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Tax Evasion and the Contribution-Benefit Link

The Case of Parental Benefits in Hungary and Latvia

Anikó Bíró
Péter Elek
Vitalijs Jascisens
Dániel Prinz
László Sándor
Anna Zasova

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Abstract

This paper studies the interaction of the contribution-benefit link with tax evasion in the context of parental benefits in Hungary and Latvia. Across the two countries, institutional settings, and time periods, earnings and employment patterns suggest substantial pre-pregnancy underreporting, followed by partial formalization during pregnancy to increase benefits. Using policy reforms, the paper shows that the reporting response tracks changing incentives. The results indicate that even with third-party reporting, income underreporting can be common. Linking benefits to contributions when earnings are underreported may reduce evasion temporarily but can impose net fiscal costs depending on program design.

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Anikó Bíró
Péter Elek
Vitalijs Jascisens
Dániel Prinz
László Sándor
Anna Zasova

Authorized for distribution by Jasmin Chakeri, Practice Manager, Prosperity Vertical, World Bank Group

*Bíró: ELTE Centre for Economic and Regional Studies (biro.aniko@krtk.elte.hu). Elek: ELTE Centre for Economic and Regional Studies and Corvinus University of Budapest (elek.peter@krtk.elte.hu). Jascisens: Amazon (jascisen@gmail.com). Prinz: World Bank (dprinz@worldbank.org). Sándor: Consumer Financial Protection Bureau (laszlo.sandor@cfpb.gov). Zasova: UNU-WIDER (anna.zasova@wider.unu.edu). Bíró was supported by the National Research, Development and Innovation Office of Hungary (grant number: OTKA K 146309). Jascisens and Zasova were supported by the Latvian Council of Science (grant number: LZP-2018/2-0067). We thank Pierre Bachas, Matteo Bobba, Anne Brockmeyer, Shoumeli Das, Pascaline Dupas, Sandra Gain, Nicolas Gavoille, Sergei Guriev, Dániel Horn, Yunan Ji, János Köllő, Colin Kuehnhanss, Attila Lindner, Oyebola Okunogbe, Elena Paltseva, Rita Pető, Balázs Reizer, Jesper Roine, Mahvish Shaukat, Konstantin Sonin, Giancarlo Spagnolo, Stéphane Straub, András Svraka, Annalisa Tassi, Gabriel Ulyssea, Roula Yazigi, Roman Zhukovskyi, and seminar participants at the Baltic International Centre for Economic Policy Studies, the Centre for Economic and Regional Studies, the CERS Summer Workshop, the FREE Network Retreat, the Helsinki Graduate School of Economics, the Hungarian Society of Economics Annual Conference, the Hungarian Labor Market Conference, the Ifo-FAU Workshop on Tax Evasion in the Digital Age, the IZA/HSE Workshop, the Shadow2023 Tallinn conference, the SSE Riga/BICEPS Conference on Corruption, Tax Evasion and Institutions, the Toulouse School of Economics, the University of Liverpool, and the World Bank for helpful comments. We also acknowledge the use of Refine.ink to enhance the expositional clarity and structural composition of this article. The Hungarian administrative database used in this paper is owned by the National Health Insurance Fund Administration, the Central Administration of National Pension Insurance, the National Tax and Customs Administration, the National Employment Service, and the Educational Authority of Hungary. The data was processed by the Databank of the ELTE Centre for Economic and Regional Studies. The Latvian administrative database used in this paper was provided by the Latvian Social Security Agency. We thank Sabīna Rauhmane for answering endless inquiries about the data. This article is the result of Vitalijs Jascisens's independent research and does not necessarily represent the views of Amazon. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not represent the views of the World Bank and its affiliated organizations or those of the Executive Directors of the World Bank or the governments they represent. This article is the result of László Sándor's independent research and does not necessarily represent the views of the Consumer Financial Protection Bureau or the United States. Declarations of interest: none.

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; Dean, Fleitas and Zerpa, 2024; French et al., 2026) and the incentive to report lower earnings to decrease the amount of taxes owed (Mortenson and Whitten, 2020; Bjørneby, Alstadsæter and Telle, 2021; Bíró, Prinz and Sándor, 2022; Gavoille and Zasova, 2023*a*,*b*). 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 parental benefits in Hungary and Latvia. Both countries are characterized by high labor tax wedges arising from flat income taxation combined with substantial social security contributions, generous parental benefits, and pervasive under-reporting of earnings through envelope wages (the practice of supplementing a formally declared base salary with undeclared, under-the-table cash payments to evade taxes). In both countries, the level of parental benefits depends on earnings reported during a narrow reference window. This link between social security contributions associated with reported wages during the reference window and parental benefits creates a strong incentive to report higher earnings.

While we study the relationship between tax evasion and the contribution-benefit link in two institutional settings that have important commonalities, the two countries also differ in specific policy design features such as benefit caps and qualification windows, as discussed below. Examining both contexts allows us to test whether the same incentive mechanism operates under somewhat different policy designs and to examine the impact of the particular design choices. Throughout the paper, we present results from Hungary first and then results from Latvia, highlighting similarities and differences. Some questions, such as the role of cross-firm mobility and post-birth earnings dynamics, can only be addressed in one country due to data availability, and we note these differences explicitly where relevant.

Using comprehensive administrative data, we show that in both countries, reported earnings increase during pregnancy compared to the pre-pregnancy period and to women who do not give birth, in line with the incentives created by the contribution-benefit link. This increase is concentrated in the firms where we expect tax evasion to be the most common and employer-employee collusion the easiest to sustain: small, lower-paying, less-productive, and domestic firms (Kleven, Kreiner and Saez, 2016). In contrast, we do not observe similar increases in reported earnings in larger, higher-paying, more-productive, and foreign firms, or in the public sector.

In addition to the baseline incentives, in both countries, a reform during our study period significantly strengthened reporting incentives. In Hungary, until 2014, benefits were calculated based on average earnings over the most recent calendar year before the start of the benefit receipt; since 2015, this reference period is the six months ending three months before childbirth. This policy change effectively shortened the period over which higher earnings had to be reported to obtain higher benefits and therefore lowered the cost of reporting higher earnings in terms of

the extra contributions that had to be paid. In addition, after the reform, the reference period fully overlapped with a term pregnancy. In Latvia, a new wage-dependent parental benefit was introduced in 2005. Until then, only a short-term maternity benefit depended on reported earnings, with a reference period of six months, including the first five months of a typical pregnancy. The new parental benefit was paid for ten months and used a reference period of twelve months, likewise including the first five months of term pregnancies. This policy change significantly increased the returns to reporting higher earnings. In both countries, reporting responses in smaller, lower-paying firms became much stronger after the reforms, while the reforms had little impact on reported earnings in larger, higher-paying firms. This further suggests that the reported earnings response during pregnancy is driven by pre-pregnancy tax evasion followed by partial formalization of earnings during pregnancy to qualify for higher benefits and that earnings reporting is sensitive to the incentives inherent in benefit design.

Analyzing a sample of women in Latvia who give birth twice and change employers between their pregnancies, we find that the documented pattern of earnings increases during pregnancy appears to be employer driven. Among women who do not switch employers between their first and second pregnancies, results are very similar to our baseline for both their first and second pregnancies with reported earnings among women working in smaller firms increasing during pregnancy compared to the pre-pregnancy period and to women who do not give birth, while there is no such effect for women in larger firms and the public sector. Among women who switch to smaller firms between their pregnancies, reported earnings exhibit the same pattern, regardless of where they worked during their first pregnancies. On the other hand, no such increase in reported wages is observed during the second pregnancies of women who switch to larger firms or the public sector between their pregnancies, regardless of their original employer. These results suggest that while employers and employees need to cooperate to increase reported earnings in order to obtain higher benefits, the ability and willingness to change reported earnings is firm dependent, rather than worker driven.

On top of the intensive margin response of higher reported wages, we document extensive margin formalization responses in both countries. In both Hungary and Latvia, employment in larger firms and in the public sector declines slightly during pregnancy, which could be explained by discrimination, health concerns, lower labor supply, or reduced job search effort. In smaller firms, reported employment does not decline in the same way. Instead, depending on the time period and country, it either stays constant or increases. The reported employment patterns suggest that these firms formalize some of their previously informal employees during pregnancy to give them access to parental benefits.

Given data constraints, it is difficult to assess post-birth earnings dynamics among women after birth. In both Hungary and Latvia, most women do not return to work for at least three years after giving birth and in over half the cases they do not return to the same firm. Moreover, our post-reform panel, taking into account the three-year leave period, is limited, especially in Hungary. As suggestive evidence, we examine men in Latvia who were also eligible for parental benefits but typically do not take long leaves or change employers after childbirth. We find that

the reported earnings of men who go on to receive parental benefits also increase during the pre-birth period. However, this wage growth persists only until the end of the period taken into account to calculate the amount of parental benefit, implying that there is no permanent improvement in tax compliance.

Several patterns support our interpretation that the results reflect adjustments in reported earnings rather than real labor supply responses. Overall, although the contribution–benefit link creates incentives for all workers and firms (with the exception of Hungarian workers above the benefit cap), we observe adjustments only among a specific subset of firms and workers.

In Hungary, the reporting response is concentrated among lower earners, particularly those reporting the minimum wage, and among firms employing a high share of such workers, consistent with prior evidence documenting under-reporting at the minimum wage in Hungary (Bíró, Prinz and Sándor, 2022). The response is limited to smaller, lower-quality, domestically owned firms, where employer–employee coordination is easier and tax evasion is more prevalent. Following the 2015 reform, the magnitude of the response increases, but only among firms and workers that were already responsive beforehand. Reported earnings bunch at the minimum wage before pregnancy and move to the benefit-maximizing threshold during pregnancy, consistent with strategic reporting given a benefit cap. Moreover, reported hours change little, indicating that adjustments occur primarily through reported hourly wages rather than increased labor supply. In many cases, reported earnings double from the minimum wage to the benefit-maximizing threshold, an adjustment difficult to reconcile with real labor supply changes during pregnancy. Employment patterns also align with reporting behavior: although women have equal incentives to work in small and large firms to qualify for benefits, employment increases slightly or stays stable in smaller firms while declining in larger ones and the public sector during pregnancy, consistent with the formalization of previously informal employment relationships.

In Latvia, the response is likewise concentrated among small, lower-quality firms and workers who report earning the minimum wage, consistent with prior evidence on under-reporting at the minimum wage in Latvia (Gavoille and Zasova, 2023*a*,*b*). The response also becomes stronger after the reform that increased reporting incentives. Analysis of women who switch firms between two pregnancies suggests that the adjustment is firm driven rather than reflective of individual labor supply changes. Employment patterns during pregnancy also appear more consistent with the formalization of previously informal employment relationships than with real labor supply responses as we observe, especially in the post-reform period, a significant increase in employment in smaller firms during pregnancy, even as employment in larger firms declines. Finally, analysis of Latvian men who take parental benefits shows that reported earnings rise before childbirth but revert once the qualification period ends, indicating that the adjustment is temporary.

Taken together, the evidence from both countries points to formalization of previously under-reported earnings in response to benefit incentives rather than genuine changes in labor supply.

Our results highlight that tax evasion is responsive to the incentives created by the

contribution-benefit link: more employment and earnings are formalized in order to receive higher benefits. This formalization is costly for firms and workers because higher taxes and social security contributions must be paid on formal employment and on higher reported wages. Assuming that employers cannot immediately shift the full cost of employer social security contributions onto the affected expectant mothers, part of the upfront cost of this formalization is borne by them. Why might employers still engage in this behavior? Though by its nature it cannot be observed directly, the likely explanation is longer-term employer-employee collusion involving wage and employment under-reporting, with the understanding that employers would help their employees qualify for higher parental benefits, which involve a significant transfer from the government to the employees, while employers recapture their cost through longer-term under-reporting.

Our findings that reported earnings and employment increase in response to incentives embedded in the design of parental benefits in both Hungary and Latvia and that this responsiveness tracks changing incentives suggest that governments could use the social security benefit system to lower tax evasion by linking benefits to contributions. However, it is important to note that, given how the contribution-benefit link was designed in both countries, this responsiveness imposed a net fiscal cost on the government. This net fiscal cost arose because employers and employees were able to raise reported earnings by partially formalizing previous envelope wages in a way that allowed them to capture a transfer from the government in the form of benefits that were higher than extra taxes and contributions. Thus our results underscore the idea that policy makers need to consider earnings under-reporting and tax evasion when designing contribution-dependent benefits.

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, Verhoogen and Frías, 2020; Becerra, 2024; Dean, Fleitas and Zerpa, 2024; Bozio et al., 2026; French et al., 2026), health insurance (Bergolo and Cruces, 2014), and unemployment insurance (Le Barbanchon, 2025). An important feature of parental 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 in earnings responses to incentives embedded in the design of social security programs.

Second, we contribute to the recent literature on tax evasion (Artavanis, Morse and Tsoutsoura, 2016; Kumler, Verhoogen and Frías, 2020; Mortenson and Whitten, 2020; Al-Karablieh, Koumanakos and Stantcheva, 2021; Bjørneby, Alstadsæter and Telle, 2021; Bíró, Prinz and Sándor, 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 decrease under-reporting and encourage formalization.

Third, we contribute to the literature on informal employment and taxation.[1] Recent work (de Mel, McKenzie and Woodruff, 2013; Bergolo and Cruces, 2014; De Andrade, Bruhn and

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

McKenzie, 2014; Kuehn, 2014; Meghir, Narita and Robin, 2015; Rocha, Ulyssea and Rachter, 2018; Ulyssea, 2018; Kumler, Verhoogen and Frías, 2020; Gerard and Gonzaga, 2021) has focused on various policy interventions to improve formalization. While low- and middle-income countries are characterized by large informal sectors, the high-income economies of Central and Eastern Europe also have sizable shadow economies; some estimates put the size of the informal economy at 20% of GDP in the region, including at 26% in both Hungary and Latvia (Hassan and Schneider, 2016). In this region, including specifically in Hungary (Elek et al., 2012; Bíró, Prinz and Sándor, 2022) and Latvia (Putniņš and Sauka, 2015; Gavoille and Zasova, 2021, 2023*a*,*b*; Beņkovskis and Fadejeva, 2025), shadow economies are characterized by partially formalized employment and envelope wages (Williams, 2013; Williams and Padmore, 2013), rather than full informality. In the period studied in this paper, an estimated 15% of employees in Hungary received higher wages than their declared salary and 17% of employment was undeclared (European Labour Authority, 2017*a*; Benedek, Elek and Köllő, 2013), while in Latvia envelope wages were estimated at 8% of GDP and the value of unreported employment at 4% of GDP (European Labour Authority, 2017*b*; Putniņš and Sauka, 2017). We find that contribution-dependent benefits can help formalize the employment and earnings of some workers in this context.

Fourth, our work is related to the literature on parental leave and benefit policies and child penalties.[2] Recent work on parental leave policies (e.g., Rossin-Slater, Ruhm and Waldfogel, 2013; Carneiro, Løken and Salvanes, 2015; Stearns, 2015; Baum and Ruhm, 2016; Stearns, 2018; Bana, Bedard and Rossin-Slater, 2020; Ginja, Karimi and Xiao, 2023; Bartel et al., 2025) 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, Johansson and Lindahl, 2016; Lundborg, Plug and Rasmussen, 2017; Kleven, Landais and Søgaard, 2019; Andresen and Nix, 2022; **?**; Kleven et al., 2024; Kleven, Landais and Leite-Mariante, 2025) also documents large and ubiquitous decreases in women's post-birth earnings in most countries. Hungary's and Latvia's parental leave policies are among the most generous in the world (OECD, 2024) and at 40% and 35%, respectively, their child penalties are among the highest (Kleven, Landais and Leite-Mariante, 2025). 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.

The remainder of this paper proceeds as follows. In Section 2, we describe the tax and benefit systems of Hungary and Latvia, as well as the contribution-benefit link we study. We also provide an overview of the administrative databases used in each country and explain our sample definitions. In Section 3 we present our results on earnings and employment formalization. Finally, Section 4 concludes.

[2]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).

2 Background and Data

2.1 Tax and Benefit Systems

2.1.1 Hungary

During our study period, Hungary had the fourth highest tax wedge among OECD members, reaching 49%, compared to the OECD average of 35% (OECD, 2023).[3] The tax system combines a flat personal income tax with high social security contributions. There is no general personal allowance, though dependent allowances exist. The personal income tax rate was 16% between 2011 and 2015 and 15% thereafter. Employee social security contributions have been 18.5% since 2012, while employer contributions were 27% between 2010 and 2016 and 22% thereafter.

Hungary provides both paid maternity leave and paid parental and home care leave. Paid maternity leave lasts 24 weeks (beginning up to four weeks before childbirth) and replaces 70% of pre-birth average earnings without a cap. After maternity leave, parental and home care leave is payable for up to two years after childbirth and replaces 70% of pre-birth earnings, subject to a cap equal to 140% of the minimum wage. Both types of benefits are subject to personal income tax, while paid maternity leave is exempt from social security contributions and paid parental and home care leave is subject to a decreased 10% rate. Both the replacement rate and the duration of benefits are substantially more generous than OECD averages for maternity and parental leave. In 2023, the OECD average earnings replacement rate was 77% for paid maternity leave for an average of 18.6 weeks, while the average replacement rate for paid parental and home care leave was 40% for an average 33.3 weeks (OECD, 2024).

Until December 2014, benefits were based on average earnings in the calendar year preceding benefit receipt. The reference period used to calculate benefits changed in January 2015, becoming the 180 days ending three months before childbirth. This change shortened the qualification window and aligned it more closely with pregnancy, substantially increasing the return to reporting higher earnings during pregnancy. The reform was enacted by Parliament in December 2014 and took effect in January 2015, limiting anticipation effects. Because for births between January and September 2015 part of the pregnancy overlapped with the pre-reform regime, we focus on births from October 2015 onward in the post-reform analysis. In both the pre- and post-reform periods, eligibility requires 365 days of social security coverage within the two years before childbirth. Panel (a) of Figure 1 shows the qualification and benefit payment periods in Hungary before and after the reform.

2.1.2 Latvia

The tax wedge in Latvia was 43.1% during the study period (OECD, 2023), the 12th highest in the OECD. The system combines a flat personal income tax of 25% with substantial social security contributions. Employee contributions were 9% throughout the study period, while

[3]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).

employer contributions were 24.1% after 2003, having gradually declined from 28.1% in 1999. The monthly personal allowance was minimal at 30 euros until 2004, gradually rising to 114 euros by 2008 (10 to 17% of the average gross wage during our sample period). Dependent allowances also exist.

Paid maternity benefits cover 10 weeks before and 8 weeks after childbirth and replace 100% of pre-birth average earnings. During our study period, maternity benefits were calculated using a six-month reference period ending two months before benefit entitlement. Depending on the timing of birth within the month, four to five months of this reference period overlap with pregnancy; for simplicity, we treat five months as overlapping.

