the first year after returning from maternity leave.

While different factors may have contributed the observed effects, overall these results suggest that tax evasion is responsive to the contribution-benefit link built into the social insurance systems. Two important trade-offs need to be highlighted. First, a reference period for benefits that is shorter and closer to childbirth can be advantageous for those who can quickly adjust their (reported) earnings either because they are formalizing previous under-reported earnings and employment relationships or because they have flexible contracts, while disadvantaging those who have less flexible employment and those whose earnings are reduced due to health problems or discrimination. Shortening the reference period and bringing it closer to childbirth might also have the unintended consequence of decreasing reported earnings outside the reference period. Second, while linking benefits to reported earnings can help reduce tax evasion, it also limits redistribution. Governments should consider the avoidance, evasion, and informality responses to benefit program incentives as one element of the trade-offs inherent in designing social insurance programs.

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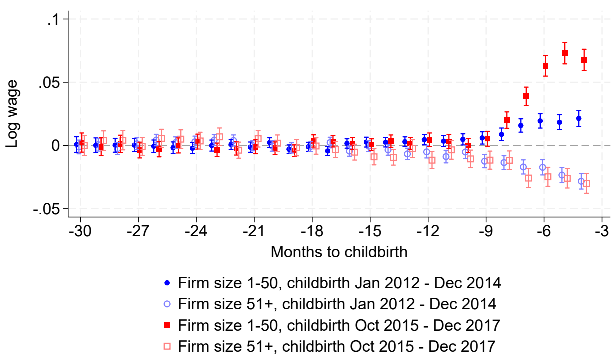
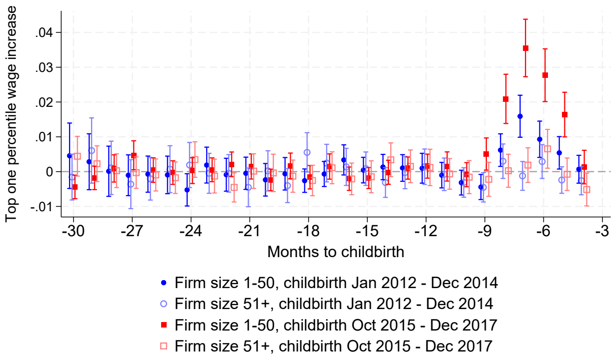
Figures and Tables

Figure 1: Reported Earnings and Employment Before Childbirth

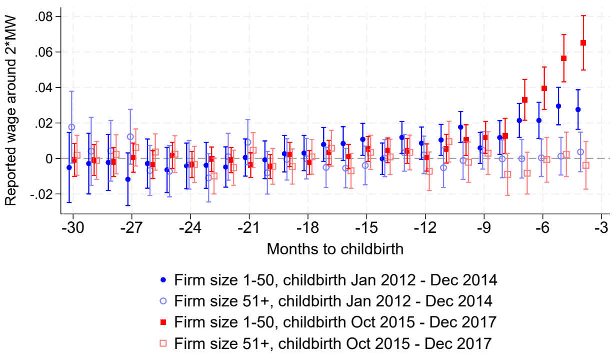
(a) Log Monthly Earnings



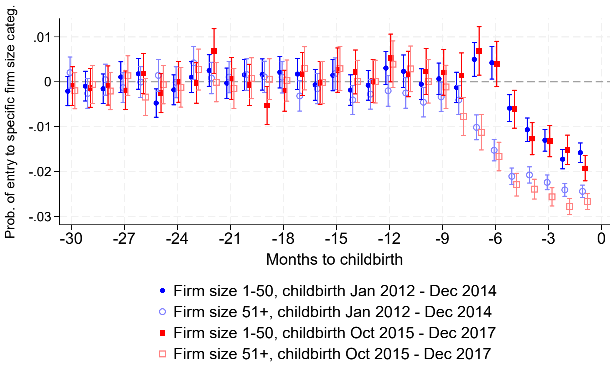
(b) Probability of Large Wage Increase



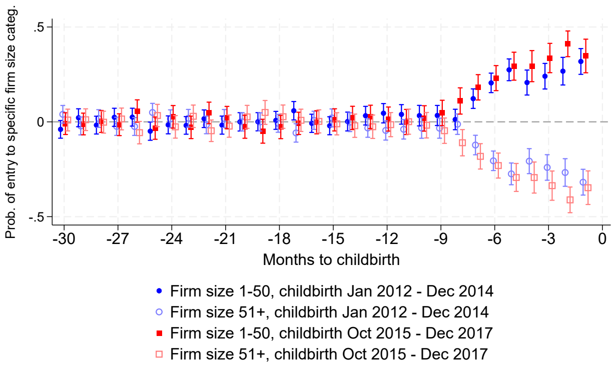
(c) Probability of Reporting Earnings at Benefit-Maximizing Threshold