In January 2005, Latvia introduced a new earnings-dependent parental benefit, paid from the end of maternity leave until the child turned one year old (approximately ten months). This benefit replaced 70% of pre-birth gross earnings and was calculated using a 12-month reference period ending three months before childbirth (excluding the birth month), again covering roughly the first five months of pregnancy. The benefit was capped at 558 euros in 2005–2007, but the cap was largely non-binding, requiring monthly earnings of roughly 800 euros, approximately 2.3 times the average wage in 2005. The reform was announced in August 2004, enacted in November 2004, and implemented in January 2005. For births between January and April 2005, the policy change was announced after pregnancy had already begun; we therefore focus on births from May 2005 onward in the post-reform period. Panel (b) of Figure 1 shows the qualification and benefit payment periods in Latvia before and after the reform.

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 in Hungary (top panel) and in Latvia (bottom panel). The first three columns consider the pre-reform period and the fourth to sixth columns consider the post-reform period when reporting incentives were strengthened.

For each period, three different scenarios are considered: baseline, wage formalization with constant net wage, and wage formalization with constant total cost. Under the baseline scenario, we assume that there is no tax evasion before pregnancy and that reported earnings reflect true earnings. Under this assumption, an increase in the gross wage during the reference periods corresponds to an equivalent adjustment in the accurately reported net wage. Thus in this case the employer must pay more in wages, taxes, and social security contributions and the employee actually earns more. Under the wage formalization scenario with constant net wages we assume that there was tax evasion before pregnancy and thus the reported gross wage can be adjusted in a way that the net wage stays the same. This means that while the employer must pay more in taxes and social security contributions, there is no extra wage cost and the wage received by the employee does not change. Under the wage formalization scenario with constant total cost the net wage is decreased by the amount of extra taxes and social security contributions that the employer has to pay. Thus in this case the employer bears no extra cost and the employee receives lower net wages in exchange for the higher benefits she would later

receive. The underlying assumption for the second and third scenarios with wage formalization is that some wages were previously paid as unreported (envelope) wage, a common phenomenon in Hungary (Elek et al., 2012; Bíró, Prinz and Sándor, 2022), Latvia (Putniņš and Sauka, 2015; Gavoille and Zasova, 2023*a*,*b*; Beņkovskis and Fadejeva, 2025), and the broader region (Williams, 2013; Williams and Padmore, 2013).

The three cases displayed in Table 1 are edge cases: they assume either no tax evasion (baseline scenario), that the marginal dollar of extra gross earnings comes from an adjustment to envelope wages (wage formalization with constant net wage scenario), or that all (including employer-related) costs associated with extra gross earnings come from an adjustment to envelope wages (wage formalization with constant total cost scenario). Intermediate cases are also possible, with some adjustment to both net earnings and the envelope versus official share in compensation. Importantly, since envelope wages are not observed in our data, we cannot empirically distinguish these cases. However, they are useful benchmarks to understand the magnitude of the reporting incentives at stake and the implications for employers, employees, and the government.

2.2.1 Hungary

Panel (a) of Table 1 shows the contribution-benefit link in the case of Hungary. Monthly wage items are displayed in row A of the table. In the baseline scenario, a \$1 increase in gross earnings costs the employer \$1.27, while the employee receives \$0.66 in net earnings. Total tax and contribution payments (employer plus employee) equal \$0.62. Under wage formalization with constant net wage, a \$1 increase in reported gross earnings costs only \$0.62 to the employer, since the net wage does not change and the adjustment consists of moving \$1 of envelope wage into official earnings; the additional \$0.62 reflects personal income tax (PIT) and social security contributions (SSC). Under wage formalization with constant total cost, the employer reduces the net wage by \$0.62 to offset the additional tax payments, bearing no additional cost.

Row B shows monthly benefit items. In the pre-reform period, an additional \$1 of reported gross wage during the first six months of pregnancy generated \$0.28 in additional gross monthly benefits (\$0.21 net).[4] From January 2015 onward, this increased to \$0.70 gross (\$0.54 net). The increase reflects both the shortening of the reference period from twelve months to six months and the closer alignment of the qualification window with pregnancy.

In row C, we aggregate wage increases. Aggregating over the six months of pregnancy that overlap with the qualification period, a \$1 monthly increase implies a total gross wage increase of \$6. In the baseline scenario, total employer cost equals \$7.62 (\$1.27 $\times$ 6), the employee receives \$3.93 in net earnings (\$0.66 $\times$ 6), and total tax payments equal \$3.69. Under wage formalization with constant net wage, the employer pays only \$3.69 in additional taxes. Under constant total cost, the employer pays nothing and net wages fall by \$3.69.

Similarly, row D considers aggregated benefit receipt. Aggregating over the 24 months of

[4] In the pre-reform period we use a calculation averaged over calendar months of birth, see Appendix Table A1 for details.

benefit receipt, the pre-reform gross benefit increase equals \$6.58 (\$0.28 × 24; \$5.03 net, derived from unrounded underlying figures). After January 2015, the corresponding increase equals \$16.80 (\$0.70 × 24; \$12.85 net).

Finally, row E displays aggregated gains and losses. In the baseline scenario, total employer cost equals \$7.62, while the employee gains \$8.96 pre-reform (\$3.93 in net earnings and \$5.03 in net benefits) and \$16.78 post-reform (\$3.93 and \$12.85). Under constant net wage formalization, the employer pays \$3.69 and the employee gains only the additional net benefits. Under constant total cost, the employee's net earnings fall by \$3.69, leaving gains of \$1.34 pre-reform and \$9.16 post-reform. The difference between employer cost and employee gain represents a transfer from the government.

2.2.2 Latvia

For Latvia, we compute the costs and benefits to employers, employees, and the government in the same five steps in panel (b) of Table 1.

Row A shows that in the baseline scenario, a \$1 increase in gross wages costs the employer \$1.24 and yields \$0.68 in net earnings to the employee. Total tax and contribution payments equal \$0.56. Under wage formalization with constant net wage, the employer pays only \$0.56 in additional personal income tax (PIT) and social security contributions (SSC), with no change in net wage. Under constant total cost, the employer bears no additional cost and the employee's net wage falls by \$0.56.

Benefits in Latvia are not subject to taxes or contributions. Row B shows that in the pre-reform period, an additional \$1 of reported gross wage during the first five months of pregnancy generated \$0.24 in additional monthly benefits. After January 2005, this increased to \$0.45. The increase reflects the introduction of the earnings-dependent parental benefit in addition to maternity benefits. For comparability across regimes, we compute the average monthly increase over 14.1 months, corresponding to 4.1 months of maternity benefits and 10 months of parental benefits.

Row C shows that aggregating over the five months of pregnancy overlapping with the qualification window, a \$1 monthly increase implies a gross wage increase of \$5. In the baseline scenario, total employer cost equals \$6.20 (\$1.24 × 5), the employee receives \$3.41 in net earnings (\$0.68 × 5, derived from unrounded underlying figures), and total tax payments equal \$2.79. Under constant net wage formalization, the employer pays \$2.79. Under constant total cost, the employer pays nothing and net wages fall by \$2.79.

Aggregating over 14.1 months of benefit receipt (row D), the pre-reform gross benefit increase equals \$3.44 (\$0.24 × 14.1). After the reform, the increase equals \$6.36 (\$0.45 × 14.1).

Finally, row E shows that in the baseline scenario, total employer cost equals \$6.20, while the employee gains \$6.86 pre-reform (\$3.41 in net earnings and \$3.44 in net benefits) and \$9.77 post-reform (\$3.41 and \$6.36). Under constant net wage formalization, the employer pays \$2.79 and the employee gains only the additional benefits. Under constant total cost, net wages fall by \$2.79, leaving gains of \$0.65 pre-reform and \$3.57 post-reform. The difference between

employer cost and employee gain reflects a transfer from the government.

2.2.3 Discussion

The gains of the employee from a (reported) earnings increase during the reference window always exceeded the costs to the employer, but these gains became larger after the reforms were introduced in each country. 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 three scenarios (government costs depend on tax and benefit rules, but not directly on wages).

An important question that arises is why employers would be interested in adjusting wages in a way that is costly to them but only directly benefits employees. The reason is likely to be that employers and employees collude to underreport wages over the longer term, followed by an adjustment during pregnancy to qualify for higher benefits. While by definition we cannot directly observe envelope wages, they are common in both countries (Elek et al., 2012; Putniņš and Sauka, 2015; Bíró, Prinz and Sándor, 2022; Gavoille and Zasova, 2023*a*,*b*; Beņkovskis and Fadejeva, 2025). The evidence that we present in this paper is also consistent with pre-pregnancy under-reporting in the form of envelope wages, followed by a reporting response during pregnancy. If longer-term collusion on under-reporting is indeed taking place, employers recover their costs quickly. For example, considering the wage formalization scenario that keeps net wages constant, and assuming that wages are increased in all months that count toward the benefit, it would take an employer six months to recover their costs in Hungary and five in Latvia. A majority of women – 78 percent in Hungary and 69 percent in Latvia – have at least this much tenure before learning that they are pregnant.

2.3 Data and Sample

2.3.1 Hungary

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. The data come from a research database created by merging the databases of the social security administration with those of the agencies in charge of health insurance, taxation, unemployment insurance, and education.[5] 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. We focus on births in the 2013 to 2017

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

period because in our data earnings before 2012 were smoothed within employment spells by employer-employee-year, and hence monthly wage dynamics during pregnancy could not be cleanly analyzed for births before 2013. Births between January and September 2015 are excluded as part of these pregnancies took place before the policy change. Restricting the post-reform sample to births from October 2015 ensures that parents were aware of the stronger incentives from the beginning of their pregnancies (i.e., from January 2015 or later). We limit the data to individual-month observations with at most 5 sick days and no parental benefit payments. We adjust monthly earnings for sick days and to their full-time equivalent, using contractual work hours.

Births are identified using health care data. Since 96% of parental leave 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 study only mothers, though the same eligibility conditions apply for parental leave to fathers if they are the primary caregiver. 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.[6] 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 2013 and 2017. The timing of the placebo birth is drawn from the cohort-specific distribution of childbirths among women who gave birth during the sample period.

Our baseline sample consists of women who had a non-missing full-time equivalent wage of at least 90% of the monthly minimum wage each month between 24 to 4 months before giving birth or the placebo birth. Panel (a) of 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.

2.3.2 Latvia

We use administrative data from Latvia on employment, earnings, and benefit receipt for the working population between 1997 and 2019. The data come from the databases of the social security administration. Monthly employment status and sector (private or public) are observed, along with earnings used for benefit calculation and actual benefit receipt.

The analysis focuses on births occurring between January 1999 and December 2008. Earlier births are excluded due to different maternity benefit rules, and later births are excluded to avoid the impact of the global financial crisis, which had a substantial effect on both wages and employment in Latvia. Births between January and April 2005 are also excluded, as these cohorts were in early pregnancy when the 2005 reform was announced in August 2004. Accordingly, we restrict the post-reform sample to births from May 2005 onward, ensuring that parents were aware of the new rules from the beginning of pregnancy (i.e., from September

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

2004 or later). Births are identified using administrative records on benefits which give us information on the year and month of birth.

The baseline sample is restricted to the first observed birth for women aged 20 to 40 at the time of childbirth. A control group is constructed from women who did not give birth between 1997 and 2008, assigning them a placebo childbirth date. The timing of the placebo birth is drawn from the cohort-specific distribution of childbirths among women who gave birth during the sample period.

Our baseline sample includes women with non-missing wage records in all months from 24 to 4 months before the (actual or placebo) birth. Panel (b) of Table 2 shows that the treatment and control groups are comparable in terms of wage distribution and employment sector, with similar shares of women working in small and large firms and in the public sector.

3 Reporting Responses to the Contribution-Benefit Link

3.1 Main Results

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 parental benefits.

In each country, we estimate an event study regression following Kleven, Landais and Søgaard (2019) to characterize the time pattern of reported earnings among expectant mothers relative to otherwise similar women who do not give birth:

$$W_{it} = \sum_{j=-24}^{-4} \alpha_j \mathbb{1}[E_{it} = j] + \sum_{j=-24}^{-4} \beta_j \mathbb{1}[E_{it} = j] \cdot B_i + \mathbf{A}_{it}\theta + \gamma_i + \delta_t + u_{it}, \tag{1}$$

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 exclude the last three months before birth because sick leave is prevalent, and it is also possible to claim parental benefits four weeks before giving birth in Hungary and ten weeks before giving birth in Latvia.

3.1.1 Hungary

Panel (a) of Figure 2 displays the event study coefficients β_j from equation (1) for Hungary in the pre-reform (2013-2014) period, separately for smaller (1 to 50 employees) and larger (more than 50 employees) firms, as well as the public sector. The earnings of mothers and non-mothers evolve similarly before pregnancy for all three employer types. Starting around the

time when women become pregnant, the earnings of expectant mothers in smaller firms start to diverge from women in the control group. Four months before giving birth, the earnings of expectant mothers in smaller firms are 2.4% higher than those of women in the control group working in smaller firms, with an average difference of 1.6% over the period between 8 and 4 months before birth. In larger firms, the earnings of expectant mothers declined by 1.3% during pregnancy relative to women in the control group. A similar effect, a decline of 2.8% is observed in the public sector. We interpret these results as suggesting that reported earnings in smaller firms respond to reporting incentives inherent in the design of parental benefits and firms partially formalize some previously informal earnings (envelope wages). The decline in earnings in larger firms and the public sector would be consistent with a combination of health concerns, decreasing willingness to work while pregnant, and discrimination, while under-reporting is unlikely to be a concern in larger firms and the public sector as has also been documented in previous work (e.g., Bíró, Prinz and Sándor, 2022).

Panel (b) of Figure 2 repeats the same results for the post-reform (2015-2017) period, when reporting incentives became significantly stronger as the reference period for earnings became shorter and more aligned with pregnancies. After 2015, the reported wage increase for expectant mothers became substantially larger, reaching 6.5% four months before giving birth, with an average difference of 5.2% over the period between 8 and 4 months before birth. Table 3 shows that the size of the earnings response closely tracks the change in the size of the reporting incentive: the earnings response became 3.3 times (5.2% / 1.6%) stronger as the reporting incentive increased by a factor of 2.6 (12.85 / 5.03, see Table 1, panel (a), row D). Notably, in larger firms and the public sector the decline in earnings is very similar before and after the change in reporting incentives. The responsiveness of the magnitude of the reported earnings adjustment in smaller firms and the lack of such a response in larger firms and the public sector are consistent with reporting incentives driving a reduction in earnings under-reporting in smaller firms with this adjustment margin missing in larger firms and the public sector.

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 for women who give birth and the control group of women who do not give birth, separately for the three employer types (small firms, large firms, public sector) before and after the reform in Hungary. Both before and after the reform, it is the earnings of expectant mothers that start increasing more rapidly than the previous trend in smaller firms and decreasing relative to the previous trend in larger firms at the start of pregnancy, while there is no trend change among mothers who do not give birth.

Panels (a) and (b) of Appendix Figure A2 show 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.

In the Hungarian data, we observe reported working hours. While in our main analysis we adjust monthly earnings to their full-time equivalent using contractual work hours, so our main results are not driven by changes in hours, here we examine changes in reported working

hours during pregnancy. Appendix Figure A3 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 0.4 hour (1.1%) in the 2013-2014 period and by up to 0.8 hour (2.2%) in the 2015-2017 period, with no change for employees in larger firms or in the public sector. This suggests that most of the adjustment in reported earnings is realized through reported hourly wages rather than reported working hours. In some cases, hours may also be partially misreported to mask earnings under-reporting, but if hours are reported truthfully, our results are consistent with an adjustment of reported earnings rather than a real change in labor supply. Analysis of bunching of reported wages at the monthly minimum wage before pregnancy and at the benefit-maximizing threshold of twice the monthly minimum wage during pregnancy (see Section 3.3) shows that a large part of the reporting response consists of pregnant women doubling their reported wages even though they work nearly 39 hours on average (Table 2).

3.1.2 Latvia

Panel (c) of Figure 2 displays the event study coefficients for Latvia in the pre-reform (1999-2004) period, separately for smaller firms, larger firms, and the public sector. The earnings of expectant mothers and the control group evolve similarly in all three groups of firms before pregnancy. They start to diverge at the beginning of pregnancies. Among expectant mothers working in smaller firms, the largest difference, 15.4%, is reached five months before giving birth, with an average difference of 10.2% over the period between 8 and 4 months before birth. The earnings of women working in larger firms and the public sector decline by 2.2% and 2.6%, respectively.

Panel (d) repeats the same results for the post-reform (2005-2008) period when reporting incentives were strengthened with the introduction of a longer-term earnings-dependent parental benefit in addition to the short-term maternity benefit. With these strengthened reporting incentives, the increase in reported wages during pregnancy became larger, reaching 24.4% five months before giving birth and 21% on average over the period between 8 and 4 months before birth. Table 3 shows that the magnitude of the earnings response closely tracks the change in the size of the reporting incentive: the earnings response became 2.1 times (21.0% / 10.2%) stronger as the reporting incentive increased by a factor of 1.8 (6.36 / 3.44, see Table 1, panel (b), row D). Reported earnings patterns in larger firms and the public sector did not react to the change in the reporting incentive.

Panels (c) and (d) of Appendix Figure A1 show the underlying evolution of log monthly earnings for women who give birth and the control group of women who do not give birth before and after the reform in Latvia. They confirm that it is the earnings of expectant mothers that start diverging at the start of pregnancy, while there is no trend change among mothers who do not give birth.

Panels (c) and (d) of Appendix Figure A2 show robustness using the Sun and Abraham (2021) estimator.

3.1.3 Comparison

It is reassuring that the results in two different countries and two different time periods are qualitatively similar. Reported earnings increase significantly during pregnancy in response to incentives inherent in the design of parental benefits. This response exists in smaller private sector firms but not in larger firms or in the public sector. When reporting incentives become stronger, the magnitude of the reporting response closely tracks the strengthened incentives in smaller private sector firms, but not in larger firms or the public sector.

Nevertheless, despite the qualitative similarity of the documented reporting response, it appears to be quantitatively much larger in Latvia. Table 3 makes this comparison. The size of the reporting incentive is quantified by the increase in total net benefit as a ratio of the total increase in gross wage during the first six or five months of pregnancy (depending on the country). In Hungary, this ratio was 0.84 before and 2.14 after the policy change ($5.03 and $12.85, respectively, on a $6 total wage increase, see Table 1, panel (a), row D), while it was 0.69 before and 1.27 after the policy change in Latvia ($3.44 and $6.36, respectively, on a $5 total wage increase, see Table 1, panel (b), row D). This difference in reporting incentives is explained by two distinct factors: (i) as Figure 1 shows, the relative overlap between the benefit qualification period and pregnancy was stronger in Hungary than in Latvia, particularly in the post-reform years, and (ii) the benefit receipt period was also longer in Hungary (24 months) than in Latvia (14.1 months). This is only partially offset by the fact that in Hungary benefits are also taxed. Meanwhile, over the period between 8 and 4 months before birth, the average increase in reported earnings was 1.6% before and 5.2% after the policy change in Hungary, while it was 10.2% before and 21.0% after the policy change in Latvia.

There are two key reasons why reported earnings responses may be stronger in Latvia than in Hungary. First, envelope wages were two or three times more important during this period in Latvia than in Hungary according to survey evidence (Williams and Padmore, 2013). Second, as we show in Section 3.3, the benefit cap is important in explaining reporting behavior in Hungary but not in Latvia.

We can estimate the costs of the policy for the government using row E in both panels (a) and (b) of Table 1 and row B in both panels (a) and (b) of Table 3. After the policy changes that strengthened the reporting incentives, the reporting response cost 3.4% of wage-related parental benefits in Hungary and 6.7% in Latvia (Appendix Table A2). Before the policy change, this number was much smaller (0.2% in Hungary and 1.6% in Latvia). This loss to the government corresponds to the combined gain of employers and employees.

3.2 Heterogeneity

We examine heterogeneity in the reporting response along several dimensions of workers and firms. Specifically, we study heterogeneity by wage level relative to the monthly minimum wage, firm size, firm quality, and the prevalence of minimum wage earners within firms. These dimensions are informative about the environments where earnings under-reporting is most likely

to occur. If pregnancy leads employers and employees to formalize previously under-reported earnings in order to increase parental benefits, we should observe stronger reporting responses among workers with relatively low reported wages and among workers employed in smaller and lower-quality firms, where under-reporting is more prevalent. Figure 3 presents heterogeneity results for dimensions that can be examined in both Hungary and Latvia, while Appendix Figure A4 reports additional results available only for Hungary.

Each estimate shown in the figure reports the coefficient β and 95% confidence interval from a modified version of equation (1). In this specification we replace the event-time indicators with a binary variable that equals one 8 to 4 months before birth and zero 24 to 9 months before birth. The coefficient therefore captures the differential change between expectant mothers and women who do not give birth in reported earnings between the pre-pregnancy period and the first five months of (placebo) pregnancy.

3.2.1 Hungary

Panel (a) of Figure 3 reports heterogeneity results for Hungary. We show results separately for the period before reporting incentives were strengthened (childbirths between January 2013 and December 2014) and for the period after reporting incentives were strengthened (childbirths between October 2015 and December 2017).

We begin by examining heterogeneity by wage level relative to the monthly minimum wage. Among women who reported earning at least 200% of the monthly minimum wage before pregnancy, wages during pregnancy decrease slightly by about 2%. This is consistent with our main results: women with higher earnings are more likely to be working in larger and higher-quality firms that are less prone to under-reporting. Their earnings may decrease during pregnancy due to a variety of factors, including discrimination, health concerns, or reduced hours. Among this group of higher earners, the change in reporting behavior is unresponsive to the policy change which strengthened reporting incentives, supporting the interpretation that they are unlikely to be under-reporting their earnings. Among women with earnings between 150% and 199% of the minimum wage, the earnings change is approximately zero and is not responsive to the change in the reporting incentive. As the benefit-maximizing threshold for the parental and home care leave benefit was at 200% of the monthly minimum wage, the incentive for women with already higher earnings was weak. In contrast, the earnings change between the pre-pregnancy period and pregnancy is significantly larger, about 2%, among women reporting earnings between 100% and 149% of the monthly minimum wage. The earnings change becomes substantially larger when reporting incentives are strengthened, increasing to about 5%. Finally, we observe a still larger earnings change among part-time workers reporting earnings below the monthly minimum wage, about 4% before the reform and 11% after the reform. This group of employees can also gain significantly from increasing reported earnings.

The size of the reporting response during pregnancy is inversely related to firm size. The largest response is observed among the smallest firms with 1 to 5 employees (3% pre-reform and 8% post-reform). As firm size increases, the magnitude of the reporting response decreases,

though it remains positive and significant in firms with at most 20 employees pre-reform and firms with at most 50 employees post-reform. In firms with more than 50 employees, reported earnings decrease slightly during pregnancy and show little difference between the pre- and post-reform periods.

A similar pattern is documented across quintiles of firm quality proxied by the firm-specific wage premium. We perform an Abowd-Kramarz-Margolis (AKM) style decomposition of logarithmic wages (Abowd, Kramarz and Margolis, 1999) and compute firm-level wage premia by exploiting moves between firms. The adjustment of reported earnings during pregnancy is negative in the top three quintiles and does not change strongly with the policy reform. In the bottom quintile, there is a positive change in reported earnings during pregnancy: reported earnings increase by 3% pre-reform and 7% post-reform.

Appendix Figure A4 shows additional results for two further dimensions of firm quality captured in Hungary: total factor productivity (TFP) and domestic versus foreign ownership. As in the case of firm-specific wage premia, earnings adjustments are negative during pregnancy in the top two quintiles of TFP and zero in the middle quintile, with no change when reporting incentives become stronger. In the bottom two quintiles earnings adjustments are positive during pregnancy and become larger when reporting incentives are strengthened. We also find that foreign-owned firms are not responsive to reporting incentives, while domestically owned firms exhibit a positive earnings adjustment during pregnancy and respond to stronger incentives after 2015.

Finally, building on our earlier work (Bíró, Prinz and Sándor, 2022), we examine heterogeneity by the share of minimum wage earners in a firm. There is little adjustment to reported earnings either before or after the reform in firms with at most 40% of employees earning the monthly minimum wage. In firms with more than 40% of employees initially reporting earnings at the level of the minimum wage the adjustment is significant and responsive to the strengthened reporting incentives.

3.2.2 Latvia

Panel (b) of Figure 3 reports heterogeneity results for Latvia. We show results separately for the period before reporting incentives were strengthened (childbirths between January 1999 and December 2004) and for the period after reporting incentives were strengthened (childbirths between May 2005 and December 2008).

We begin by examining heterogeneity by wage level relative to the monthly minimum wage. Among women who reported earning at least 200% of the monthly minimum wage before pregnancy, wages during pregnancy decrease slightly by about 2%, and the change in reporting behavior is not responsive to the policy change which strengthened reporting incentives. Among women with earnings between 150% and 199% of the minimum wage, the change is approximately zero in the pre-reform period and approximately 6% when the reporting incentive became stronger. The earnings change between the pre-pregnancy period and pregnancy is substantially larger among women reporting earnings between 100% and 149% of the monthly

minimum wage, about 7% before the reform. The earnings change becomes much larger when reporting incentives are strengthened, increasing to about 16%. We observe an even larger earnings change among workers reporting earnings below the monthly minimum wage, about 10% before the reform and 27% after the reform.

Turning to firm size, the size of the reporting response during pregnancy is inversely related to firm size. The largest response is observed among the smallest firms with 1 to 5 employees (16% pre-reform and 37% post-reform). As firm size increases, the magnitude of the reporting response decreases, though it remains positive and significant in firms with at most 40 employees pre-reform and firms with at most 50 employees post-reform.

A similar pattern is documented across quintiles of firm quality proxied by the firm-specific wage premium. The adjustment of reported earnings during pregnancy is negative in the top quintile and does not change strongly with the policy reform. In the bottom quintile reported earnings increase by 16% before the reform and 29% after the reform.

Finally, building on our own earlier work (Gavoille and Zasova, 2023*a*,*b*), we examine heterogeneity by the share of minimum wage earners in a firm. There is little adjustment to reported earnings either before or after the reform in firms with at most 40% of employees earning the monthly minimum wage. In firms with more than 40% of employees reporting earnings at the level of the minimum wage the adjustment is significant and becomes substantially larger when reporting incentives are strengthened.

3.2.3 Comparison

In both Hungary and Latvia, the reporting response during pregnancy is concentrated among workers with relatively low reported earnings and among workers employed in smaller and lower-quality firms. In contrast, women working in larger firms, higher-quality firms, or firms with fewer minimum wage earners exhibit little change in reported earnings during pregnancy and show little responsiveness to strengthened reporting incentives. The specific role of the minimum wage in under-reporting is also similar in the two countries.

At the same time, the magnitude of the reporting response is consistently larger in Latvia than in Hungary. One likely explanation is the difference in the benefit caps. In Hungary, the benefit-maximizing threshold for parental and home care leave benefits was at 200% of the monthly minimum wage, whereas in Latvia it was approximately 500% of the minimum wage for both types of benefit. As a result, the incentive to increase reported earnings during pregnancy extended further up the earnings distribution in Latvia than in Hungary. Another factor to keep in mind is that, as noted earlier, envelope wages were also more prevalent in Latvia (Williams and Padmore, 2013).

3.3 Role of the Minimum Wage and the Benefit Cap

In this section we examine two institutional features that play an important role in shaping the reporting response during pregnancy: the minimum wage and the cap on earnings-related

parental benefits. The minimum wage is a critical threshold for earnings under-reporting for at least four reasons. First, while completely informal employment may be possible, the minimum wage is the lowest pay that formally registered employers and employees can report. Second, registration may lower firms' risk of getting caught by tax authorities relative to having unreported employees. Third, it is also the lowest wage that can be reported in order to qualify a worker for employment-based social security benefits or health insurance. Fourth, registration allows both employers and employees to enjoy the protections of a formal contract. Thus, firms and workers have incentives to collude in substantial under-reporting of earnings specifically at the minimum wage, and some workers who declare the minimum wage may have higher true earnings, as documented by our own prior work (Bíró, Prinz and Sándor, 2022; Gavoille and Zasova, 2023*a*,*b*). The benefit cap determines the level of reported earnings that maximizes gains from reporting higher earnings. Reporting earnings above the level that corresponds to the benefit cap costs more in social security contributions without increasing parental benefits received.

3.3.1 Hungary

In Hungary, paid maternity leave during our study period covered an uncapped 70% of pre-birth average earnings for 6 months, while paid parental and home care leave covered 70% of pre-birth earnings with the maximum benefit capped at 140% of the minimum wage for 18 months (see Section 2.1 for more details). This design creates an incentive to report earnings exactly at 200% of the minimum wage to attain the maximum possible benefit with the minimum possible extra tax and social security contribution obligation. Figure 4 shows the distribution of reported earnings relative to the minimum wage in Hungary 12 months (in gray) and 4 months (in red) before childbirth separately for smaller and larger firms in the private sector and for the public sector. For each group of firms, we present the distribution of wages in the full sample of women (left panels) and in the sample of women who received a large and rare wage increase defined as an earnings change 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.

Panel (a) of Figure 4 shows that in smaller firms one year before giving birth around 35% of women report earning the monthly minimum wage or the guaranteed minimum wage for skilled jobs assumed to require a high-school diploma. This share is much higher than in larger firms in panel (c) and the public sector in panel (e) (each around 5%) and is in line with our previous work on wage under-reporting exactly at the level of the minimum wage (Bíró, Prinz and Sándor, 2022). Importantly, the share of women earning the monthly minimum wage or the guaranteed minimum wage 4 months before giving birth is significantly smaller at 26%, suggesting that about 25% of women who originally reported earning the minimum wage move away from this level during their pregnancy. Focusing on women who received a large and rare wage increase, panel (b) shows that such wage increases were especially common among women who reported earning the monthly minimum wage or the guaranteed minimum wage before

pregnancy, with just under 40% of large and rare wage increases happening to them. Moreover, it appears that during pregnancy 15% report earning exactly 200% of the minimum wage, the benefit-maximizing level, up from a share close to zero before pregnancy.

Panels (c), (d), (e), and (f) show that the phenomenon of earnings bunching at the minimum wage before and at the benefit-maximizing threshold during pregnancy is absent in larger firms and the public sector. In addition, no movement to the benefit-maximizing threshold is detected for larger firms and the public sector, in line with the results presented in Section 3.1 and with our earlier work.

3.3.2 Latvia

In Latvia, the benefit cap was largely non-binding. Benefits covered 70% of pre-birth average gross earnings, subject to a cap of 558 euros. Reaching the cap would have required monthly earnings of around 800 euros, approximately 2.3 times the average wage in 2005 (see Section 2.1 for more details). Figure 5 replicates the wage distribution analysis for Latvia. Because the cap was defined in nominal terms, but the minimum wage changed every year, Appendix Figure A5 also shows the distribution in nominal terms.

Panel (a) of Figure 5 presents the distribution of reported earnings 12 and 4 months before childbirth for births occurring after May 2005 and shows that a large share (17.3%) of women in Latvia working in smaller firms reported earning the minimum wage before pregnancy. This share decreased substantially during pregnancy, reaching 11.1% 4 months before birth. This is also in line with our earlier work on the relationship between wage under-reporting and the minimum wage in Latvia (Gavoille and Zasova, 2023*a*,*b*).

Panels (c), (d), (e), and (f) confirm that women in larger firms and the public sector do not exhibit the same behavior, which is also in line with the results presented in Section 3.1, as well as with our earlier work. As the benefit cap in Latvia was not binding, reported earnings do not bunch at the benefit-maximizing threshold. They exhibit a wider distribution with spikes at round numbers defined in Latvian lats (Appendix Figure A5).

3.3.3 Comparison

In both Hungary and Latvia, a large share of women working in smaller firms report earnings at the level of the minimum wage before pregnancy, consistent with the presence of wage under-reporting documented in earlier work. During pregnancy, many of these women move away from the minimum wage, suggesting that employers and employees partially formalize previously under-reported earnings in response to the incentives embedded in parental benefit systems. This behavior is not present in larger firms and the public sector.

The key difference between the two countries is the role of the benefit cap. In Hungary, the cap is binding and creates a clear benefit-maximizing reporting threshold at 200% of the minimum wage, leading to visible bunching of reported earnings at this level during pregnancy. In Latvia, by contrast, the cap is largely non-binding, and reported earnings therefore exhibit a much wider distribution without bunching at this specific threshold. The non-binding benefit

threshold could be an important explanation for the more pronounced adjustment of reported earnings during pregnancy in Latvia relative to Hungary.

3.4 Role of Firms

Increasing reported earnings to qualify for higher benefits requires firms and workers to cooperate. Whether firms or workers drive the phenomenon documented so far is an important question. To disentangle the role of firms and workers, we rely on a sample of women who give birth twice and change employers between their two pregnancies. In Latvia, we have a long enough panel for this exercise, but unfortunately our panel in Hungary is too short. Appendix Figure A6 shows the labor market transitions of women between firm types (smaller firms, larger firms, public sector) between their first and second pregnancies in Latvia.

We start this exercise by replicating our baseline results on reported wages separately for the first and second children among women who do not switch employers between their two pregnancies. Panel (a) of Figure 6 shows that among women who work in smaller firms and do not switch employers, the magnitude of adjustment of reported earnings during the first (17.3%) and second (16.0%) pregnancies is almost identical and falls between the pre- (10.2%) and post-reform (21.0%) baseline results. Similarly, non-switching women who work for larger firms or in the public sector during both their first and second pregnancies exhibit zero or slightly negative reported earnings adjustment during both of their pregnancies, in line with our baseline results. This panel also includes a third set of coefficients, corresponding to the reported earnings adjustment of women who do switch employers between their two pregnancies but stay within the same employer type (smaller, larger, public sector). The coefficients for these women are also similar to what we found above.

Panel (b) considers the second pregnancies of women who switch firms between their two pregnancies. Women working in smaller firms during their second pregnancies exhibit increased reported earnings regardless of what type of employer they worked in during their first pregnancies. On the other hand, women who work in larger firms or the public sector during their second pregnancies do not experience reported wage increases even if they worked in smaller firms during their first pregnancies. Appendix Figure A7 shows the full event study results corresponding to each category.

These results suggest that while employers and employees need to collude to increase reported earnings in order to obtain higher benefits, the ability and willingness to change reported earnings is firm-dependent, rather than completely worker-driven.

3.5 Employment Formalization

The incentives generated by parental 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. We estimate this model on the same sample

used in the analysis of reporting responses, with the exception that we do not restrict the sample to individuals continuously employed between 24 and 4 months prior to childbirth or the placebo birth.

3.5.1 Hungary

Panel (a) of Figure 7 shows regression results for the probability of employment for Hungary in the pre-reform period. It shows that in smaller firms, larger firms, and the public sector, employment well before pregnancy increased slightly faster among women who later gave birth than among the control group of women who did not give birth. The difference between women who gave birth and who did not give birth is similar across employer types. In all three groups of employers, this trend flattens out approximately 15 months before birth. Then, around the start of the pregnancy, employment in smaller firms diverges. Four months before giving birth, employment in smaller firms is 0.5 percentage points higher among mothers than among women in the control group. At the same time, employment in larger firms declines significantly and is about 2 percentage points lower four months before giving birth. Employment in the public sector declines as well, albeit much more slowly. The increase in reported employment in smaller firms is likely to reflect the formalization of previously informal jobs, in line with the findings on wages.

Panel (b) shows employment results for the post-reform period in Hungary (2015-2017). These results are similar to the pre-reform employment results. Employment increases faster for future mothers than for the control group, it then stabilizes before pregnancy. During pregnancy, employment decreases in larger firms and the public sector, while it remains approximately steady in smaller firms.

To confirm that these results are indeed driven by women who give birth, panels (a) and (b) of Appendix Figure A8 show the underlying evolution of employment probabilities for women who give birth and the control group, separately by employer type and time period for each country. The key employment patterns of decreasing employment in larger firms and increasing employment in smaller firms during pregnancy are indeed visible in the raw data.

The overall decrease in employment among women during pregnancy may reflect discrimination, health concerns, lower labor supply, or decreased job search effort. But these figures suggest that employment among the women who do work shifts toward smaller firms. In Hungary during the post-reform period one year before giving birth, 24.6% of mothers work in smaller firms, increasing slightly to 24.7% four months before giving birth; whereas 33.7% of mothers work in larger firms, decreasing to 32.6% four months before giving birth. Among placebo mothers the share working at smaller firms decreased slightly from 19.2% to 19.1%; whereas the share working in larger firms increased slightly from 24.5% to 25% over the same event time horizon.

3.5.2 Latvia

In Latvia, panel (c) of Figure 7 shows that before the reform strengthening reporting incentives, employment decreased during pregnancy in larger firms while remaining at about the same level in smaller firms. The decrease in employment in the public sector is less marked. Panel (d) shows that after the reporting incentives became stronger, reported employment during pregnancy increased significantly in Latvia in smaller firms by up to 2.3 percentage points.

Panels (c) and (d) of Appendix Figure A8 show the underlying evolution of employment probabilities for women who give birth and the control group in Latvia, confirming that that the results are indeed driven by women who give birth.

In Latvia, in the post-reform period, the share of mothers employed in smaller firms increases from 23.4% to 26.4%, while among placebo mothers this share increases only from 18.2% to 19%. At the same time, the share of mothers employed in larger firms increases only from 32.4% to 32.9%, while among placebo mothers this increase was more pronounced, from 23% to 24.7%.

3.5.3 Comparison

The employment results for Hungary and Latvia suggest that employment shifts toward smaller firms during pregnancy, which is consistent with formalization responses to parental benefit incentives. In both countries, employment among women who give birth declines in larger firms during pregnancy while remaining stable or increasing in smaller firms. This pattern suggests transitions from informal to formal employment relationships in smaller firms where informal arrangements are more likely.

Parental benefit rules appear to affect both the intensive margin of reported earnings and the extensive margin of reported formal employment. Women approaching childbirth are more likely to maintain or establish reported employment relationships on top of increasing their reported earnings.