(d) Probability of New Employment



(e) Probability of New Employment by Firm Size, Conditional on New Employment

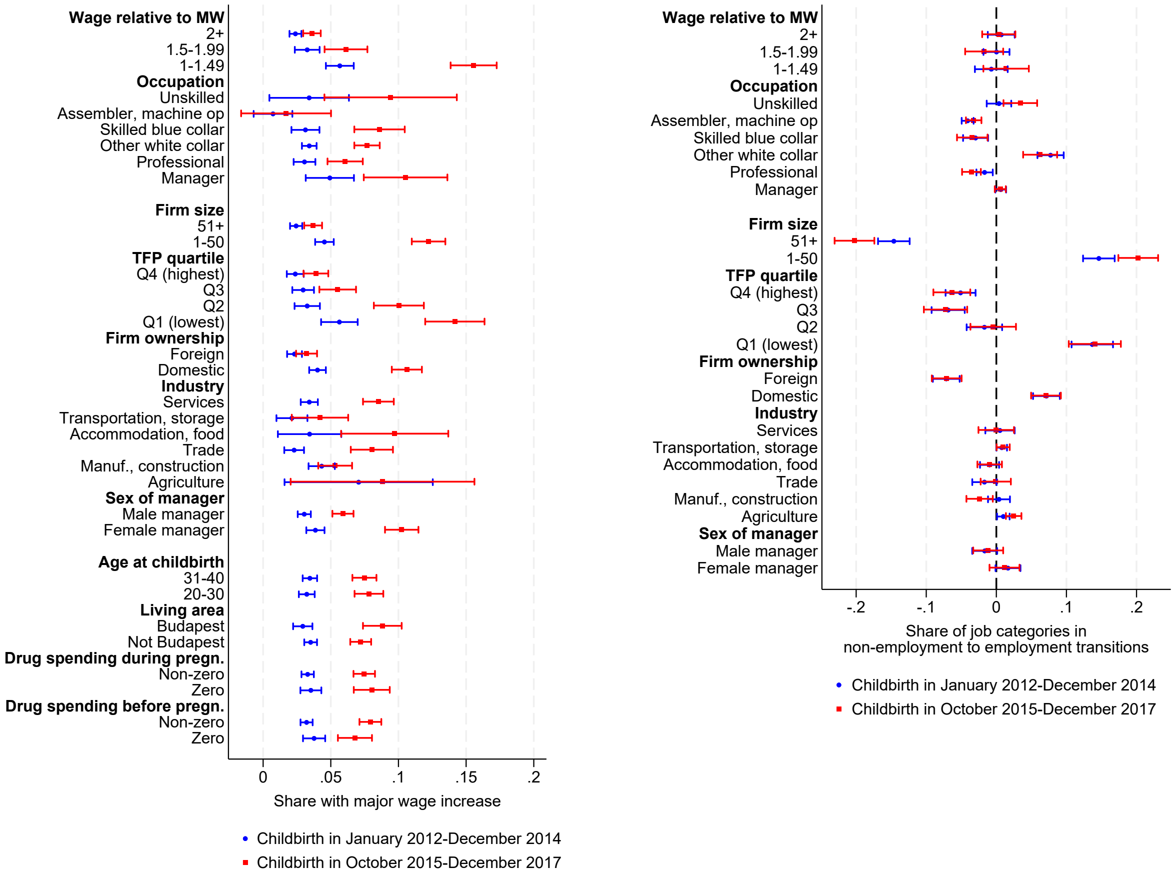


Note: Figure shows time patterns of reported earnings and employment before giving birth. Panels (a), (b), and (c) show estimated β parameters and 95% confidence intervals from equation (1). In panel (a), the dependent variable is reported log monthly earnings. In panel (b), the dependent variable is an indicator for a large wage increase. This indicator captures large and rare earnings increases: it equals one if an earnings change is in the top percentile of the year-specific distribution of monthly earnings changes, excluding transitory earnings increases where a large earnings increase took place in the previous month or there is an earnings decrease in the subsequent month. In panel (c), the dependent variable is an indicator for reporting earnings within 10% of twice the monthly minimum wage (the benefit-maximizing threshold). Panels (d) and (e) show estimated β parameters and 95% confidence intervals from a modified version of equation (1) with employment indicators as outcome variables, excluding individual fixed effects but including county fixed effects as regressors. We restrict the sample to women who did not have formal employment and did not receive benefits during the previous month. Panel (d) shows unconditional probabilities of finding new employment, while panel (e) shows probabilities of finding new employment in smaller and larger firms, conditional on new employment. In all panels, results for 2012-2014, before reporting incentives were strengthened, are shown by blue circles and results for 2015-2017, after reporting incentives were strengthened, are shown by red squares. The full blue circles and red squares indicate smaller firms with 1 to 50 employees and the hollow blue circles and red squares indicate larger firms with more than 50 employees. (Number of individuals in panel (a): childbirth 2012-2014—12,638 for firm size 1-50 and 18,321 for firm size 51+; childbirth 2015-2017—9,903 for firm size 1-50 and 13,585 for firm size 51+. Number of individuals in panels (b) and (c): childbirth 2012-2014—11,174 for firm size 1-50 and 16,143 for firm size 51+; childbirth 2015-2017—9,903 for firm size 1-50 and 13,585 for firm size 51+. Number of individuals in panel (d): childbirth 2012-2014—136,656; childbirth 2015-2017—100,219. Number of individuals in panel (e): childbirth 2012-2014—46,801; childbirth 2015-2017—33,289.)

Figure 2: Reported Earnings and Employment Before Childbirth—Heterogeneity

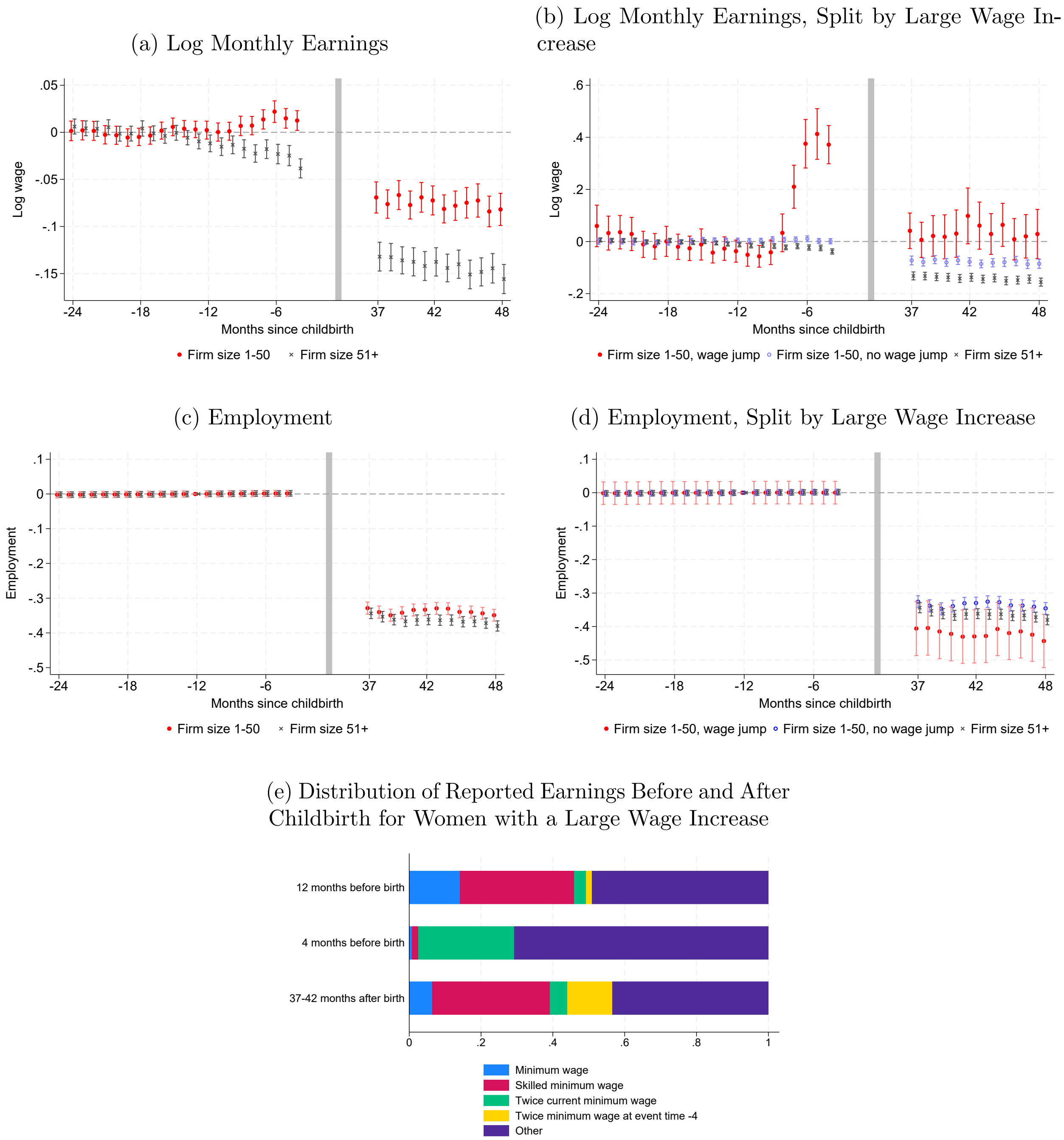
(a) Probability of Large Wage Increase

(b) Change of Probability of New Employment by Job Type, Conditional on New Employment



Note: Figure shows heterogeneity in reported earnings and employment before giving birth by individual, firm, and job characteristics. Panel (a) shows variation in the probability of a pre-childbirth top-percentile wage increase by individual and firm characteristics (average probability and 95% confidence interval). Panel (b) shows changes in non-employment to employment transition probabilities before giving birth, compared to thirty to ten months before childbirth. The panel shows estimated β parameters and 95% confidence intervals from a modified version of equation (1), with a binary indicator of pregnancy period (one to nine months before childbirth versus ten to thirty months before childbirth) replacing the event time dummies, and using an indicator for transitioning from non-employment to employment indicators as the dependent variable. Control variables include age dummies, county dummies, and calendar month date dummies. The sample is restricted to women who enter formal employment from non-employment, and the outcome is formal employment in a specific job category. In both panels, results for 2012-2014, before reporting incentives were strengthened, are shown by blue circles and results for 2015-2017, after reporting incentives were strengthened, are shown by red squares. We calculate the value added-based TFP. When doing so, we apply the estimation procedure of Wooldridge (2009) and use the `prodest` Stata package by Rovigatti and Mollisi (2020). TFP quartiles are calculated based on the year-specific distribution of TFP, using the entire linked employer-employee database. The heterogeneity indicators refer to twelve months before giving birth, except for the drug spending indicators, which refer to -24 to -13 months (before pregnancy) or to -9 to -4 months (during pregnancy) before childbirth. The ownership, TFP, and industry indicators are not observed for the smallest (single-bookkeeping) firms. The sample is women employed in the private sector who gave birth between age 20 and 40 and have non-zero wage between thirty and four months before giving birth. (Number of individuals in panel (a): childbirth 2012-2014— 8,019; childbirth 2015-2017—5,823. Number of individuals in panel (b): childbirth 2012-2014—46,801; childbirth 2015-2017—33,289.)

Figure 3: Reported Earnings and Employment After Childbirth



Note: Figure shows time patterns of reported earnings and employment before and after giving birth. Panels (a), (b), (c), and (d) show estimated β parameters and 95% confidence intervals from equation (1) with post-childbirth months 37-48 included. In panels (a) and (b), the dependent variables is log earnings. In panels (c) and (d), the dependent variable is employment. In panels (a) and (c) red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees. In panels (b) and (d), red full circles indicate employees who experienced a top-percentile wage increase in a smaller firm with 1 to 50 employees, hollow blue circles indicate employees who did not experience a top-percentile wage increase in a smaller firm with 1 to 50 employees, and gray crosses indicate employees of larger firms with more than 50 employees. Panel (e) shows the distribution of earnings across five categories for women who experienced a top-percentile wage increase: the minimum wage, the skilled minimum wage, twice the minimum wage (the benefit-maximizing threshold), twice the minimum wage of the period before giving birth (the benefit maximizing threshold at the time), and other. (Number of individuals in panel (a): 7,535 for firm size 1-50 and 11,323 for firm size 51+. Number of individuals in panel (b): 6,226 for firm size 1-50 with top-percentile wage increase plus the control group, 7,493 for firm size 1-50 without top-percentile wage increase plus the control group, and 11,323 for firm size 51+. Number of individuals in panel (c): 10,125 for firm size 1-50 and 14,203 for firm size 51+. Number of individuals in panel (d): 10,022 for firm size 1-50 with top-percentile wage increase plus the control group, 7,507 for firm size without top-percentile wage increase plus the control group, and 14,203 for firm size 51+. Number of individuals in panel (e): 120.)

Table 1: Contribution-Benefit Link

	Until December 2014		From January 2015	
	Baseline	Tax evasion	Baseline	Tax evasion
(a) Increase in monthly wage items				
Gross wage	1	1	1	1
Total cost to employer	1.27	0.62	1.27	0.62
Net wage	0.66	0	0.66	0
PIT and SSC on wage	0.62	0.62	0.62	0.62
(b) Increase in monthly benefit items				
Gross benefit	0.26	0.26	0.70	0.70
Net benefit	0.20	0.20	0.54	0.54
PIT and SSC on benefit	0.06	0.06	0.16	0.16
(c) Total increase of wage items (6 months)				
Gross wage	*6*	*6*	*6*	*6*
Total cost to employer	7.62	3.69	7.62	3.69
Net wage	3.93	0	3.93	0
PIT and SSC on wage	3.69	3.69	3.69	3.69
(d) Total increase of benefit items (24 months)				
Gross benefit	6.30	6.30	16.80	16.80
Net benefit	4.82	4.82	12.85	12.85
PIT and SSC on benefit	1.48	1.48	3.95	3.95
(e) Overall gains and losses				
Employer	*-7.62*	*-3.69*	*-7.62*	*-3.69*
Employee (= Net wage + Net benefit)	*8.75*	*4.82*	*16.78*	*12.85*
Government (= PIT and SSC on wage - Net benefit)	*-1.13*	*-1.13*	*-9.16*	*-9.16*

Note: Table shows the costs and benefits associated with a 1 dollar increase of an employee's monthly gross wage during the first six months of pregnancy. The first and second columns show costs and benefits under the system used until December 2014. Under this system, the benefit calculation window was the calendar year preceding the receipt of the benefit. For example, for a woman who gave birth on October 1, 2014, the reference period was January to December 2013. The effect of an increase in the gross wage on benefits depended on the month of birth, and here we show the average effect. The third and fourth columns show costs and benefits under the system used from January 2015. Under this system, the benefit calculation window is the six-month period between nine and four months before birth. For example, for a woman who gave birth on October 1, 2016, the reference period was January to June 2016. The first and third columns show a baseline scenario with no income tax evasion. The second and fourth columns show a scenario with income tax evasion. In this case, reported wages are increased, resulting in higher income tax and social security contribution payments, without a change in net wages. This would arise if the same net wage was previously paid as an envelope wage. Panel (a) considers the increase in monthly wage items associated with a 1 dollar increase in the gross monthly wage. For wages, a 16% personal income tax (PIT) rate, a 18.5% employee social security contribution (SSC) rate, and a 27% employer SSC rate apply. Panel (b) considers the increase in monthly benefit items. For parental leave benefits (PLB), only the 16% PIT rate applies. For child care benefits (CCB), the 16% PIT rate and the 10% employee SSC rate apply. Panel (c) considers the increase in wage items, aggregating over 6 months (for comparability across the 2012-2014 and 2015-2017 periods). Panel (d) considers the increase in benefit items, aggregating over 24 months. Panel (e) considers the overall impact on employers, employees, and the government.

Table 2: Summary Statistics

	Women never giving birth Placebo childbirth		Women giving birth Childbirth	
	Jan 2012 to Dec 2014	Oct 2015 to Dec 2017	Jan 2012 to Dec 2014	Oct 2015 to Dec 2017
Age	32.4	31.2	30.4	30.6
Employed in private sector	0.736	0.717	0.715	0.697
Lives in Budapest	0.219	0.210	0.251	0.239
Private sector workers				
Weekly working hours	38.2	38.1	39.0	38.6
Firm size category				
1-50	0.398	0.409	0.438	0.461
51+	0.602	0.591	0.562	0.539
Wage relative to minimum wage				
1-1.49	0.361	0.361	0.243	0.300
1.5-1.99	0.211	0.185	0.181	0.152
2+	0.428	0.454	0.577	0.548
Occupation				
Manager, political	0.058	0.057	0.071	0.065
Professional	0.129	0.151	0.220	0.221
Other white collar	0.428	0.435	0.538	0.530
Skilled blue collar	0.233	0.206	0.136	0.150
Assembler, machine operator	0.087	0.077	0.017	0.010
Unskilled	0.064	0.073	0.018	0.024
Industry				
Agriculture	0.011	0.011	0.011	0.013
Manufacturing, construction	0.278	0.289	0.228	0.231
Trade	0.243	0.226	0.218	0.218
Accommodation, food	0.042	0.049	0.031	0.040
Transportation, storage	0.079	0.072	0.083	0.067
Services	0.348	0.354	0.428	0.431
Number of individuals	31,157	24,632	11,215	8,349

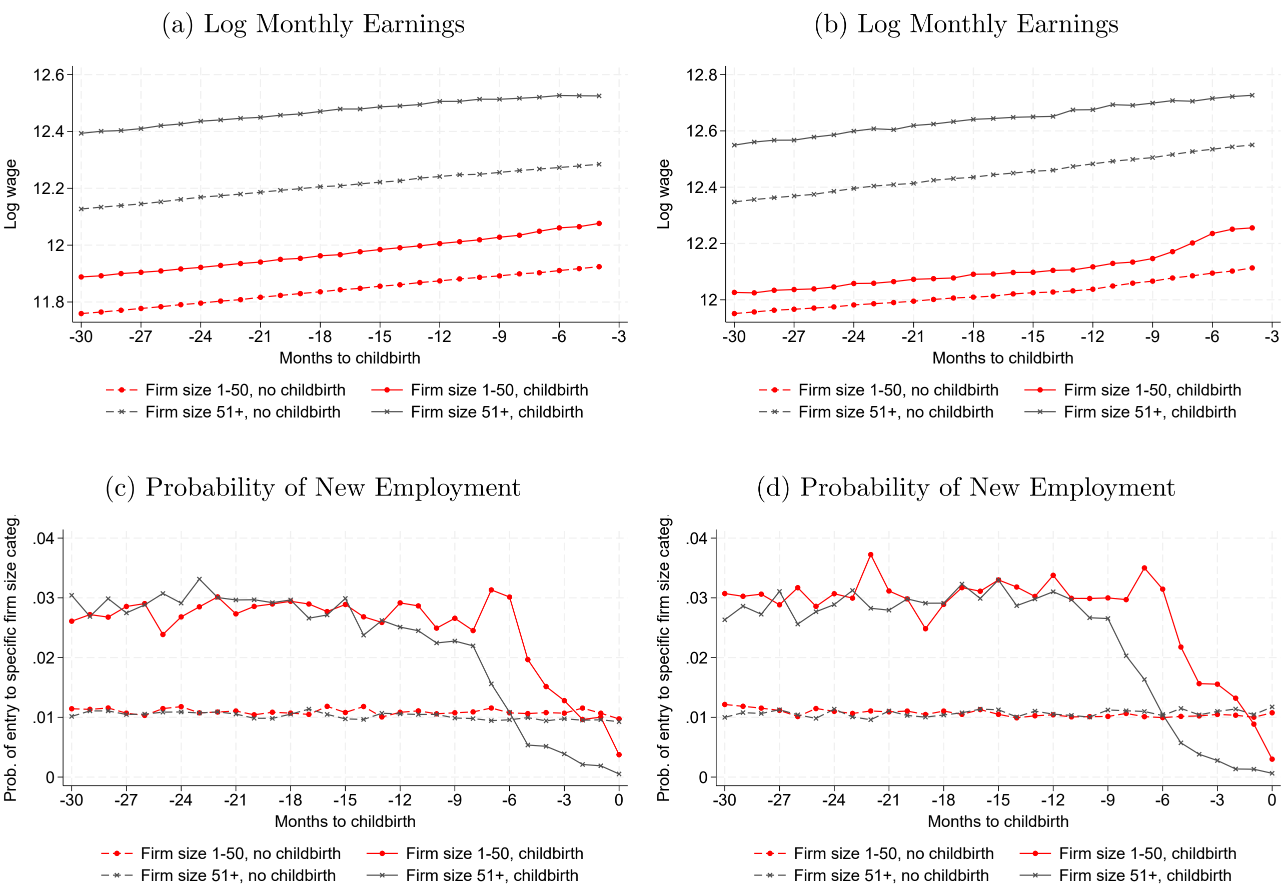
Note: Table shows descriptive statistics for the baseline sample. The sample of mothers is restricted to women who gave birth between ages 20 and 40 in the 2012-2017 period. The control group includes women who did not give birth by 2017 who are assigned a placebo date of birth between ages 20 and 40 and calendar years 2012 and 2017. The baseline estimation sample also limits to women who had a non-missing full-time equivalent wage of at least 90% of the minimum wage each month between thirty months to four months before giving birth or before the placebo date of birth. Summary statistics are calculated 12 months before the (placebo) childbirth.