3.6 Results for Men in Latvia

An important question regarding the increase in reported wages during pregnancy that we have so far documented in both Hungary and Latvia is whether it is persistent or if it disappears after the reference period for benefits ends. It is difficult to answer this question using our baseline sample of women because women in both countries typically exit employment during the three months before childbirth and do not return to work for at least three years after childbirth. Our post-birth panels are also short, especially in Hungary. In this section we instead examine the reported earnings of fathers in Latvia. We are able to identify fathers in Latvia from benefit records for the parental benefit, but not in Hungary because mothers are identified using health care records there, benefit uptake among men is near zero, and couples are not linked. In this analysis, we apply the same approach of assigning a placebo childbirth date to the control group of men as we do for women. The male sample is restricted to those with non-missing wage records for every month from 24 months before to 12 months after the

actual or placebo childbirth date. We examine births occurring between July 2008 and August 2009. Earlier births are excluded due to benefit rules that previously limited uptake among men, including a cap on benefit amounts and a reduced benefit for parents who continued working during parental leave. Until these restrictions were lifted, recipients were almost exclusively mothers. In early October 2007, the government adopted amendments removing the remaining restrictions, leading to a substantial increase in male benefit uptake. We therefore include only those men whose partners learned of their pregnancy in November 2007 or later, after the policy change was announced, corresponding to childbirth from July 2008 onward. While the female sample excludes births after December 2008 to avoid crisis-related confounding, extending the male sample through August 2009 is necessary to retain a sufficient sample following the October 2007 policy change.

Figure 8 reports results for Latvia for the sample of men receiving parental benefit. From the fiscal perspective, a wage increase during the benefit reference window may be harmless if permanent, as higher tax revenues could offset higher benefits. However, if the increase is only temporary, the fiscal effect is negative. The results show that reported wages of men receiving and not receiving parental benefits move similarly until about nine months before childbirth across all firm types. After that, wages in smaller firms start to diverge. Four months before childbirth, men receiving parental benefits in small firms earn 13.3% more on average than the control group. In larger firms and in the public sector, no divergence is observed during men's partners' pregnancy. After childbirth, wages in the private sector drop due to the short (10-day) paternity benefit available after childbirth and before the child turns two months old. This benefit is not compatible with employment, leading to a temporary fall in fathers' earnings. In the public sector, we observe a strong increase in wages right after childbirth, explained by a one-off civil servant bonus equal to six monthly wages, payable to either parent. Finally, and most importantly, we find no lasting positive wage differential in small private firms after childbirth. This suggests that the reported earnings increase in response to benefit incentives is only short-term, at least among Latvian men.

3.7 Alternative Explanations

Our results so far suggest that across both countries reported earnings respond strongly to the incentives created by the contribution-benefit link in the design of parental benefits. The response patterns are difficult to reconcile with genuine labor supply adjustments. In both countries, the response is concentrated among minimum-wage earners and small, lower-quality, domestically oriented firms where under-reporting and employer–employee coordination are easier. Reported earnings bunch at the minimum wage prior to pregnancy and shift to the benefit-maximizing threshold during pregnancy in Hungary where there is a binding benefit cap, often doubling despite little change in reported hours, indicating adjustments in reported hourly wages rather than real effort. The response intensifies following reforms that strengthened reporting incentives and is driven primarily by firms and workers already prone to under-reporting. Evidence from firm switchers in Latvia and from Latvian men whose earnings revert

after the qualification period further suggests that adjustments are firm-driven and temporary. Employment patterns reinforce this interpretation: employment rises or remains stable in small firms during pregnancy while declining in larger firms and the public sector, consistent with the formalization of previously informal employment relationships. Taken together, the cross-country evidence points to strategic reporting and partial formalization of previously under-reported earnings, rather than real changes in labor supply.

Nevertheless, in addition to the possibility of real labor supply responses, which are largely ruled out by our analysis of working hours, there are other alternative mechanisms that are worth considering. First, the earnings response may be connected to labor regulation enforcement, labor courts, or unions. It is possible that these would influence firms' compliance behavior and that they are perhaps disproportionately present at smaller firms or become more important during pregnancies. Data on labor inspections are not available, and it is difficult to assess whether smaller firms or pregnant women are especially impacted by them. However, OECD data on trade union density (OECD, 2021) suggest that unionization rates were low and decreasing during this period. In Latvia, 21% of employees were covered by a union in 2003, decreasing to 15% in 2008 (European Trade Union Institute, 2017). In Hungary, 9% of workers were covered by a union in 2015. This rate was only 5% in the private sector (European Trade Union Institute, 2019) and much lower in smaller firms than in larger ones (Hungarian Central Statistical Office, 2015).

Another possibility is that while employers increase their compliance in wage reporting, they adjust along other margins, for instance by reducing hiring, cutting fringe benefits for new employees, or lowering mandated benefits in contexts where enforcement is relatively weak. Such adjustments would have immediate effects on other workers, but not necessarily on pregnant women or parents. While we do not have data on fringe benefits, we can examine firm-level wages and hiring among workers not directly impacted. Appendix Figures A9 and A10 display the evolution of these two variables, separately for smaller and larger firms for both countries. There does not seem to be any evidence for firm-level wage or hiring spillovers. We also do not have data on mandated benefit provision, but in both countries benefits like paid time off and parental leave are standardized, while health insurance and pensions are publicly provided and also standardized. Thus it is unlikely that employers would be able to adjust on this margin.

4 Conclusion

Most social insurance programs link benefits to prior contributions. A central motivation for this design is to ensure similar replacement rates across beneficiaries with different earnings levels, thereby providing comparable incentives for take-up and return to work (Chetty and Finkelstein, 2013). However, earnings-dependent benefits affect more than the duration of time out of work. When benefits depend on earnings reported during a narrow reference window, the contribution-benefit link also creates strong incentives to increase reported earnings in that window. This reporting margin is particularly important in settings where earnings are

under-reported, as it can generate fiscal costs that partially offset the revenue gains from formalization.

This paper has documented earnings reporting responses to incentives inherent in the design of parental benefits in Hungary and Latvia. Using detailed administrative records, we have demonstrated that reported earnings and formal employment of women increase during pregnancy. Some of this adjustment happens on the intensive margin through the formalization of under-reported earnings of women who previously received some of their compensation under the table, while some of it happens on the extensive margin by formalizing previously informal employment relationships. The magnitude of the reporting response tracks reporting incentives, becoming significantly stronger when policy reforms in both countries strengthened incentives.

Several patterns support the interpretation that earnings are under-reported prior to pregnancy and then partially formalized during pregnancy in response to reporting incentives. First, the response is concentrated among lower earners, particularly those who report earnings precisely at the minimum wage, and among small, lower-quality, and domestic firms. Second, the magnitude of the reporting response increases when incentives are strengthened. Third, reported earnings bunch at the benefit-maximizing threshold during pregnancy in Hungary where a binding benefit cap is present. Fourth, women who switch firms exhibit responses consistent with firm-driven reporting adjustments. Finally, men's reported earnings rise during the qualification period but return to their previous levels afterward.

These results suggest that tax evasion is responsive to the contribution-benefit link built into the social insurance systems. Some important trade-offs need to be highlighted. First, under the specific design of the contribution-benefit link that we studied, these adjustments likely resulted in a net fiscal cost for the government, unless wages remained elevated for women after returning to work after birth, which is difficult to convincingly examine with our data because in both countries most women take at least three years after birth to return to work, a large share do not return to the same firm, and our panels after the policy changes studied are limited. Second, a reference period for benefits that is shorter and closer to benefit claiming 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 benefit claiming might also have the unintended consequence of decreasing reported earnings outside the reference period. Third, while linking benefits to reported earnings can help reduce tax evasion at least temporarily, 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.

References

Abowd, John M, Francis Kramarz, and David N Margolis. 1999. "High Wage Workers and High Wage Firms." *Econometrica*, 67(2): 251–333.

Al-Karablieh, Yazan, Evangelos Koumanakos, and Stefanie Stantcheva. 2021. "Clearing the Bar: Improving Tax Compliance for Small Firms Through Target Setting." *Journal of International Economics*, 130(1): 103452.

Andresen, Martin Eckhoff, and Emily Nix. 2022. "What Causes the Child Penalty? Evidence from Adopting and Same-Sex Couples." *Journal of Labor Economics*, 40(4): 971–1004.

Angelov, Nikolay, Per Johansson, and Erica Lindahl. 2016. "Parenthood and the Gender Gap in Pay." *Journal of Labor Economics*, 34(3): 545–579.

Artavanis, Nikolaos, Adair Morse, and Margarita Tsoutsoura. 2016. "Measuring Income Tax Evasion Using Bank Credit: Evidence from Greece." *Quarterly Journal of Economics*, 131(2): 739–798.

Bana, Sarah H., Kelly Bedard, and Maya Rossin-Slater. 2020. "The Impacts of Paid Family Leave Benefits: Regression Kink Evidence from California Administrative Data." *Journal of Policy Analysis and Management*, 39(4): 888–929.

Bartel, Ann P, Maya Rossin-Slater, Christopher J Ruhm, Meredith Slopen, and Jane Waldfogel. 2025. "The Impact of Paid Family Leave on Employers: Evidence from New York." *Community, Work & Family*, 28(2): 153–171.

Baum, Charles L., and Christopher J. Ruhm. 2016. "The Effects of Paid Family Leave in California on Labor Market Outcomes." *Journal of Policy Analysis and Management*, 35(2): 333–356.

Becerra, Oscar. 2024. "The Effect of Future Pension Benefits on Labor Supply in a Developing Economy." *Economic Development and Cultural Change*, 72(3): 1527–1566.

Benedek, Dóra, Péter Elek, and János Köllő. 2013. "Tax avoidance, tax evasion, black and grey employment." In *The Hungarian Labour Market 2013.* , ed. Károly Fazekas, Péter Benczúr and Álmos Telegdy, 161–178. Hungarian Academy of Sciences Centre for Economic and Regional Research.

Bergolo, Marcelo, and Guillermo Cruces. 2014. "Work and Tax Evasion Incentive Effects of Social Insurance Programs: Evidence from an Employment-Based Benefit Extension." *Journal of Public Economics*, 117: 211–228.

Beŋkovskis, Konstantīns, and Ludmila Fadejeva. 2025. "Chasing the Shadow: Unreported Wage Payments and Income Inequality." *Journal of Economic Inequality*, 23(4): 1089–1120.

Bíró, Anikó, Dániel Prinz, and László Sándor. 2022. "The Minimum Wage, Informal Pay, and Tax Enforcement." *Journal of Public Economics*, 215: 104728.

Bjørneby, Marie, Annette Alstadsæter, and Kjetil Telle. 2021. "Limits to Third-Party Reporting: Evidence from a Randomized Field Experiment in Norway." *Journal of Public Economics*, 203: 104512.

Bozio, Antoine, Thomas Breda, Julien Grenet, and Arthur Guillouzouic. 2026. "Does Tax-Benefit Linkage Matter for the Incidence of Payroll Taxes?" *Review of Economic Studies*, 93(3): 1536–1573.

Carneiro, Pedro, Katrine V. Løken, and Kjell G. Salvanes. 2015. "A Flying Start? Maternity Leave Benefits and Long-Run Outcomes of Children." *Journal of Political Economy*, 123(2): 365–412.

Chetty, Raj, and Amy Finkelstein. 2013. "Chapter 3 - Social Insurance: Connecting Theory to Data." In *Handbook of Public Economics, Volume 5.* , ed. Alan J. Auerbach, Raj Chetty, Martin Feldstein and Emmanuel Saez, 111–193. Elsevier.

Cortés, Patricia, and Jessica Pan. 2023. "Children and the Remaining Gender Gaps in the Labor Market." *Journal of Economic Literature*, 61(4): 1359–1409.

Dean, Andrés, Sebastian Fleitas, and Mariana Zerpa. 2024. "Dynamic Incentives in Retirement Earnings-Replacement Benefits." *Review of Economics and Statistics*, 106(3): 762–777.

De Andrade, Gustavo Henrique, Miriam Bruhn, and David McKenzie. 2014. "A Helping Hand or the Long Arm of the Law? Experimental Evidence on What Governments Can Do to Formalize Firms." *World Bank Economic Review*, 30(1): 24–54.

de Mel, Suresh, David McKenzie, and Christopher Woodruff. 2013. "The Demand for, and Consequences of, Formalization among Informal Firms in Sri Lanka." *American Economic Journal: Applied Economics*, 5(2): 122–150.

Elek, Péter, János Köllő, Balázs Reizer, and Péter A. Szabó. 2012. "Detecting Wage Under-Reporting Using a Double-Hurdle Model." In *Informal Employment in Emerging and Transition Economies.* Vol. 34 of *Research in Labor Economics*, , ed. Hartmut Lehmann and Konstantinos Tatsiramos, 135–166. Emerald Group Publishing Limited.

European Labour Authority. 2017*a*. "Factsheet on Undeclared Work – Hungary." https://www.ela.europa.eu/sites/default/files/2024-02/HU_UDW_Factsheet_2017-Hungary.pdf.

European Labour Authority. 2017*b*. "Factsheet on Undeclared Work – Latvia." https://www.ela.europa.eu/sites/default/files/2024-02/LV_UDW_Factsheet_2017-Latvia.pdf.

European Trade Union Institute. 2017. "Industrial relations in Latvia: background summary." https://www.etui.org/covid-social-impact/latvia/industrial-relations-in-latvia-background-summary.

European Trade Union Institute. 2019. "Industrial relations in Hungary: background summary (update March 2019)." https://www.etui.org/covid-social-impact/hungary/industrial-relations-in-hungary-background-summary-update-march-2019.

Fitzpatrick, Maria D. 2017. "Pension-Spiking, Free-Riding, and the Effects of Pension Reform on Teachers' Earnings." *Journal of Public Economics*, 148: 57–74.

French, Eric, Attila S. Lindner, Cormac O'Dea, and Tom A. Zawisza. 2026. "Labor Supply and the Pension-Contribution Link." *Review of Economic Studies*, Forthcoming.

Gavoille, Nicolas, and Anna Zasova. 2021. "Foreign Ownership and Labor Tax Evasion: Evidence from Latvia." *Economics Letters*, 207: 110030.

Gavoille, Nicolas, and Anna Zasova. 2023*a*. "Minimum Wage Spike and Income Underreporting: A Back-of-the-Envelope-Wage Analysis." *Journal of Comparative Economics*, 51(1): 372–402.

Gavoille, Nicolas, and Anna Zasova. 2023*b*. "What We Pay in the Shadows: Labor Tax Evasion, Minimum Wage Hike and Employment." *Journal of Public Economics*, 228: 105027.

Gerard, François, and Gustavo Gonzaga. 2021. "Informal Labor and the Efficiency Cost of Social Programs: Evidence from Unemployment Insurance in Brazil." *American Economic Journal: Economic Policy*, 13(3): 167–206.

Ginja, Rita, Arizo Karimi, and Pengpeng Xiao. 2023. "Employer Responses to Family Leave Programs." *American Economic Journal: Applied Economics*, 15(1): 107–135.

Hassan, Mai, and Friedrich Schneider. 2016. "Size and Development of the Shadow Economies of 157 Countries Worldwide: Updated and New Measures from 1999 to 2013." IZA Discussion Paper 10281.

Hungarian Central Statistical Office. 2015. "Number of Employees Aged 15–64 Working at the Site, by Gender and Whether Their Workplace Has a Trade Union, 2015. Q2 [15–64 éves alkalmazottak a telephelyen dolgozók száma, nemek és aszerint, hogy munkahelyükön működik-e szakszervezet, 2015. II. negyedév]." https://www.ksh.hu/docs/hun/xstadat/xstadat_evkozi/e_szerv9_01_14.html.

Kleven, Henrik, Camille Landais, and Gabriel Leite-Mariante. 2025. "The Child Penalty Atlas." *Review of Economic Studies*, 92(5): 3174–3207.

Kleven, Henrik, Camille Landais, and Jakob Egholt Søgaard. 2019. "Children and Gender Inequality: Evidence from Denmark." *American Economic Journal: Applied Economics*, 11(4): 181–209.

Kleven, Henrik, Camille Landais, Johanna Posch, Andreas Steinhauer, and Josef Zweimüller. 2024. "Do Family Policies Reduce Gender Inequality? Evidence from 60 Years of Policy Experimentation." *American Economic Journal: Economic Policy*, 16(2): 110–149.

Kleven, Henrik Jacobsen, Claus Thustrup Kreiner, and Emmanuel Saez. 2016. "Why Can Modern Governments Tax So Much? An Agency Model of Firms as Fiscal Intermediaries." *Economica*, 83(330): 219–246.

Kuehn, Zoë. 2014. "Tax Rates, Governance, and the Informal Economy in High Income Countries." *Economic Inquiry*, 52(1): 405–430.

Kumler, Todd, Eric Verhoogen, and Judith Frías. 2020. "Enlisting Employees in Improving Payroll Tax Compliance: Evidence from Mexico." *Review of Economics and Statistics*, 102(5): 881–896.

Le Barbanchon, Thomas. 2025. "Taxes Today, Benefits Tomorrow." *American Economic Journal: Applied Economics*, 17(4): 155–183.

Lundborg, Petter, Erik Plug, and Astrid Würtz Rasmussen. 2017. "Can Women Have Children and a Career? IV Evidence from IVF Treatments." *American Economic Review*, 107(6): 1611–1637.

Meghir, Costas, Renata Narita, and Jean-Marc Robin. 2015. "Wages and Informality in Developing Countries." *American Economic Review*, 105(4): 1509–1546.

Mortenson, Jacob A., and Andrew Whitten. 2020. "Bunching to Maximize Tax Credits: Evidence from Kinks in the US Tax Schedule." *American Economic Journal: Economic Policy*, 12(3): 402–32.

OECD. 2021. "OECD/AIAS Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS)." https://data-explorer.oecd.org/vis?df[ds]=DisseminateFinalDMZ&df[id]=DSD_TUD_CBC%40DF_TUD&df[ag]=OECD.ELS.SAE&dq=..&pd=2000%2C&to[TIME_PERIOD]=false&vw=tb.

OECD. 2023. "Tax Wedge." https://data.oecd.org/tax/tax-wedge.htm.

OECD. 2024. "Parental Leave Systems." https://www.oecd.org/content/dam/oecd/en/data/datasets/family-database/pf2_1_parental_leave_systems.pdf.

Olivetti, Claudia, and Barbara Petrongolo. 2017. "The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries." *Journal of Economic Perspectives*, 31(1): 205–230.

Putniņš, Tālis J., and Arnis Sauka. 2015. "Measuring the Shadow Economy Using Company Managers." *Journal of Comparative Economics*, 43(2): 471–490.

Putniņš, Tālis J., and Arnis Sauka. 2017. "SSE Riga Shadow Economy Index 2009-2016."

Rocha, Rudi, Gabriel Ulyssea, and Laísa Rachter. 2018. "Do Lower Taxes Reduce Informality? Evidence from Brazil." *Journal of Development Economics*, 134: 28–49.

Rossin-Slater, Maya. 2018. "Maternity and Family Leave Policy." In *The Oxford Handbook of Women and the Economy.* , ed. Susan L. Averett, Laura M. Argys and Saul D. Hoffman. Oxford University Press.

Rossin-Slater, Maya, Christopher J. Ruhm, and Jane Waldfogel. 2013. "The Effects of California's Paid Family Leave Program on Mothers' Leave-Taking and Subsequent Labor Market Outcomes." *Journal of Policy Analysis and Management*, 32(2): 224–245.

Rovigatti, Gabriele, and Vincenzo Mollisi. 2020. "PRODEST: Stata Module for Production Function Estimation Based on the Control Function Approach." *Statistical Software Components, Boston College Department of Economics.*

Sebők, Anna. 2019. "The Panel of Linked Administrative Data of CERS Databank." Centre for Economic and Regional Studies Institute of Economics Budapest Working Papers on the Labour Market 2019/2.

Stearns, Jenna. 2015. "The Effects of Paid Maternity Leave: Evidence from Temporary Disability Insurance." *Journal of Health Economics*, 43: 85–102.

Stearns, Jenna. 2018. "The Long-Run Effects of Wage Replacement and Job Protection: Evidence from Two Maternity Leave Reforms in Great Britain." *Mimeo.*

Sun, Liyang. 2021. "EVENTSTUDYINTERACT: Interaction Weighted Estimator for Event Study." *Boston College Department of Economics.*

Sun, Liyang, and Sarah Abraham. 2021. "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects." *Journal of Econometrics*, 225(2): 175–199.

Ulyssea, Gabriel. 2018. "Firms, Informality, and Development: Theory and Evidence from Brazil." *American Economic Review*, 108(8): 2015–2047.

Ulyssea, Gabriel. 2020. "Informality: Causes and Consequences for Development." *Annual Review of Economics*, 12(1): 525–546.

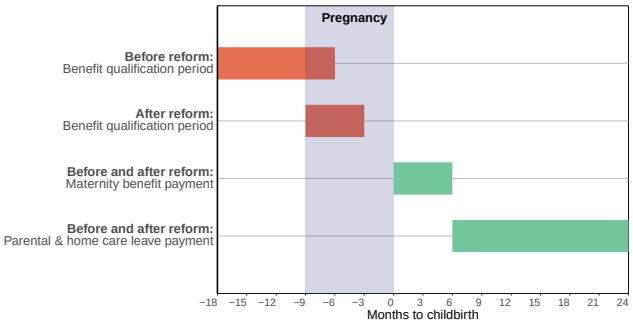
Williams, Colin C. 2013. "Evaluating Cross-National Variations in the Extent and Nature of Informal Employment in the European Union." *Industrial Relations Journal*, 44(5-6): 479–494.

Williams, Colin C., and Jo Padmore. 2013. ""Envelope Wages" in the European Union." *International Labour Review*, 152(3-4): 411–430.

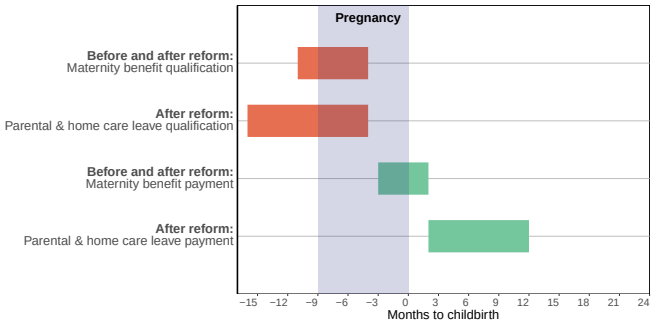
Wooldridge, Jeffrey M. 2009. "On Estimating Firm-Level Production Functions Using Proxy Variables to Control for Unobservables." *Economics Letters*, 104(3): 112–114.

Figure 1: Benefit Qualification and Payment Periods

(a) Hungary



(b) Latvia



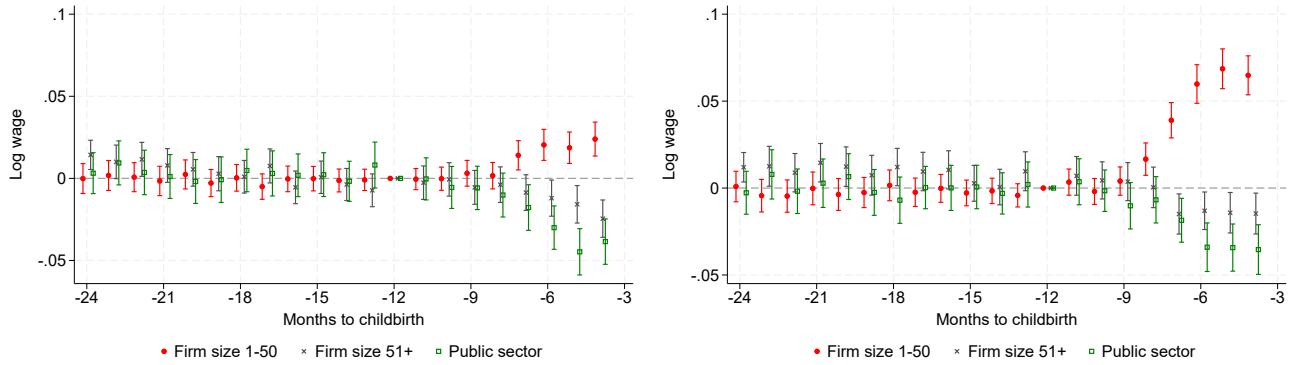
Note: Figure shows benefit qualification (in orange) and payment (in green) periods. Panel (a) shows benefit qualification and payment periods for Hungary. Both before and after the 2015 reform, maternity benefits covered the 24 weeks (approximately 6 months) after childbirth and were followed by parental and home care leave benefits, payable for up to two years. Before the 2015 reform, benefits depended on average earnings in the calendar year before the start of the benefit. (The figure shows a scenario of a June birth.) The 2015 reform shortened the qualification window to a six-month period ending three months before birth. Panel (b) shows the qualification and payment periods for Latvia. Both before and after the 2005 reform, maternity benefits covered 10 weeks before and 8 weeks after birth, with a qualification period of six months ending two months before benefit entitlement. The number of months in the benefit reference period that overlap with pregnancy depends on the exact timing of birth within the month, and can be either four or five. Assuming birth occurs in the middle of a month, the first five months of the reference period overlap with pregnancy. For instance, if a child is born on 15 December, maternity benefit payments start in early October, and the reference period ends in early August. In this case, five months—April (around the time when the woman is likely to learn she is pregnant) through August—overlap with pregnancy. The 2005 reform introduced a wage-dependent parental benefit, paid from the end of maternity leave until the child turns one year old. The qualification period was 12 months, ending three months before childbirth (excluding the birth month). Continuing the example above, months from September to December are excluded from the qualification period, and five months (April to August) overlap with pregnancy.

Figure 2: Reported Earnings Before Childbirth

Hungary

(a) January 2013 to December 2014

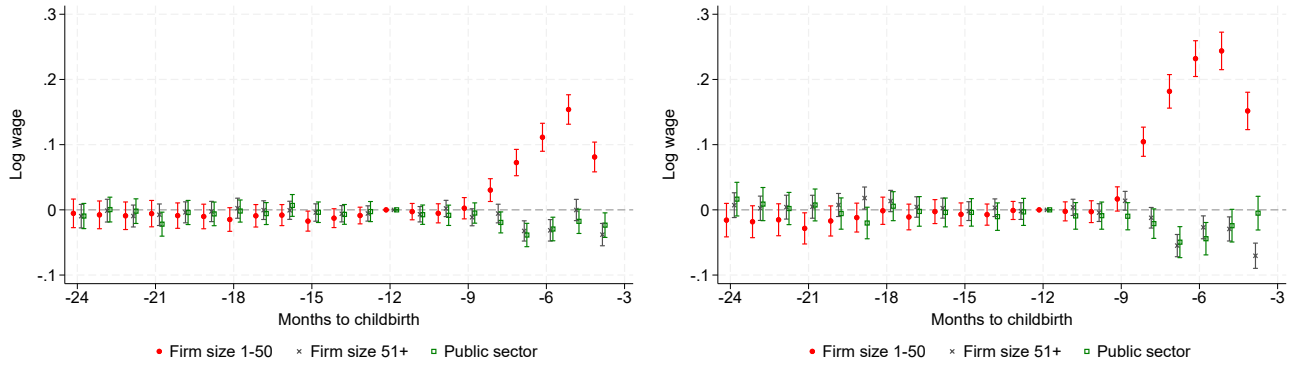
(b) October 2015 to December 2017



Latvia

(c) January 1999 to December 2004

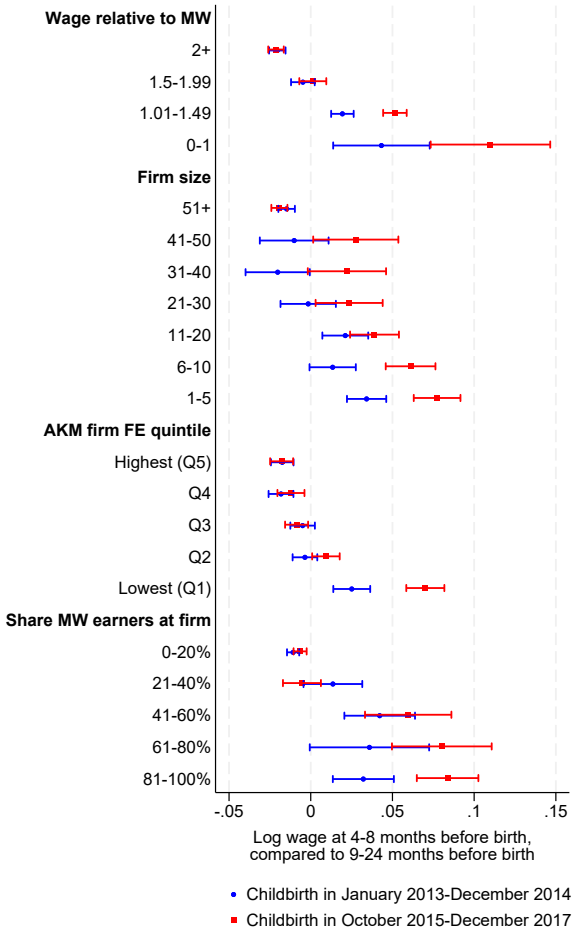
(d) May 2005 to December 2008



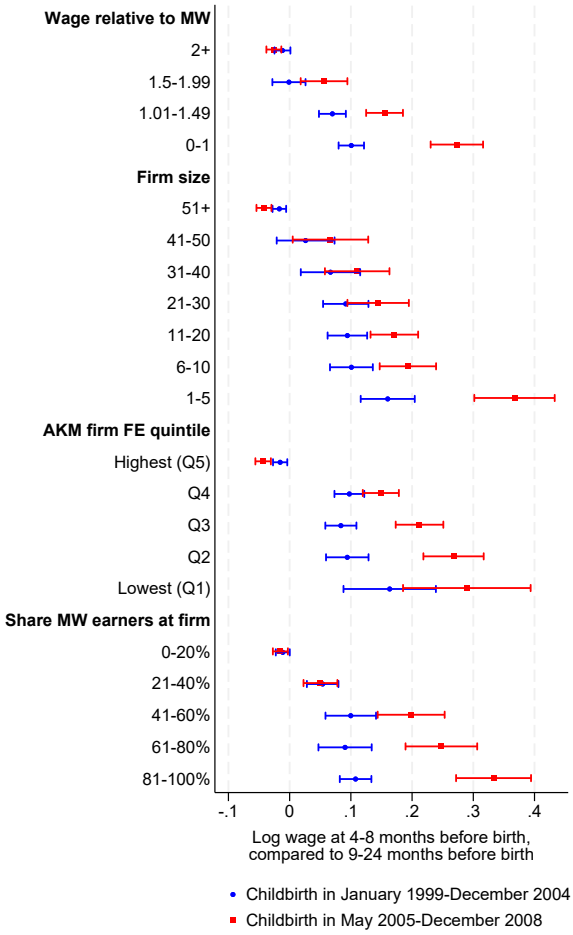
Note: Figure shows time patterns of reported earnings before giving birth. Panel (a) shows estimates for births between January 2013 and December 2014 in Hungary. Panel (b) shows estimates for births between October 2015 and December 2017 in Hungary. Panel (c) shows estimates for births between January 1999 and December 2004 in Latvia. Panel (d) shows estimates for births between May 2005 and December 2008 in Latvia. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). Number of individuals in panel (a): 8,217 for firm size 1-50, 11,623 for firm size 51+, and 6,578 for the public sector. Number of individuals in panel (b): 8,168 for firm size 1-50, 10,870 for firm size 51+, and 7,111 for the public sector. Number of individuals in panel (c): 8,469 for firm size 1-50, 12,764 for firm size 51+, and 8,836 for the public sector. Number of individuals in panel (d): 7,481 for firm size 1-50, 11,501 for firm size 51+, and 6,319 for the public sector.

Figure 3: Reported Earnings Before Childbirth—Heterogeneity

(a) Hungary



(b) Latvia



Note: Figure shows heterogeneity in the change in reported earnings before giving birth by individual, firm, and job characteristics. Panel (a) shows heterogeneity results for Hungary. Panel (b) shows heterogeneity for Latvia. In both panels, blue circles denote the period before reporting incentives were strengthened (childbirths between January 2013 and December 2014 in Hungary and between January 1999 and December 2004 in Latvia) and red squares denote the period after reporting incentives were strengthened (childbirths between October 2015 and December 2017 in Hungary and between May 2005 and December 2008 in Latvia). Each result shows estimated β parameters and 95% confidence intervals from a modified version of equation (1), in which we replace the event time dummies with a binary indicator that equals one 8 to 4 months before birth, and zero 24 to 9 months before birth.

Figure 4: Distribution of Reported Earnings Before Childbirth, Hungary

Firm Size 1-50

(a) Full Sample

(b) Women Receiving Large Wage Increase

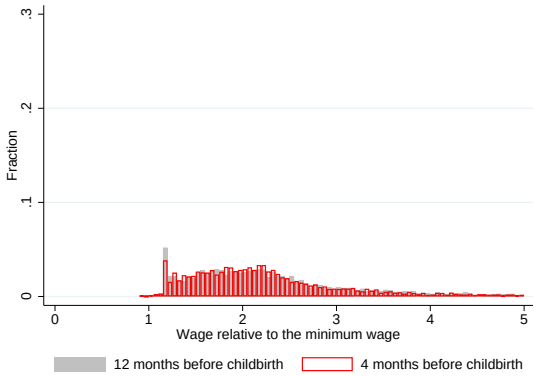
Firm Size 51+

(c) Full Sample

(d) Women Receiving Large Wage Increase

Public Sector

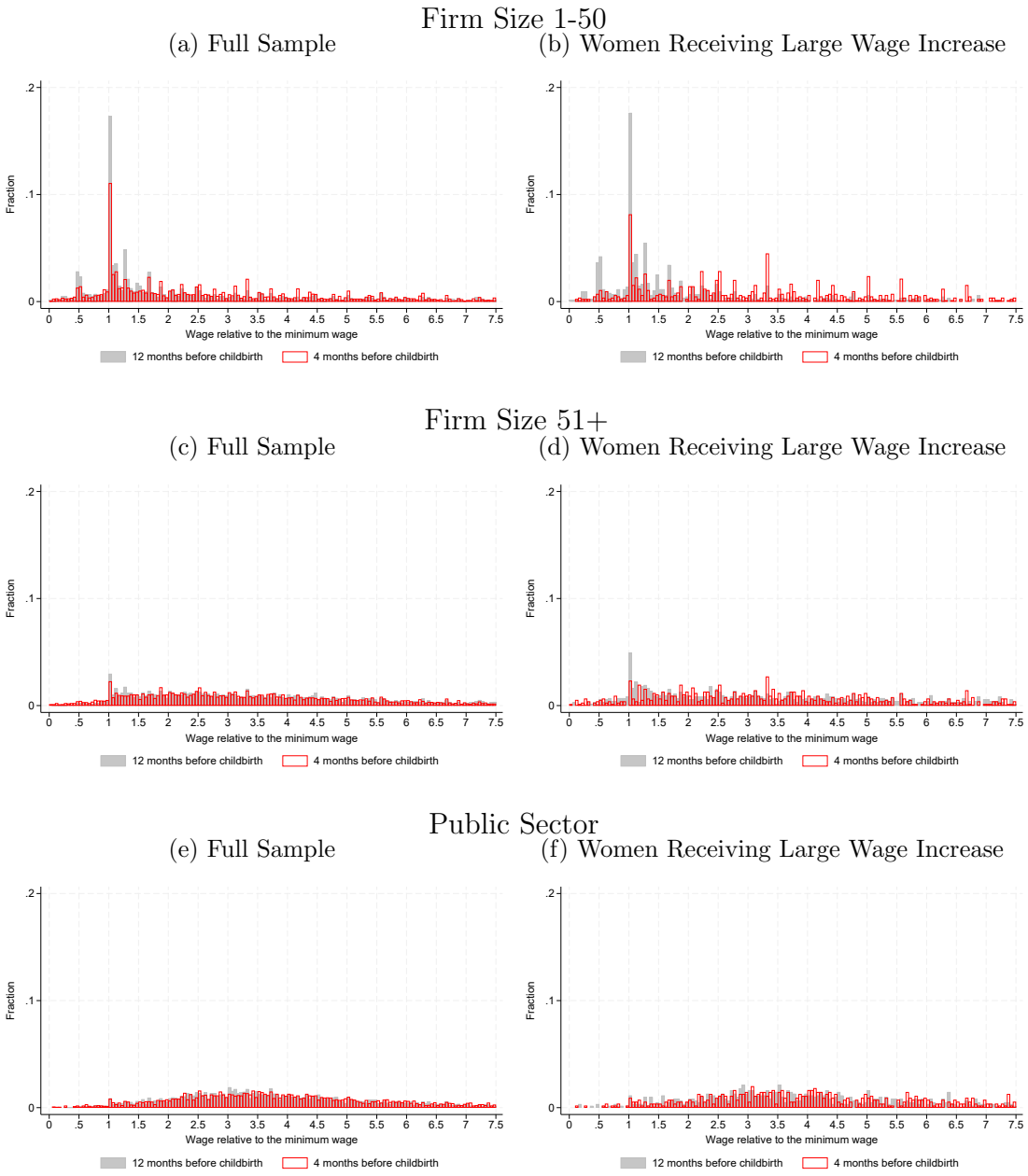
(e) Full Sample



(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 in Hungary. 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 an 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): 7,705. Number of individuals in panel (b): 729. Number of individuals in panel (c): 7,194. Number of individuals in panel (d): 237. Number of individuals in panel (e): 5,669. Number of individuals in panel (f): 164.)