Online Appendix

Additional Figures and Tables

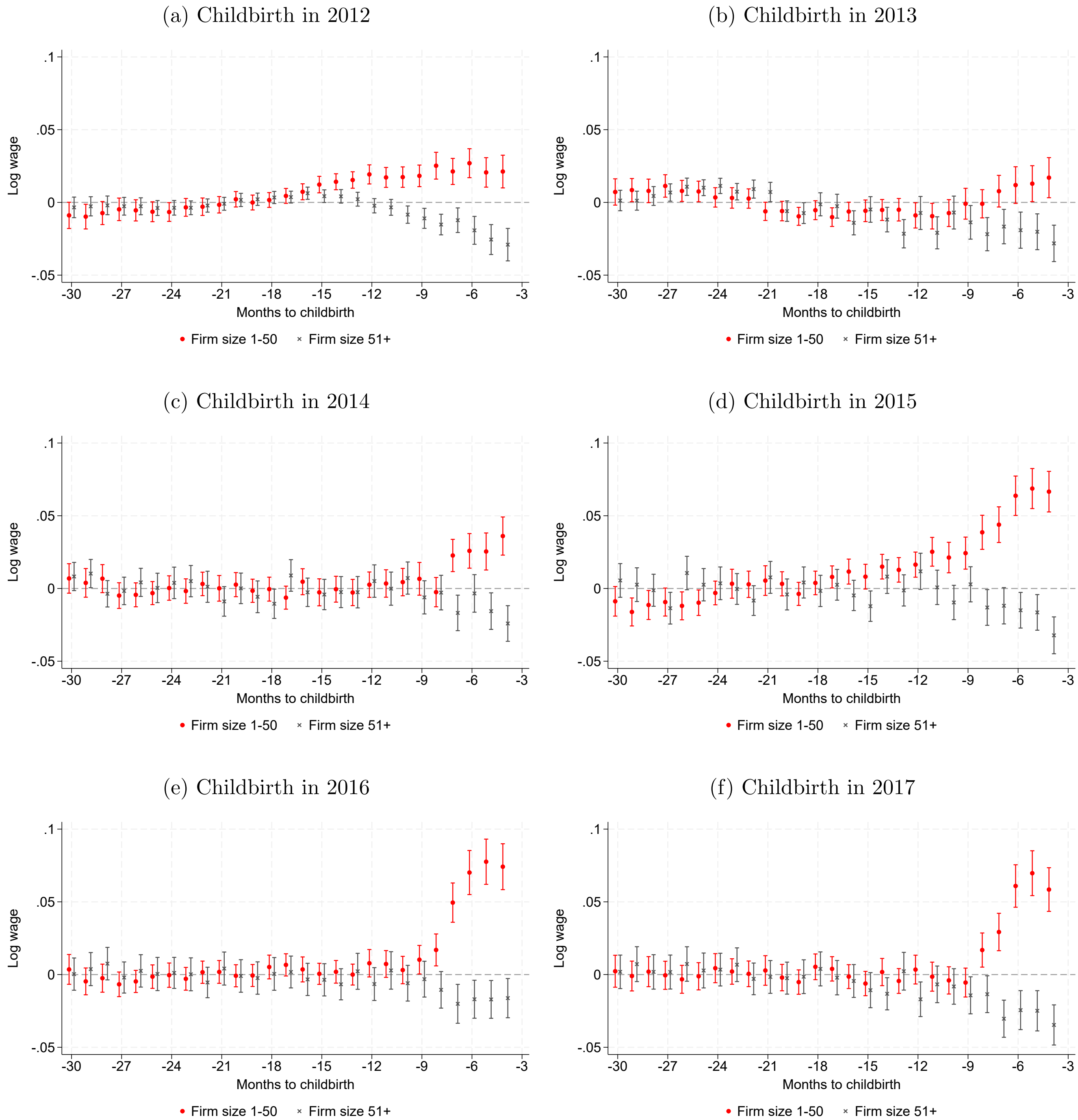
Appendix Figure A1: Reported Earnings and Employment Before Childbirth

January 2012 to December 2014 | October 2015 to December 2017



Note: Figure shows time patterns of reported earnings and new employment before giving birth. Panels (a) and (b) show average log monthly earnings. Panels (c) and (d) show probabilities of finding new employment among the non-employed. Panels (a) and (c) show average values for births between January 2012 and December 2014. Panel (b) and (d) show average values for births between October 2015 and December 2017. In all panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees. Dashed lines indicate the control group of women who did not give birth and solid lines indicate mothers. (Number of individuals in panel (a): 12,638 for firm size 1-50 and 18,321 for firm size 51+. Number of individuals in panel (b): 9,903 for firm size 1-50 and 13,585 for firm size 51+. Number of individuals in panel (c): 136,656. Number of individuals in panel (d): 100,219.)

Appendix Figure A2: Reported Earnings Before Childbirth—By Year of Childbirth

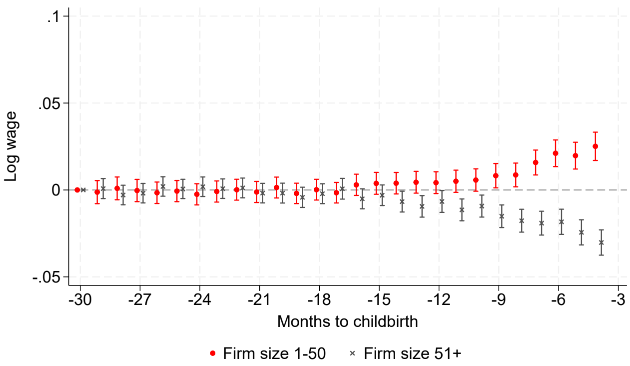


Note: Figure shows time patterns of reported earnings before giving birth, separately by year of birth. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). The dependent variable is reported log monthly earnings. In all panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees. (Number of individuals in panel (a): 4,366 for firm size 1-50 and 6,420 for firm size 51+. Number of individuals in panel (b): 4,204 for firm size 1-50 and 5,968 for firm size 51+. Number of individuals in panel (c): 4,068 for firm size 1-50 and 5,933 for firm size 51+. Number of individuals in panel (d): 4,257 for firm size 1-50 and 5,990 for firm size 51+. Number of individuals in panel (e): 4,329 for firm size 1-50 and 6,034 for firm size 51+. Number of individuals in panel (f): 4,511 for firm size 1-50 and 6,081 for firm size 51+.)