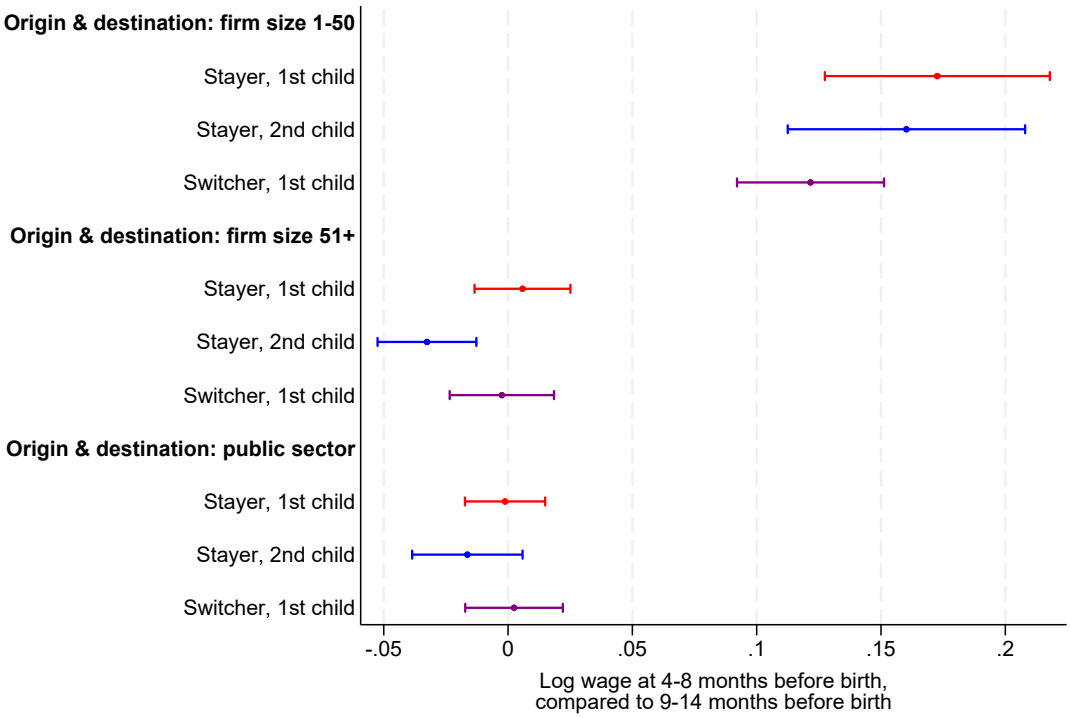
Figure 5: Distribution of Reported Earnings Before Childbirth, Latvia



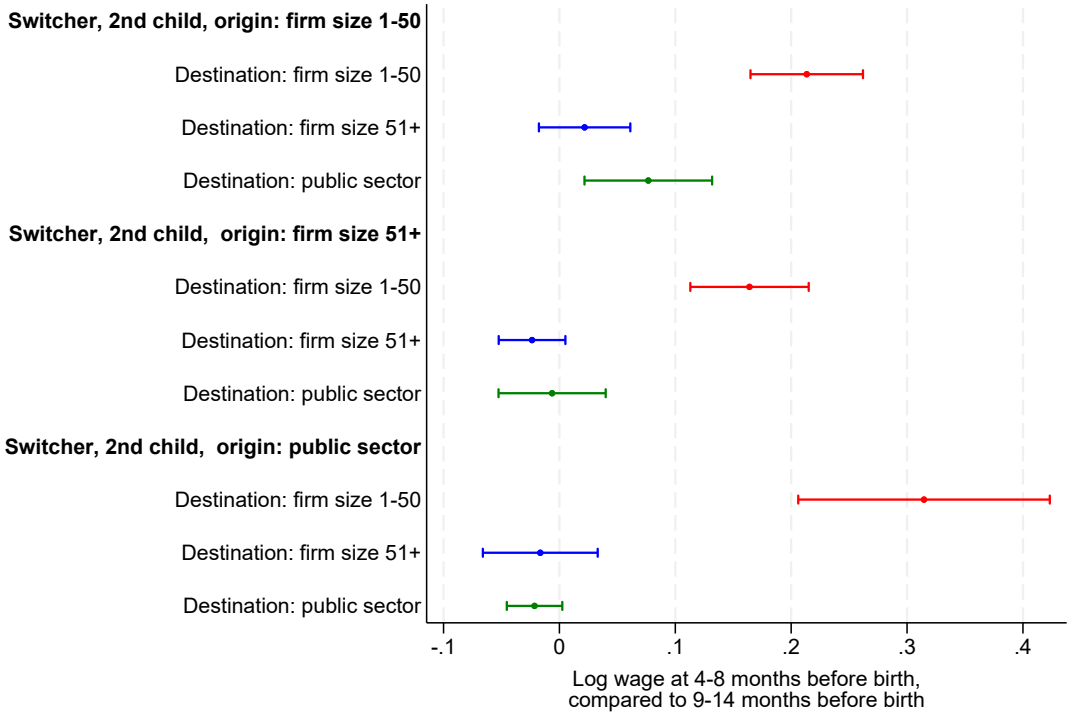
Note: Figure shows the distribution of reported earnings relative to the minimum wage 12 and 4 months before childbirth for births occurring after May 2005 in Latvia. Panels (a) and (b) display the distribution for small private firms (1–50 employees); panels (c) and (d) for large private firms (more than 50 employees); and panels (e) and (f) for the public sector. Panels (a), (c), and (e) present the distribution for the baseline sample; panels (b), (d), and (f) focus on women who experienced a large wage increase and are restricted to births occurring in 2005–2007, the period during which the parental benefit cap was in effect. This indicator equals one if the earnings change falls within the top 1% of the year-specific distribution of monthly earnings changes. The year-specific distributions were calculated using the full sample of women, excluding transitory earnings changes. Transitory earnings changes were defined as cases in which a large increase was preceded by another large increase or a decrease in the previous month, or followed by a decrease in the subsequent month. The benefit cap was 558 euros, which required monthly earnings of approximately 800 euros, corresponding to 7.03 minimum wages in 2005, 6.25 minimum wages in 2006, and 4.69 minimum wages in 2007. Sample sizes: panel (a) 4,271; panel (b) 1,031; panel (c) 6,599; panel (d) 902; panel (e) 3,726; panel (f) 742.

Figure 6: Reported Earnings Before Childbirth: First and Second Pregnancies, Latvia

(a) Stayers and First Pregnancies

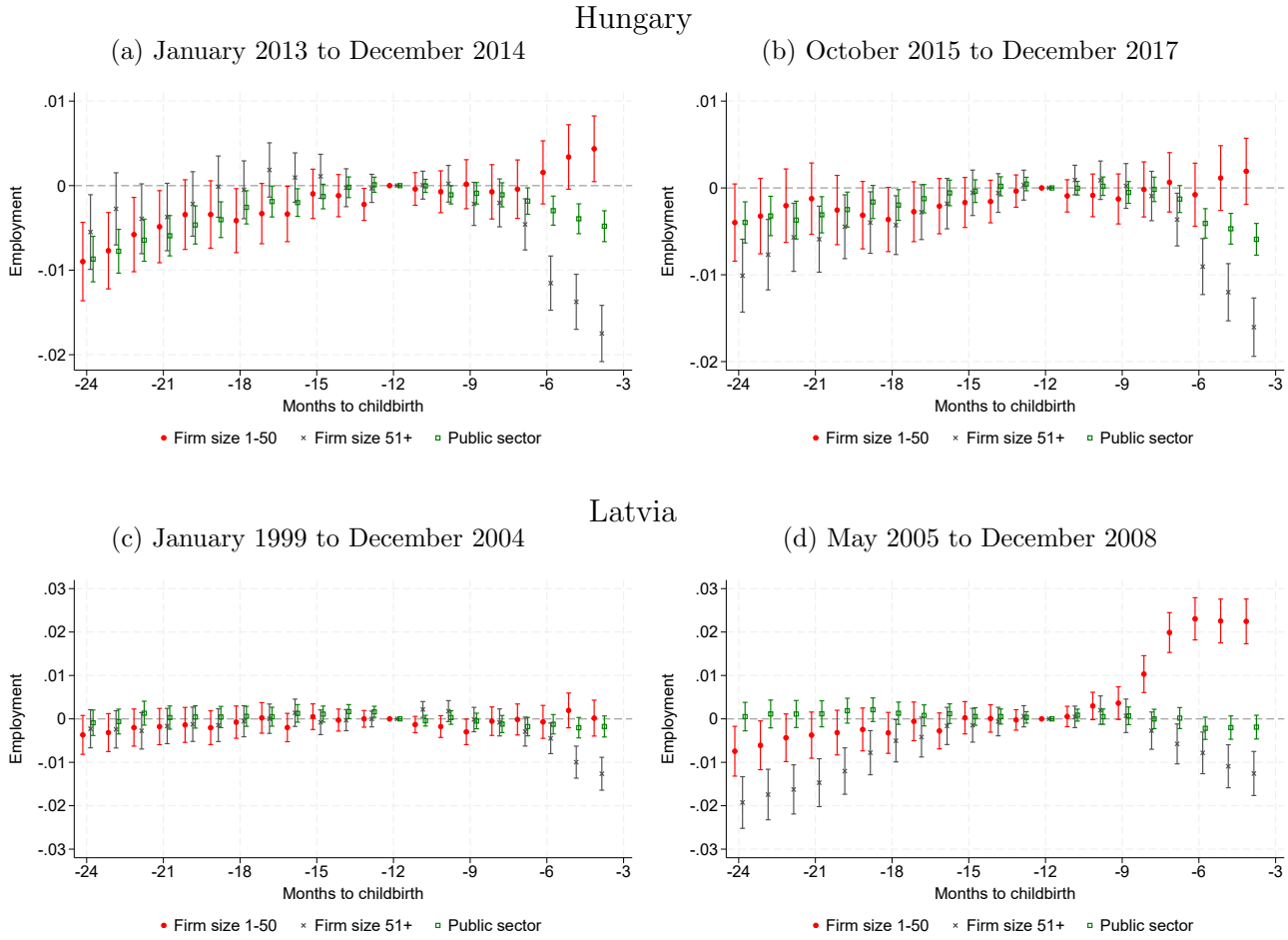


(b) Second Pregnancies



Note: Figure shows estimates of log monthly reported earnings at 4–8 months before childbirth relative to 9–14 months before childbirth for Latvian women who gave birth twice between January 1999 and December 2010, with at least 34 months between the two births. The sample is restricted to women who were employed 14 to 4 months before childbirth. Panel (a) shows stayers (women who did not change employer) during their first and second pregnancies, and movers (women who changed employer) during their first pregnancy, by employer type at the first birth. Panel (b) shows movers during their second pregnancy, by employer type at the first and second birth. Each result shows estimated $\hat{\beta}$ parameters and 95% confidence intervals from a modified version of equation (1), in which we replace the event time dummies with a binary indicator that equals one 8 to 4 months before birth, and zero 14 to 9 months before birth.

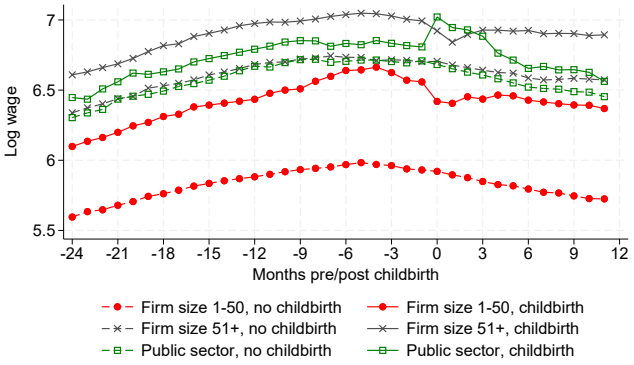
Figure 7: Reported Employment Before Childbirth



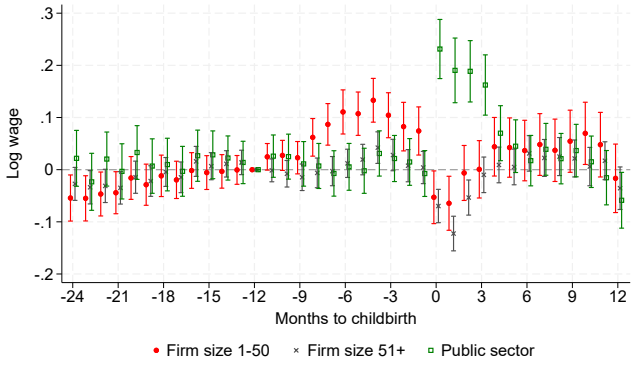
Note: Figure shows time patterns of employment before giving birth. Panel (a) shows estimates for births between January 2013 and December 2014 in Hungary. Panel (b) shows estimates for births between October 2015 and December 2017 in Hungary. Panel (c) shows estimates for births between January 1999 and December 2004 in Latvia. Panel (d) shows estimates for births between May 2005 and December 2008 in Latvia. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). Number of individuals in panel (a): 96,917. Number of individuals in panel (b): 91,855. Number of individuals in panel (c): 94,245. Number of individuals in panel (d): 66,001.

Figure 8: Reported Earnings of Men Around Childbirth, Latvia

(a) Descriptive



(b) Regression Estimates



Note: Figure shows time patterns of reported earnings of men around childbirth in Latvia. Red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees, green squares indicate public sector. In panel (a), dashed lines indicate the control group of men who did not receive parental benefit, and solid lines indicate men who did. Panel (b) shows estimated β parameters and 95% confidence intervals from equation (1). The sample consists of men receiving parental benefits for births occurring between July 2008 and August 2009. Number of individuals: no childbirth group – 2 079 for firm size 1-50, 2 098 for firm size 51+, 895 for public sector; childbirth group – 1 421 for firm size 1-50, 2 555 for firm size 51+, 1 096 for public sector.

Table 1: Contribution-Benefit Link

(a) Hungary

	Until December 2014			From January 2015		
	Baseline	Wage formalization		Baseline	Wage formalization	
		net wage constant	total cost constant		net wage constant	total cost constant
A: Increase in monthly wage items						
Gross wage	1.00	1.00	1.00	1.00	1.00	1.00
Total cost to employer	1.27	0.62	0.00	1.27	0.62	0.00
Net wage	0.66	0.00	-0.62	0.66	0.00	-0.62
PIT and SSC on wage	0.62	0.62	0.62	0.62	0.62	0.62
B: Increase in monthly benefit items						
Gross benefit	0.28	0.28	0.28	0.70	0.70	0.70
Net benefit	0.21	0.21	0.21	0.54	0.54	0.54
PIT and SSC on benefit	0.06	0.06	0.06	0.16	0.16	0.16
C: Total increase of wage items (6 months)						
Gross wage	*6.00*	*6.00*	*6.00*	*6.00*	*6.00*	*6.00*
Total cost to employer	7.62	3.69	0.00	7.62	3.69	0.00
Net wage	3.93	0.00	-3.69	3.93	0.00	-3.69
PIT and SSC on wage	3.69	3.69	3.69	3.69	3.69	3.69
D: Total increase of benefit items (24 months)						
Gross benefit	6.58	6.58	6.58	16.80	16.80	16.80
Net benefit	5.03	5.03	5.03	12.85	12.85	12.85
PIT and SSC on benefit	1.55	1.55	1.55	3.95	3.95	3.95
E: Overall gains and losses						
Employer	*-7.62*	*-3.69*	*0.00*	*-7.62*	*-3.69*	*0.00*
Employee (= Net wage + Net benefit)	*8.96*	*5.03*	*1.34*	*16.78*	*12.85*	*9.16*
Government (= PIT and SSC on wage - Net benefit)	*-1.34*	*-1.34*	*-1.34*	*-9.16*	*-9.16*	*-9.16*

(b) Latvia

	Until December 2004			From January 2005		
	Baseline	Wage formalization		Baseline	Wage formalization	
		net wage constant	total cost constant		net wage constant	total cost constant
A: Increase in monthly wage items						
Gross wage	1.00	1.00	1.00	1.00	1.00	1.00
Total cost to employer	1.24	0.56	0.00	1.24	0.56	0.00
Net wage	0.68	0.00	-0.56	0.68	0.00	-0.56
PIT and SSC on wage	0.56	0.56	0.56	0.56	0.56	0.56
B: Increase in monthly benefit items						
Gross benefit	0.24	0.24	0.24	0.45	0.45	0.45
Net benefit	0.24	0.24	0.24	0.45	0.45	0.45
PIT and SSC on benefit	–	–	–	–	–	–
C: Total increase of wage items (5 months)						
Gross wage	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
Total cost to employer	6.20	2.79	0.00	6.20	2.79	0.00
Net wage	3.41	0.00	-2.79	3.41	0.00	-2.79
PIT and SSC on wage	2.79	2.79	2.79	2.79	2.79	2.79
D: Total increase of benefit items (14.1 months)						
Gross benefit	3.44	3.44	3.44	6.36	6.36	6.36
Net benefit	3.44	3.44	3.44	6.36	6.36	6.36
PIT and SSC on benefit	–	–	–	–	–	–
E: Overall gains and losses						
Employer	*-6.20*	*-2.79*	*0.00*	*-6.20*	*-2.79*	*0.00*
Employee (= Net wage + Net benefit)	*6.86*	*3.44*	*0.65*	*9.77*	*6.36*	*3.57*
Government (= PIT and SSC on wage - Net benefit)	*-0.65*	*-0.65*	*-0.65*	*-3.57*	*-3.57*	*-3.57*

Note: Table shows the costs and benefits associated with a 1 dollar increase in an employee's monthly gross wage in months where pregnancy overlaps with the benefit qualification period: the first six months of pregnancy in Hungary and the first five in Latvia. The first three columns show costs and benefits under the pre-reform systems (until December 2014 in Hungary and December 2004 in Latvia). In Hungary, under the pre-reform system, the benefit calculation window was the calendar year preceding the receipt of the benefit. For example, for a woman who gave birth on April 1, 2014, the reference period was January to December 2013. The effect of an increase in gross wage on benefits depended on the month of birth, and here we show the average effect. Appendix Table A1 shows the calculation in detail. In Latvia, the maternity benefit calculation window was six months ending two months before benefit entitlement, i.e., approximately four months before childbirth (see Figure 1 note for details), and therefore included approximately five months of pregnancy. The last three columns show costs and benefits under the post-reform systems (from January 2015 for Hungary and January 2005 for Latvia). In Hungary, the benefit calculation window was changed to the six-month period between nine and four months before birth. For example, for a woman who gave birth on April 1, 2016, the reference period was July to December 2015. In Latvia, a new wage-dependent parental benefit was introduced, based on earnings over the 12 months ending three months before childbirth (excluding the birth month), thus covering approximately five months of pregnancy (see Figure 1 note for details). The first and fourth columns show a baseline scenario with no income tax evasion. The second and fifth 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. The third and sixth columns show a scenario with income tax evasion where the additional taxes triggered by the gross wage increase are fully borne by the employee, while labor costs to the employer remain unchanged. Panel (a) considers the increase in monthly wage items associated with a $1 increase in gross monthly wage. Panel (b) considers the increase in monthly benefit items. For Latvia, to ensure comparability before and after the reform, we calculate the average monthly increase over a 14.1-month period in both cases (i.e., 4.1 months of maternity benefit plus 10 months of parental benefit). Panel (c) considers the total increase in wage items during six months of pregnancy in Hungary and five months in Latvia. Panel (d) considers the increase in benefit items, aggregated over the months during which benefits are received. Panel (e) considers the overall impact on employers, employees, and the government.