Appendix Figure A3: Reported Earnings Before Childbirth—Estimation Allowing for Treatment Effect Heterogeneity

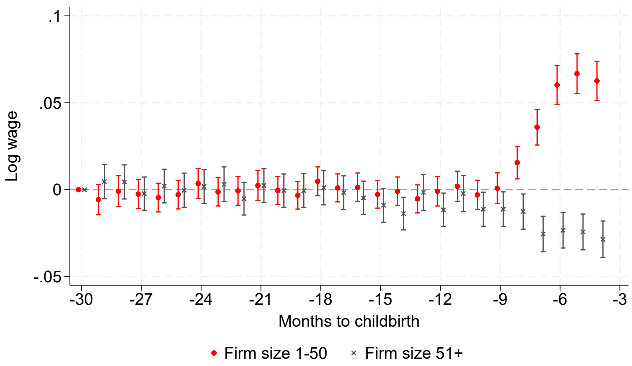
January 2012 to December 2014

(a) Log Monthly Earnings



October 2015 to December 2017

(b) Log Monthly Earnings



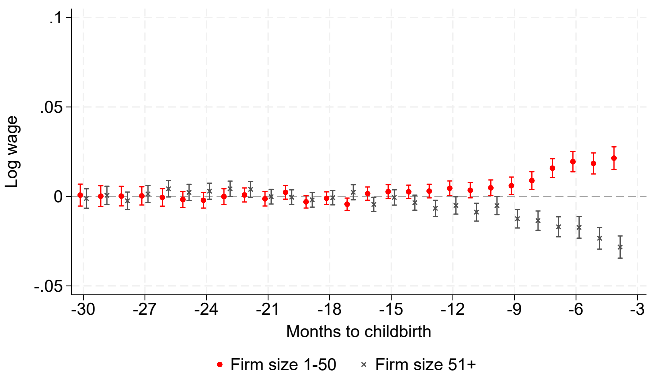
Note: Figure shows time patterns of reported earnings before giving birth, using the estimator of Sun and Abraham (2021), implemented with Stata package Sun (2021). Panel (a) shows estimates for births between January 2012 and December 2014. Panel (b) shows estimates for births between October 2015 and December 2017. Both panels show estimated β parameters and 95% confidence intervals from equation (1). In both panels, the dependent variable is reported log monthly earnings. In both panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees. (Number of individuals in panel (a): 12,638 for firm size 1-50 and 18,321 firm size 51+. Number of individuals in panel (b): 9,903 for firm size 1-50 and 13,585 for firm size 51+.)

Appendix Figure A4: Reported Earnings Before Childbirth—Broader Sample

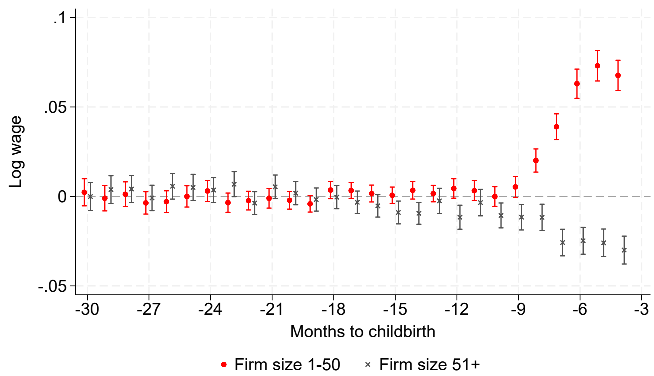
January 2012 to December 2014

October 2015 to December 2017

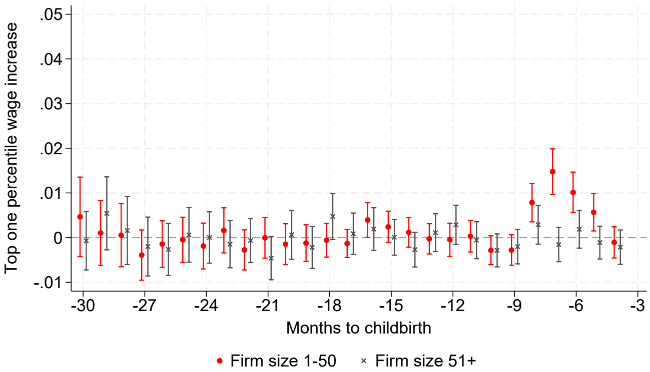
(a) Log Wage



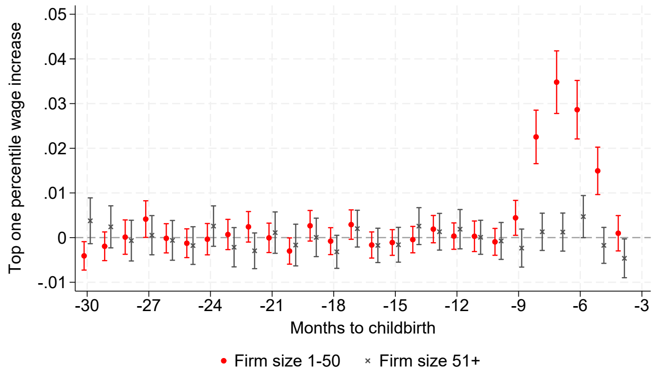
(b) Log Wage



(c) Probability of Large Wage Increase



(d) Probability of Large Wage Increase

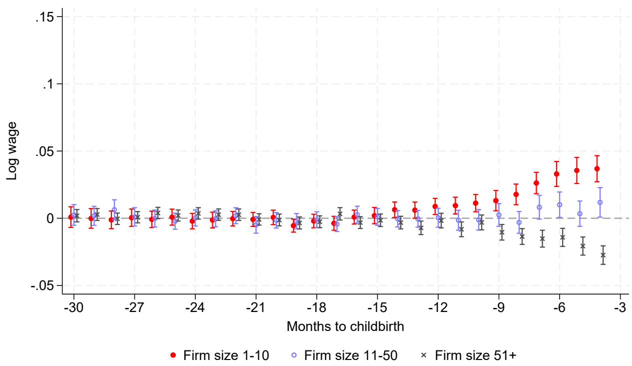


Note: Figure shows time patterns of reported earnings before giving birth using a broader sample, consisting of women who had non-missing wages in each month between eighteen months to four months before giving birth. Panels (a) and (c) show estimates for births between January 2012 and December 2014. Panels (b) and (d) show estimates for births between October 2015 and December 2017. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). In panels (a) and (b), the dependent variable is reported log monthly earnings. In panels (c) and (d), the dependent variable is an indicator for a large wage increase. This indicator captures large and rare earnings increases: it equals one if an earnings change is in the top percentile of the year-specific distribution of monthly earnings changes, excluding transitory earnings increases where a large earnings increase took place in the previous month or there is a earnings decrease in the subsequent month. In all panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees. (Number of individuals in panel (a): 18,061 for firm size 1-50 and 24,647 for firm size 51+. Number of individuals in panel (b): 14,685 for firm size 1-50 and 18,832 for firm size 51+. Number of individuals in panel (c): 15,985 for firm size 1-50 and 21,753 for firm size 51+. Number of individuals in panel (d): 14,685 for firm size 1-50 and 18,832 for firm size 51+.)

Appendix Figure A5: Reported Earnings Before Childbirth—Three Firm Size Categories

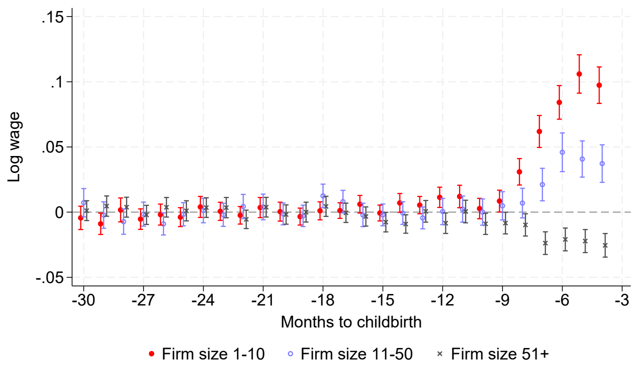
January 2012 to December 2014

(a) Log Wage



October 2015 to December 2017

(b) Log Wage

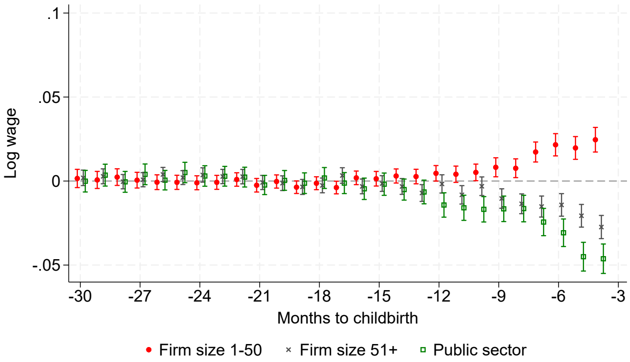


Note: Figure shows time patterns of reported earnings before giving birth. Panel (a) shows estimates for births between January 2012 and December 2014. Panel (b) shows estimates for births between October 2015 and December 2017. Both panels show estimated β parameters and 95% confidence intervals from equation (1). In both panels, the dependent variable is reported log monthly earnings. In both panels, red full circles indicate firms with 1 to 50 employees. purple hollow circles indicate firms with 11 to 50 employees, and gray crosses indicate larger firms with more than 50 employees. (Number of individuals in panel (a): 6,643 for firm size 1-10, 5,995 for firm size 11-50, and 18,321 for firm size 51+. Number of individuals in panel (b): 4,994 for firm size 1-10, 4,909 for firm size 11-50, and 13,585 for firm size 51+.)

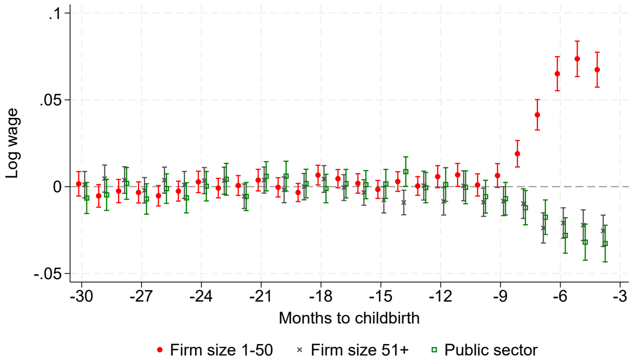
Appendix Figure A6: Reported Earnings Before Childbirth – Including the Public Sector

January 2012 to December 2014 | October 2015 to December 2017

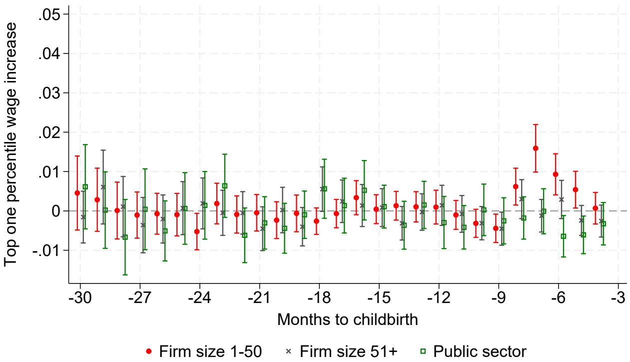
(a) Log Wage



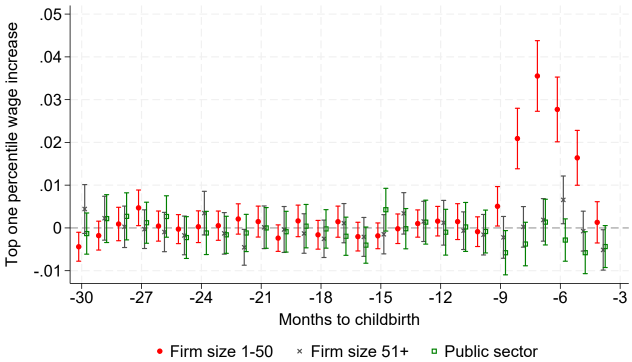
(b) Log Wage



(c) Probability of Large Wage Increase



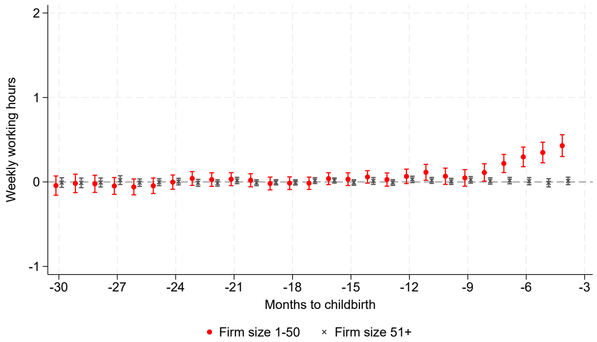
(d) Probability of Large Wage Increase



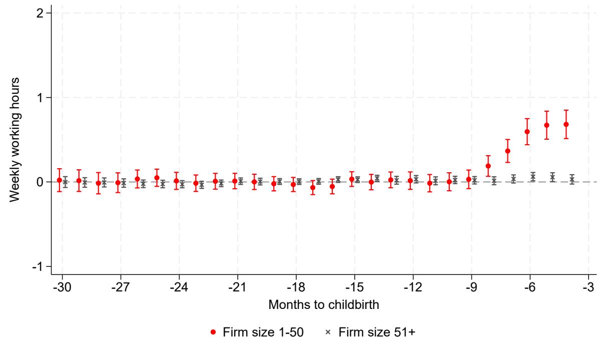
Note: Figure shows time patterns of reported earnings before giving birth. Panels (a) and (c) show estimates for births between January 2012 and December 2014. Panels (b) and (d) show estimates for births between October 2015 and December 2017. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). In panels (a) and (b), the dependent variable is reported log monthly earnings. In panels (c) and (d), the dependent variable is an indicator for a large wage increase. This indicator captures large and rare earnings increases: it equals one if an earnings change is in the top percentile of the year-specific distribution of monthly earnings changes, excluding transitory earnings increases where a large earnings increase took place in the previous month or there is a earnings decrease in the subsequent month. In all panels, red circles indicate smaller firms with 1 to 50 employees, gray crosses indicate larger firms with more than 50 employees, and green squares indicate public sector employees. (Number of individuals in panel (a): 12,638 for firm size 1-50, 18,321 for firm size 51+, and 10,217 for the public sector. Number of individuals in panel (b): 9,903 for firm size 1-50, 13,585 for firm size 51+, and 8,841 for the public sector. Number of individuals in panel (c): 11,174 for firm size 1-50, 16,143 for firm size 51+, and 8,940 for the public sector. Number of individuals in panel (d): 9,903 for firm size 1-50, 13,585 for firm size 51+, and 8,841 for the public sector.)

Appendix Figure A7: Reported Weekly Working Hours Before Childbirth

(a) Childbirth in January 2012 to December 2014



(b) Childbirth in October 2015 to December 2017

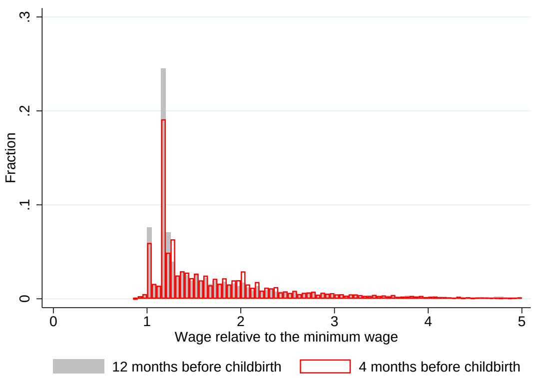


Note: Figure shows time patterns of weekly working hours before giving birth. Panel (a) shows estimates for births between January 2012 and December 2014. Panel (b) shows estimates for births between October 2015 and December 2017. Both panels show estimated β parameters and 95% confidence intervals from equation (1). In both panels, the dependent variable is weekly working hours. In both panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees. (Number of individuals in panel (a): 12,637 for firm size 1-50 and 18,321 for firm size 51+. Number of individuals in panel (b): 9,902 for firm size 1-50 and 13,584 for firm size 51+.)