Table 2: Summary Statistics

(a) Hungary

	Women never giving birth Placebo childbirth		Women giving birth Childbirth	
	Jan 2013 to Dec 2014	Oct 2015 to Dec 2017	Jan 2013 to Dec 2014	Oct 2015 to Dec 2017
Age	31.3	30.9	30.3	30.3
Employed in private sector	0.741	0.719	0.709	0.702
Lives in Budapest	0.215	0.215	0.247	0.237
Private sector workers				
Weekly working hours	38.0	38.2	38.7	38.5
Firm size category				
1-50	0.402	0.406	0.442	0.470
51+	0.598	0.594	0.558	0.530
Wage relative to minimum wage				
1-1.49	0.373	0.346	0.270	0.316
1.5-1.99	0.203	0.177	0.186	0.155
2+	0.423	0.477	0.544	0.529
Occupation				
Manager, political	0.057	0.057	0.063	0.063
Professional	0.143	0.163	0.221	0.218
Other white collar	0.437	0.450	0.534	0.523
Skilled blue collar	0.220	0.195	0.146	0.161
Assembler, machine operator	0.082	0.073	0.017	0.011
Unskilled	0.061	0.062	0.018	0.025
Industry				
Agriculture	0.011	0.014	0.012	0.012
Manufacturing, construction	0.269	0.272	0.229	0.227
Trade	0.237	0.218	0.216	0.222
Accommodation, food	0.047	0.044	0.032	0.041
Transportation, storage	0.073	0.075	0.079	0.065
Services	0.363	0.377	0.432	0.432
Number of individuals	18,281	16,828	8,137	9,322

(b) Latvia

	Women never giving birth Placebo childbirth		Women giving birth Childbirth	
	Jan 1999 to Dec 2004	May 2005 to Dec 2008	Jan 1999 to Dec 2004	May 2005 to Dec 2008
Age	26.8	26.3	26.3	26.4
Employed in private sector	0.702	0.757	0.708	0.745
Private sector workers				
Firm size category				
1-50	0.391	0.407	0.402	0.384
51+	0.609	0.593	0.598	0.616
Wage relative to minimum wage				
≤ 1	0.267	0.156	0.243	0.130
1-1.49	0.178	0.164	0.166	0.144
1.5-1.99	0.116	0.104	0.103	0.093
2+	0.439	0.576	0.487	0.634
Number of individuals	12,026	9,655	18,043	15,646

Note: Table shows descriptive statistics for the baseline sample. Panel (a) shows descriptive statistics for Hungary. 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 between 2003 and 2017 who are assigned a placebo date of birth between ages 20 and 40 and calendar years 2012 and 2017. The baseline 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 24 months to 4 months before giving birth or before the placebo date of birth. Summary statistics are calculated 12 months before the (placebo) childbirth. Panel (b) shows descriptive statistics for Latvia. The sample of mothers is restricted to women who gave birth between ages 20 and 40 in the 1999-2008 period. The control group includes women who did not give birth between 1997 and 2008 who are assigned a placebo date of birth between ages 20 and 40 and calendar years 1999 and 2008. The baseline sample also limits to women with non-missing wage records each month between 24 months to 4 months before giving birth or before the placebo date of birth.

Table 3: Implied Semi-Elasticity

(a) Hungary

	January 2013 to December 2014	October 2015 to December 2017
A: Increase in total net benefit as a ratio of an increased total wage during 6 months of pregnancy	0.84	2.14
B: Average increase in wage in 8 to 4 months before birth, firm size 1–50	1.6% (SE 0.3)	5.2% (SE 0.4)
Semi-elasticity (B/A)	1.90%	2.43%

(b) Latvia

	January 1999 to December 2004	May 2005 to December 2008
A: Increase in total net benefit as a ratio of an increased total wage during 5 months of pregnancy	0.69	1.27
B: Average increase in wage in 8 to 4 months before birth, firm size 1–50	10.2% (SE 0.8)	21.0% (SE 1.1)
Semi-elasticity (B/A)	14.8%	16.5%

Note: Table shows the semi-elasticities implied by our estimates. The total net benefit increase as a ratio of total wage increase comes from row D divided by row C of Table 1 – these numbers consider the increase in benefit items, aggregated over the months during which benefits are received. For further details on their calculation, see the notes of Table 1. The estimates on the wage increases are based on a modified version of equation (1), in which we replace the event time dummies with a binary indicator that equals one 8 to 4 months before birth, and zero 24 to 9 months before birth, and interact this binary indicator with giving birth ever. The percentage increase is calculated as $(exp(\beta) - 1) \times 100$, where β is the coefficient of the interaction term between the binary indicator of 8–4 months before birth and giving birth ever.

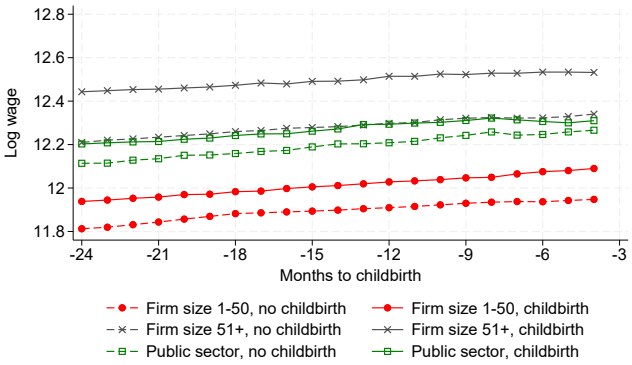
Online Appendix

Additional Figures and Tables

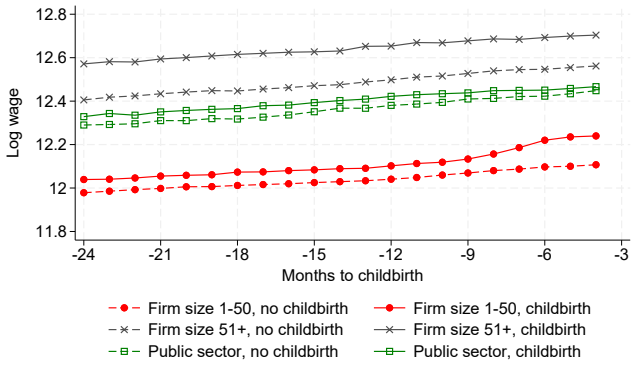
Appendix Figure A1: Reported Earnings Before Childbirth

Hungary

(a) January 2013 to December 2014

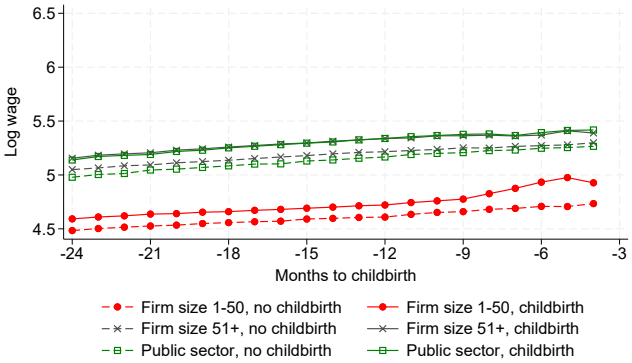


(b) October 2015 to December 2017

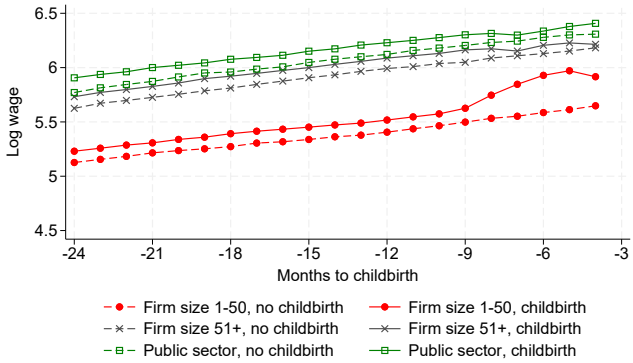


Latvia

(c) January 1999 to December 2004

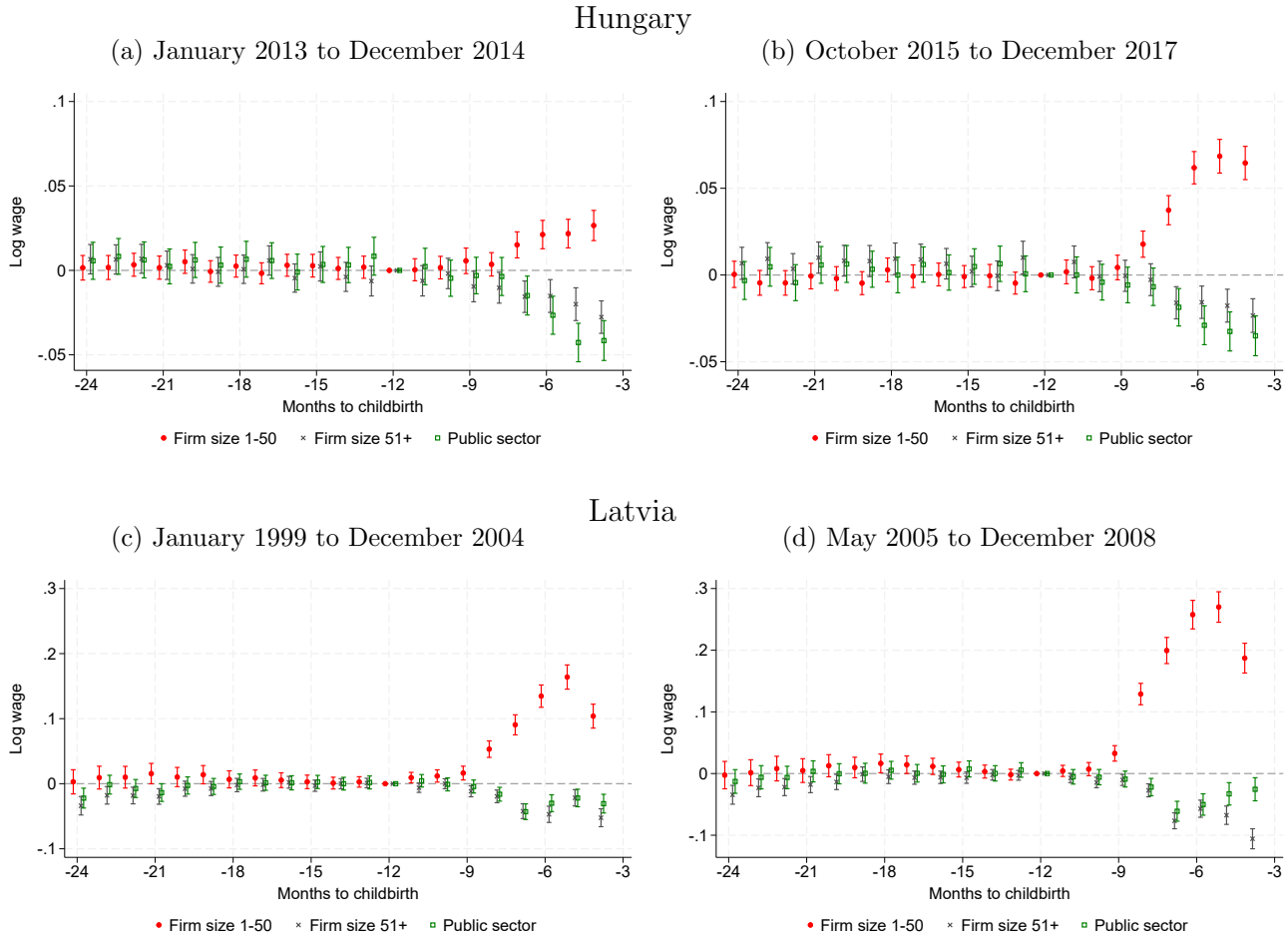


(d) May 2005 to December 2008



Note: Figure shows time patterns of reported earnings before giving birth. In all panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees, green squares indicate public sector. Dashed lines indicate the control group of women who did not give birth and solid lines indicate mothers. Number of individuals in panel (a): no childbirth group – 5 583 for firm size 1-50, 8 323 for firm size 51+, 4 375 for public sector; childbirth group – 2 634 for firm size 1-50, 3 300 for firm size 51+, 2 203 for public sector. Number of individuals in panel (b): no childbirth group – 5 018 for firm size 1-50, 7 324 for firm size 51+, 4 485 for public sector; childbirth group – 3 150 for firm size 1-50, 3 546 for firm size 51+, 2 626 for public sector. Number of individuals in panel (c): no childbirth group – 3 317 for firm size 1-50, 5 130 for firm size 51+, 3 579 for public sector; childbirth group – 5 152 for firm size 1-50, 7 634 for firm size 51+, 5 257 for public sector. Number of individuals in panel (d): no childbirth group – 2 987 for firm size 1-50, 4 325 for firm size 51+, 2 343 for public sector; childbirth group – 4 494 for firm size 1-50, 7 176 for firm size 51+, 3 976 for public sector.

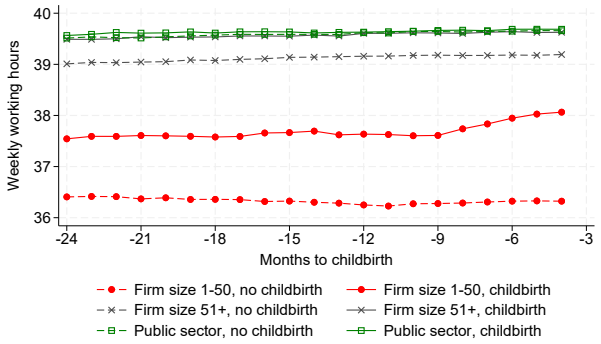
Appendix Figure A2: Reported Earnings Before Childbirth—Estimation Allowing for Treatment Effect Heterogeneity



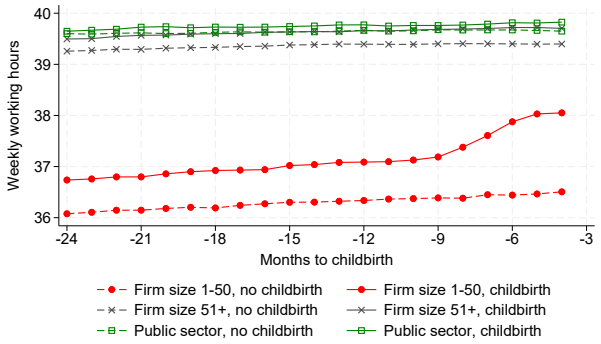
Note: Figure shows time patterns of reported earnings before giving birth, using the estimator of Sun and Abraham (2021), implemented with Stata package Sun (2021). Panel (a) shows estimates for births between January 2013 and December 2014 in Hungary. Panel (b) shows estimates for births between October 2015 and December 2017 in Hungary. Panel (c) shows estimates for births between January 1999 and December 2004 in Latvia. Panel (d) shows estimates for births between May 2005 and December 2008 in Latvia. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). Number of individuals in panel (a): 8,217 for firm size 1-50, 11,623 for firm size 51+, and 6,578 for the public sector. Number of individuals in panel (b): 8,168 for firm size 1-50, 10,870 for firm size 51+, and 7,111 for the public sector. Number of individuals in panel (c): 8,469 for firm size 1-50, 12,764 for firm size 51+, and 8,836 for the public sector. Number of individuals in panel (d): 7,481 for firm size 1-50, 11,501 for firm size 51+, and 6,319 for the public sector.

Appendix Figure A3: Reported Working Hours Before Childbirth, Hungary

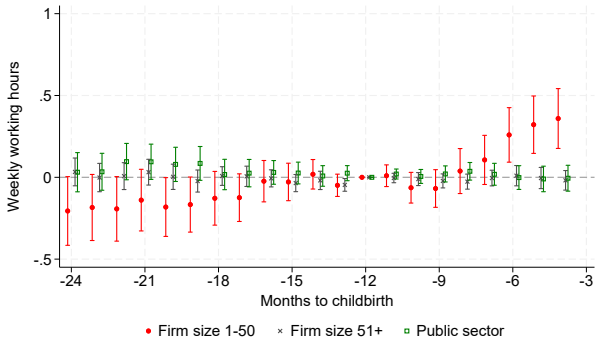
(a) Descriptive, January 2013 to December 2014



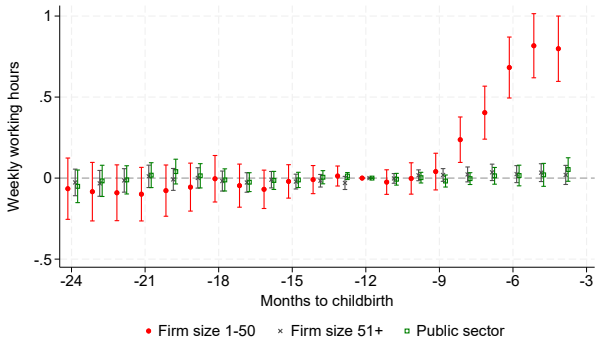
(b) Descriptive, October 2015 to December 2017



(c) Regression Estimates, January 2013 to December 2014

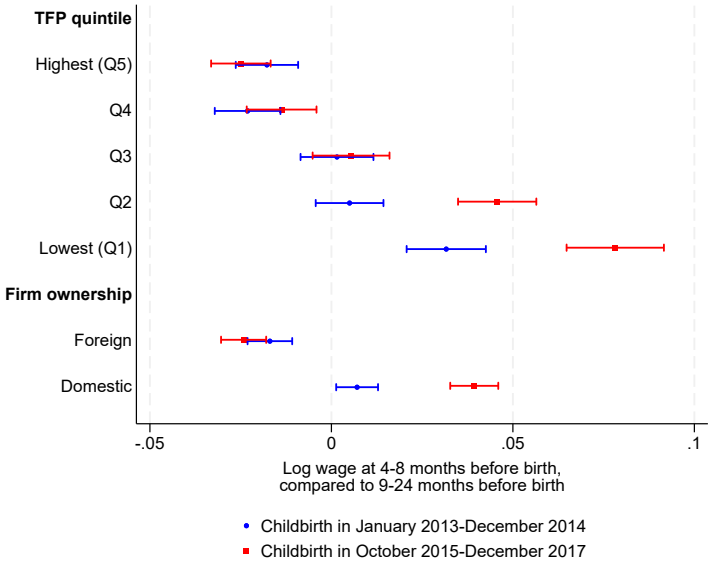


(d) Regression Estimates, October 2015 to December 2017



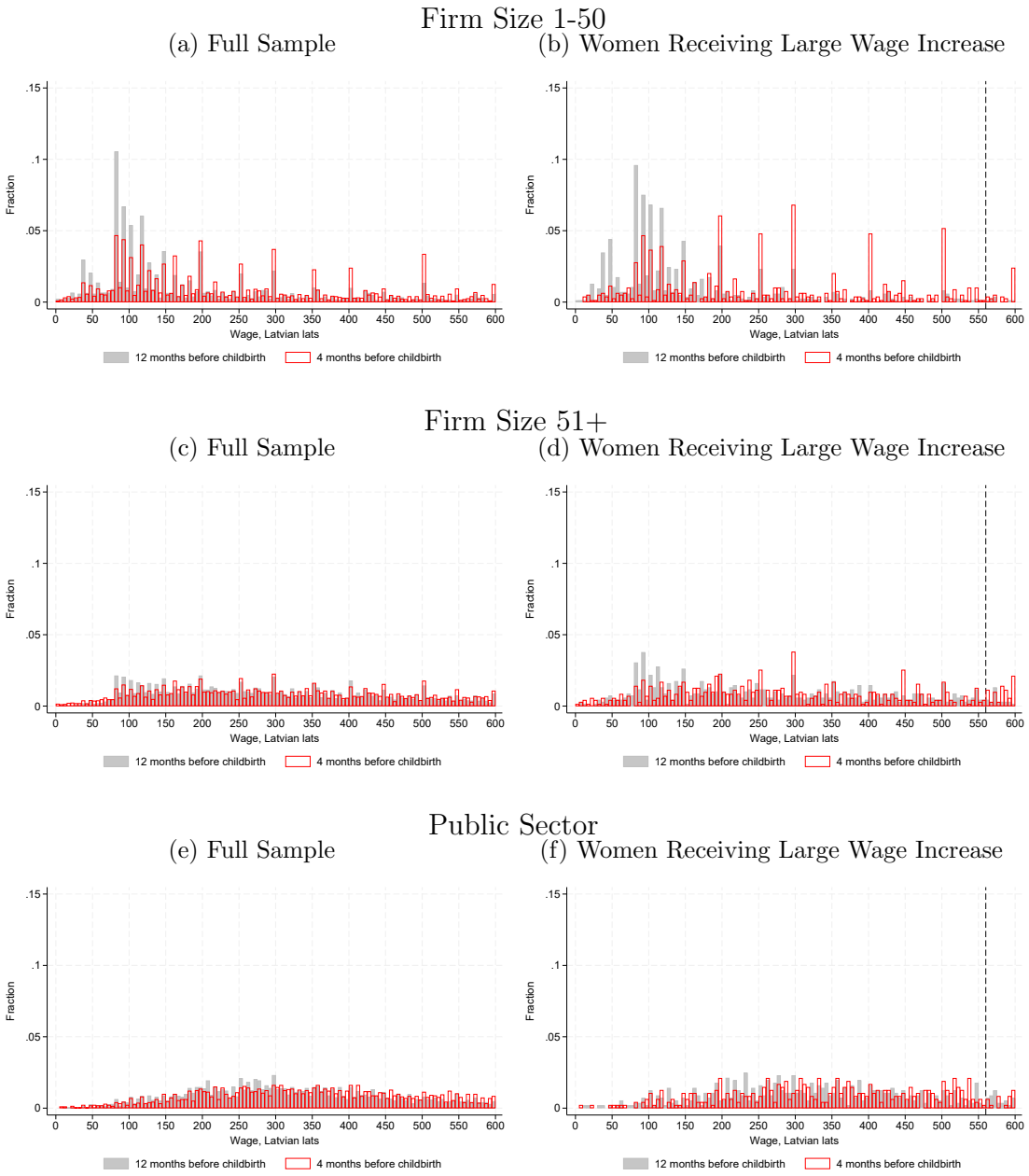
Note: Figure shows time patterns of weekly working hours before giving birth. In all panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees, green squares indicate public sector. Dashed lines indicate the control group of women who did not give birth and solid lines indicate mothers. Panels (c) and (d) show estimated β parameters and 95% confidence intervals from equation (1). Number of individuals in panels (a) and (c): no childbirth group – 7 234 for firm size 1-50, 10 503 for firm size 51+, 5 641 for public sector; childbirth group – 2 611 for firm size 1-50, 3 295 for firm size 51+, 2 201 for public sector. Number of individuals in panel (b) and (d): no childbirth group – 5 041 for firm size 1-50, 7 370 for firm size 51+, 4 532 for public sector; childbirth group – 3 144 for firm size 1-50, 3 540 for firm size 51+, 2 624 for public sector.