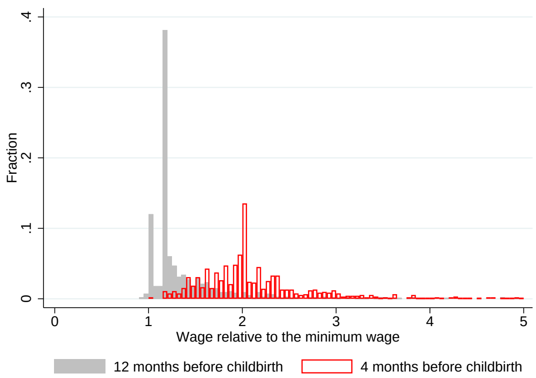
Appendix Figure A8: Distribution of Reported Earnings Before Childbirth

Firm Size 1-50

(a) Full Sample



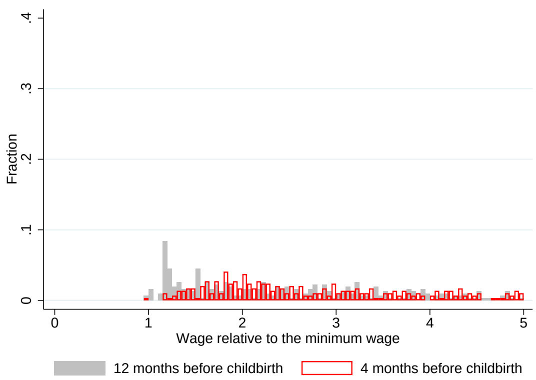
(b) Women Receiving Large Wage Increase



Firm Size 51+

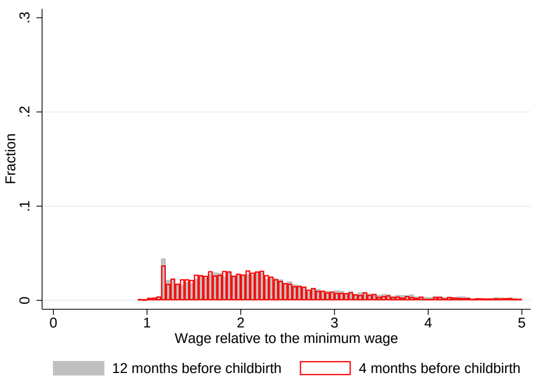
(c) Full Sample

(d) Women Receiving Large Wage Increase



Public Sector

(e) Full Sample



(f) Women Receiving Large Wage Increase

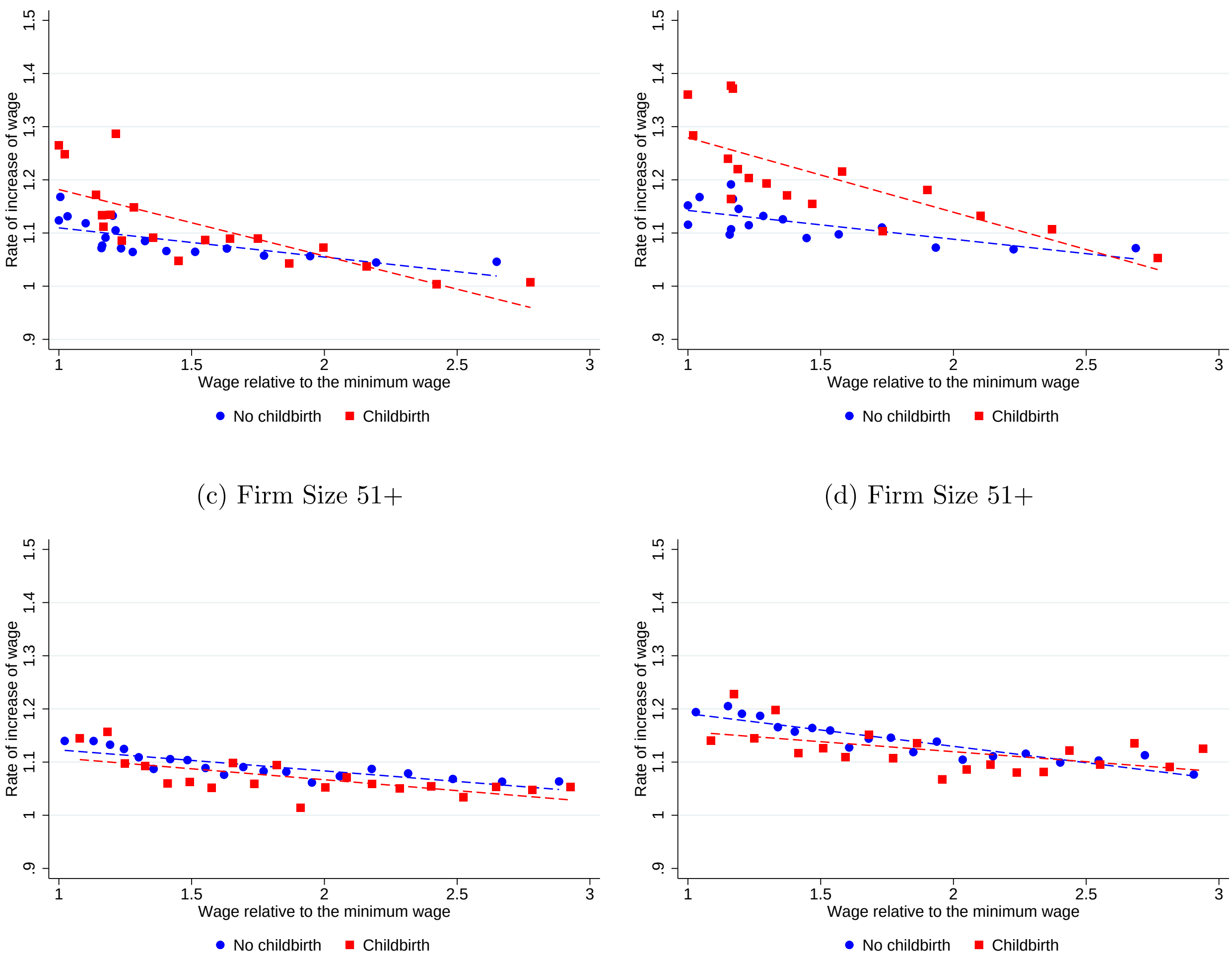
Note: Figure shows the distribution of reported earnings relative to the monthly minimum wage twelve and four months before giving birth. Panels (a) and (b) show the distribution for smaller firms with 1 to 50 employees. Panels (c) and (d) show the distribution for larger firms with more than 50 employees. Panels (e) and (f) show the distribution for the public sector. Panels (a), (c), (e) show the distribution for the baseline sample. Panels (b), (d), and (f) show the distribution for women who receive a large wage increase. This indicator captures large and rare earnings increases: it equals one if an earnings change is in the top percentile of the year-specific distribution of monthly earnings changes, excluding transitory earnings increases where a large earnings increase took place in the previous month or there is a earnings decrease in the subsequent month. In all panels, the gray bars show the distribution 12 months before childbirth and the red bars show the distribution 4 months before childbirth conditional on earning at least 90% of the minimum wage. (Number of individuals in panel (a): 9,963. Number of individuals in panel (b): 931. Number of individuals in panel (c): 10,075. Number of individuals in panel (d): 310. Number of individuals in panel (e): 7,735. Number of individuals in panel (f): 208.)

Appendix Figure A9: Reported Earnings Growth Before Childbirth

January 2012 to December 2014 | October 2015 to December 2017

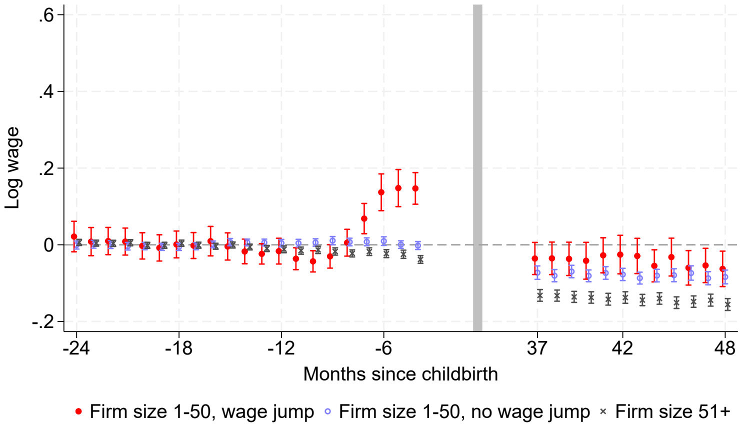
(a) Firm Size 1-50 | (b) Firm Size 1-50

(c) Firm Size 51+ | (d) Firm Size 51+



Note: Figure shows the relationship between reported earnings growth and reported earnings. Panels (a) and (b) show the relationship for smaller firms with 1 to 50 employees Panels (c) and (d) show the relationship for larger firms with more than 50 employees. Panels (a) and (c) show the relationship for births between January 2012 and December 2014. Panels (b) and (d) show the relationship for births between October 2015 and December 2017. In all panels, blue circles indicate women who do not give birth and red squares indicate mothers. In all panels, the x-axis shows reported monthly earnings relative to the monthly minimum wage 12 months before childbirth or 12 months before the placebo event date for women who do not give birth. The y-axis shows the rate of reported earnings growth, defined as the ratio between reported monthly earnings 4 month before childbirth or the placebo event date, divided by reported monthly earnings 12 months before childbirth or the placebo event date. The blue circles and red squares show binned scatterplot with 20 equal-sized bins and the blue and red dashed lines show a fitted regression line. (Number of individuals in panel (a): 25,414 with no childbirth and 11,572 with childbirth. Number of individuals in panel (b): 21,198 with no childbirth and 8,438 with childbirth. Number of individuals in panel (c): 30,817 with no childbirth and 15,597 with childbirth. Number of individuals in panel (d): 25,642 with no childbirth and 11,541 with childbirth.)

Appendix Figure A10: Reported Earnings After Childbirth, Sample Split by Top Five Percentile Wage Increase



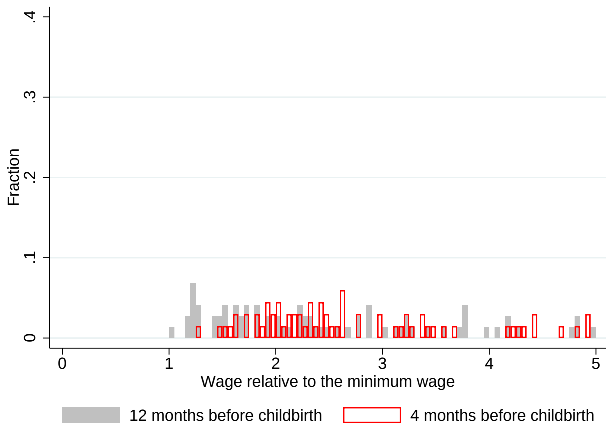
Note: Figure shows time patterns of reported earnings and employment before and after giving birth. Figure shows estimated β parameters and 95% confidence intervals from equation (1) with post-childbirth months 37-48 included. The dependent variables is log earnings. Red full circles indicate employees who experienced a top-five-percentile wage increase in a smaller firm with 1 to 50 employees, hollow blue circles indicate employees who did not experience a top-five-percentile wage increase in a smaller firm with 1 to 50 employees, and gray crosses indicate employees of larger firms with more than 50 employees. Number of individuals: 6,315 for firm size 1-50 with top-five-percentile wage increase plus the control group, 7,404 for firm size 1-50 without top-five-percentile wage increase plus the control group, and 11,323 for firm size 51+.)

Appendix Figure A11: Distribution of Reported Earnings Before and After Childbirth

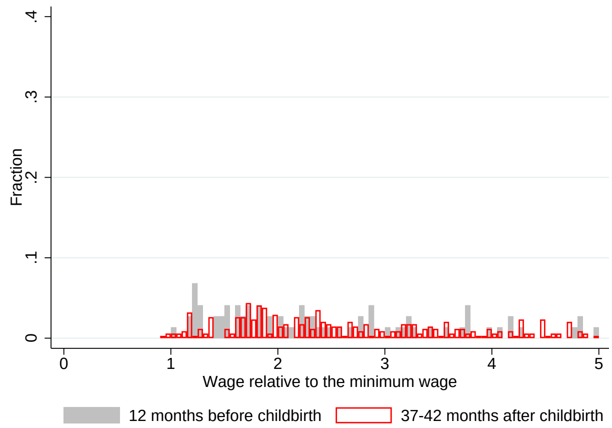
(a) Firm Size 1-50, 12 Months Before vs 4 Months Before Childbirth

(b) Firm Size 1-50, 12 Months Before vs 37-42 Months After Childbirth

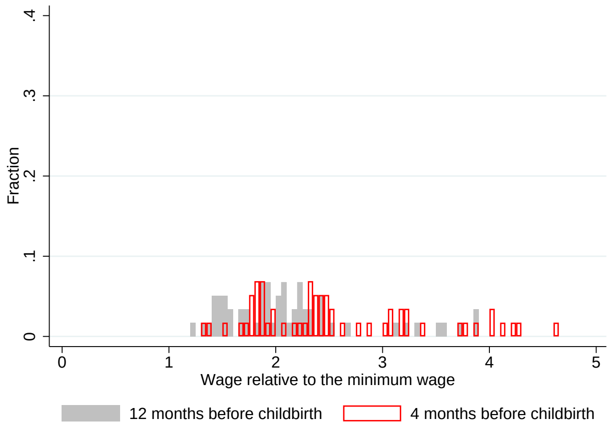
(c) Firm Size 51+, 12 Months Before vs 4 Months Before Childbirth



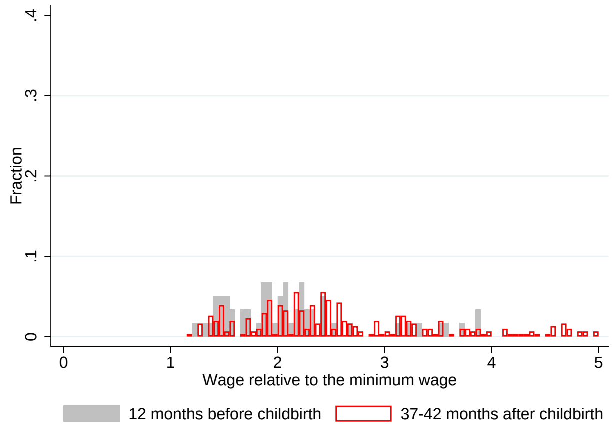
(d) Firm Size 51+, 12 Months Before vs 37-42 Months After Childbirth



(e) Public Sector, 12 Months Before vs 4 Months Before Childbirth



(f) Public Sector, 12 Months Before vs 37-42 Months After Childbirth



Note: Figure shows the distribution of reported earnings relative to the monthly minimum wage twelve and four months before and 37 to 42 months after giving birth. Panels (a) and (b) show the distribution for smaller firms with 1 to 50 employees. Panels (c) and (d) show the distribution for larger firms with more than 50 employees. Panels (e) and (f) show the distribution for the public sector. Panels (a), (c), and (e) show the distribution 12 months (in gray) and 4 months (in red) before childbirth. Panels (b), (d), and (f) show the distribution 12 months before (in gray) and 37 to 42 months after (in red) childbirth. All panels show the distribution for women who receive a large wage increase. This indicator captures large and rare earnings increases: it equals one if an earnings change is in the top percentile of the year-specific distribution of monthly earnings changes, excluding transitory earnings increases where a large earnings increase took place in the previous month or there is a earnings decrease in the subsequent month. (Number of individuals in panels (a) and (b): 118. Number of individuals in panels (c) and (d): 73. Number of individuals in panels (e) and (f): 59.)

Appendix Table A1: Distribution of Reported Earnings Before and After Childbirth

	Event Time		
	-12	-4	$37-42$
Firm size 1-50			
Minimum wage	14.2%	0.8%	6.4%
Skilled minimum wage	31.7%	1.7%	32.8%
Twice current minimum wage	3.3%	26.7%	4.8%
Twice minimum wage of event time -4	1.7%	(26.7%)	12.6%
Firm size 51+			
Minimum wage	1.3%	0.0%	1.1%
Skilled minimum wage	6.3%	0.0%	4.9%
Twice current minimum wage	6.3%	11.3%	6.3%
Twice minimum wage of event time -4	3.8%	(11.3%)	5.5%
Public sector workers			
Minimum wage	0.0%	0.0%	0.0%
Skilled minimum wage	0.0%	0.0%	1.9%
Twice current minimum wage	18.5%	6.2%	11.6%
Twice minimum wage of event time -4	12.3%	(6.2%)	1.3%

Note: Table shows probabilities of reported wages at 95% to 105% of the minimum wage, skilled minimum wage, twice the minimum wage, and twice the minimum wage of event time -4. The sample is women employed in the private sector (top two panels) or the public sector (bottom panel) who gave birth between age 20 and 40 and were employed between twelve and four months before giving birth and at least in one month 37-42 months after childbirth, and received a top-percentile wage increase between four to nine months before giving birth. Firm size categories refer to 12 months before childbirth. (Number of individuals: top panel: 120; middle panel: 80; bottom panel: 65.)