Appendix Figure A4: Reported Earnings Before Childbirth—Heterogeneity, Additional Results for Hungary



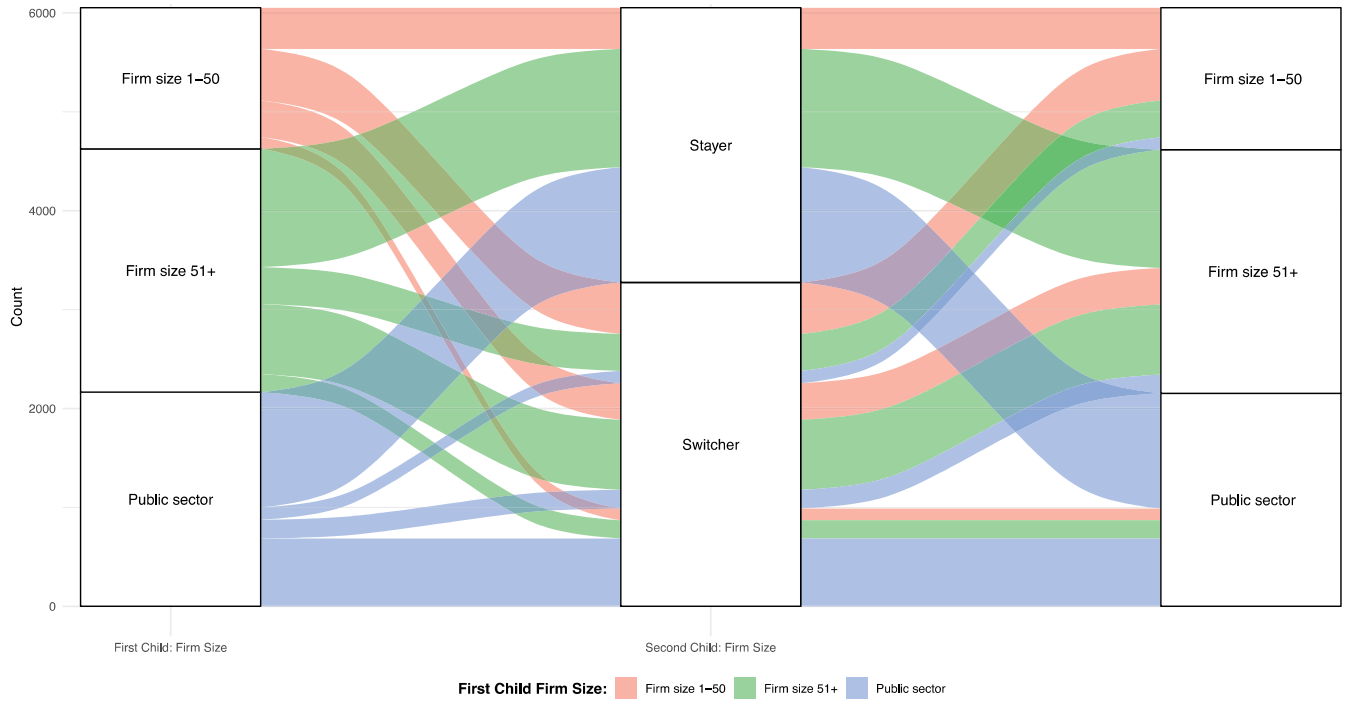
Note: Figure shows heterogeneity in the change in reported earnings before giving birth by firm characteristics for Hungary. Blue circles denote the period before reporting incentives were strengthened (childbirths between January 2013 and December 2014) and red squares denote the period after reporting incentives were strengthened (childbirths between October 2015 and December 2017). Each result shows estimated β parameters and 95% confidence intervals from a modified version of equation (1), in which we replace the event time dummies with a binary indicator that equals on 8 to 4 months before birth, and zero 24 to 9 months before birth. 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). Foreign ownership indicates at least 50% foreign ownership of the firm's capital. The heterogeneity indicators refer to twelve months before giving birth

Appendix Figure A5: Distribution of Reported Earnings Before Childbirth, Latvia (in Latvian lats)



Note: Figure shows the distribution of reported earnings 12 and 4 months before childbirth for births occurring after May 2005 in Latvia. Panels (a) and (b) display the distribution for small private firms (1–50 employees); panels (c) and (d) for large private firms (more than 50 employees); and panels (e) and (f) for the public sector. Panels (a), (c), and (e) present the distribution for the baseline sample; panels (b), (d), and (f) focus on women who experienced a large wage increase and are restricted to births occurring in 2005–2007, the period during which the parental benefit cap was in effect. This indicator equals one if the earnings change falls within the top 1% of the year-specific distribution of monthly earnings changes. The year-specific distributions were calculated using the full sample of women, excluding transitory earnings changes. Transitory earnings changes were defined as cases in which a large increase was preceded by another large increase or a decrease in the previous month, or followed by a decrease in the subsequent month. Wages are reported in Latvian lats (the currency in use during the sample period) to highlight spikes at round-number values. The fixed exchange rate was 0.7028 lats per 1 euro. The vertical dashed line in panels (b), (d), and (f) indicates the wage level required to reach the parental benefit cap between 2005 and 2007. The cap was 558 euros, which required monthly earnings of approximately 800 euros (562 lats). The maximum value on the x-axis, 600 lats, corresponds to 7.5 minimum wages in 2005, 6.7 minimum wages in 2006 and 5 minimum wages in 2007. Sample sizes: panel (a) 4,088; panel (b) 1,015; panel (c) 6,105; panel (d) 850; panel (e) 3,394; panel (f) 682.

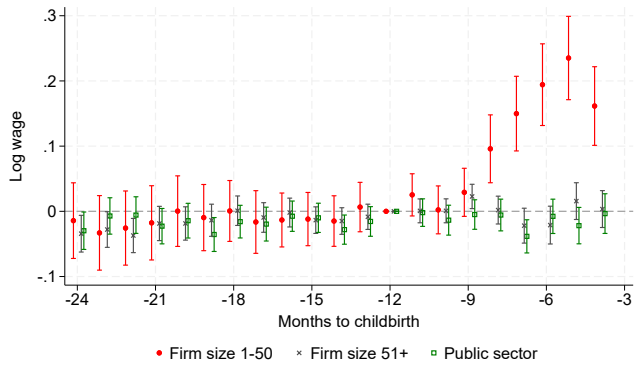
Appendix Figure A6: Labor Market Transitions Between First and Second Pregnancies, Latvia



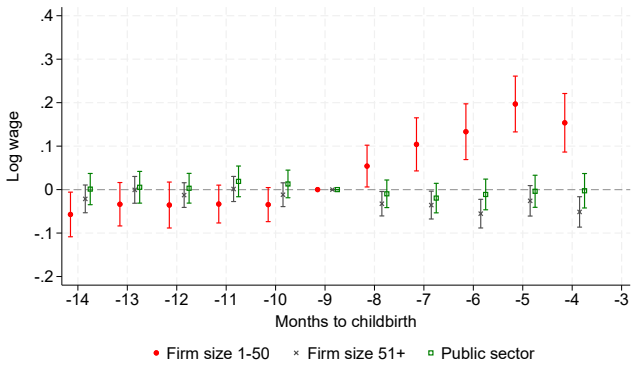
Note: Figure shows labor market transitions between the first and second pregnancies for Latvian women who gave birth twice between January 1999 and December 2010, with at least 34 months between the two births. The sample is restricted to women who were employed 14 to 4 months before childbirth. The flows indicate transitions across employer types—small firms (1–50 employees), large firms (51+ employees), and the public sector—between the first and second births. Stayers are women who remained with the same employer, while switchers are women who changed employer.

Appendix Figure A7: Reported Earnings Before Childbirth: First and Second Pregnancies, Latvia

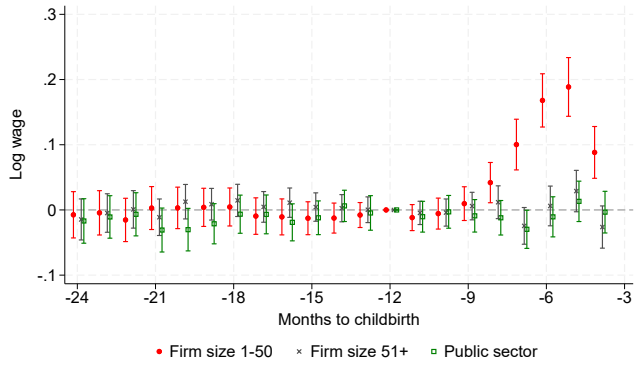
(a) Same: First



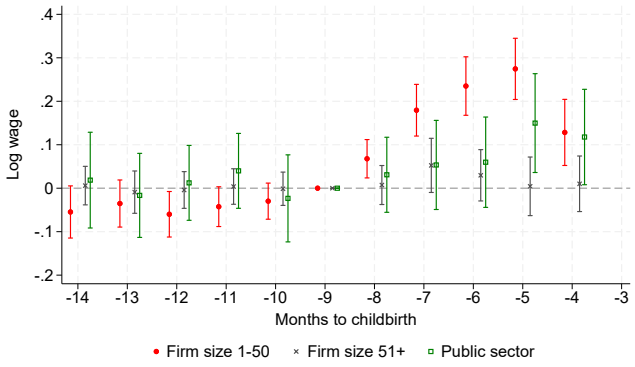
(b) Same: Second



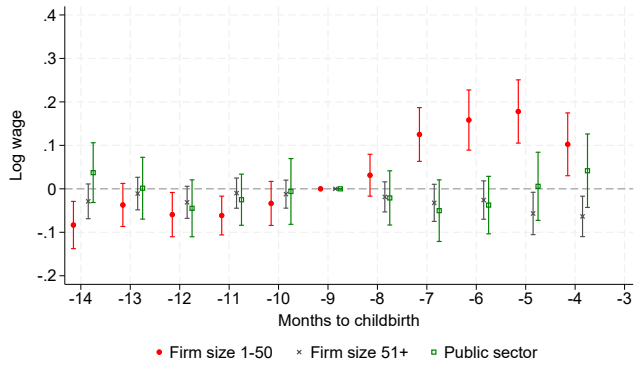
(c) Switch: First



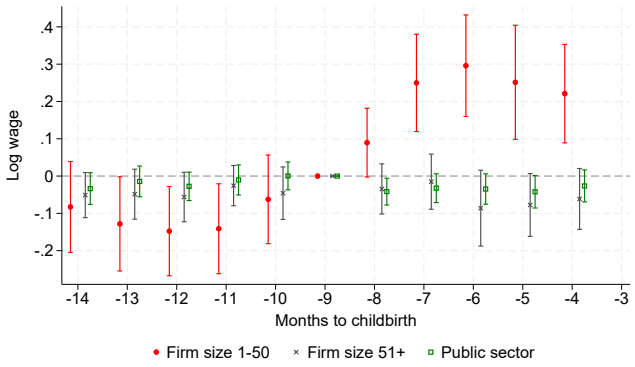
(d) Switch: Second, Origin Small



(e) Switch: Second, Origin Large



(f) Switch: Second, Origin Public

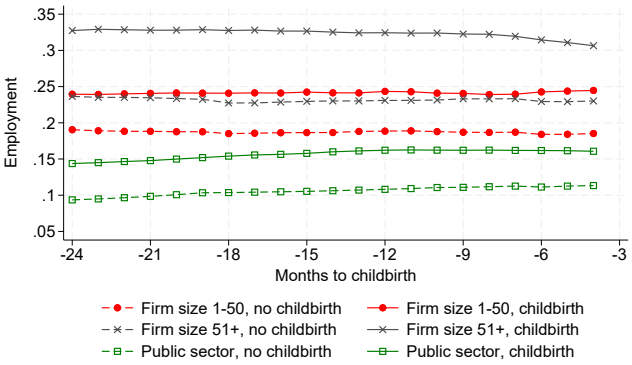


Note: Figure shows event–study estimates of log monthly reported earnings before childbirth for Latvian women who gave birth twice between January 1999 and December 2010, with at least 34 months between the two births. The sample is restricted to women who were continuously employed 14 to 4 months before childbirth. Panel (a) shows women who remained with the same employer during their first pregnancy; panel (b) shows the same group during their second pregnancy. Panel (c) displays the first pregnancy of women who switched employer between births, while panels (d)–(f) show their second pregnancy by employer type at the first birth - small firms, large firms, and the public sector, respectively. Each panel shows estimated $\hat{\beta}$ parameters and 95% confidence intervals from equation (1). Standard errors are clustered at the individual level. Number of individuals in panel (a): 6,720 (firm size 1–50), 10,651 (firm size 51+), 7,087 (public sector); number of individuals in panel (b): 1,552 (firm size 1–50), 2,757 (firm size 51+), 2,019 (public sector); number of individuals in panel (c): 7,314 (firm size 1–50), 10,720 (firm size 51+), 6,922 (public sector); number of individuals in panel (d): 1,657 (firm size 1–50), 1,931 (firm size 51+), 973 (public sector); number of individuals in panel (e): 1,509 (firm size 1–50), 2,269 (firm size 51+), 1,038 (public sector); number of individuals in panel (f): 1,261 (firm size 1–50), 1,750 (firm size 51+), 1,540 (public sector).

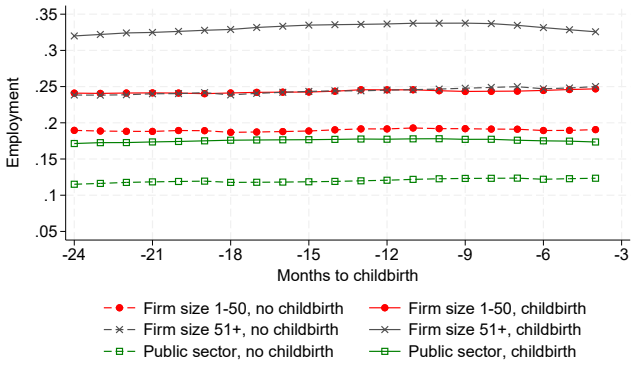
Appendix Figure A8: Employment Before Childbirth

Hungary

(a) January 2013 to December 2014

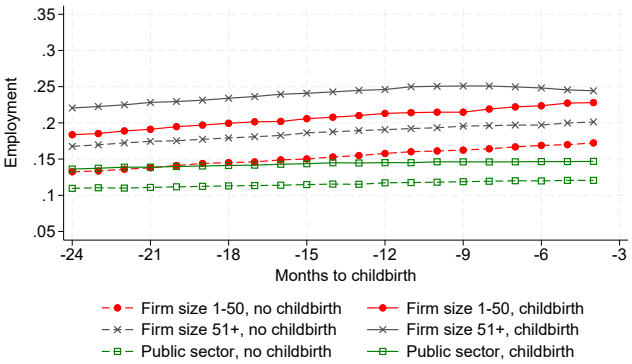


(b) October 2015 to December 2017

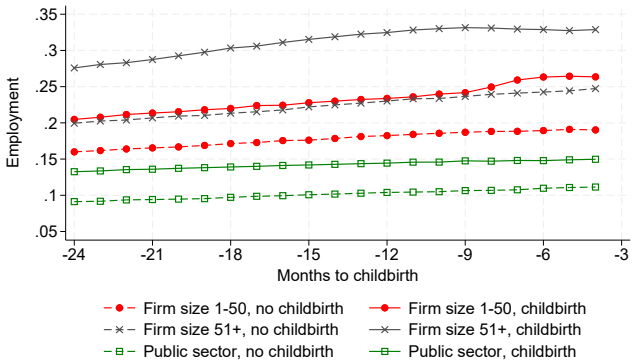


Latvia

(c) January 1999 to December 2004



(d) May 2005 to December 2008

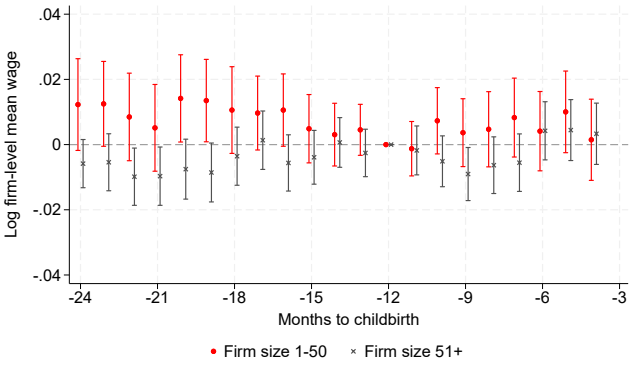


Note: Figure shows time patterns of employment before giving birth. In all panels, red circles indicate smaller firms with 1 to 50 employees and gray crosses indicate larger firms with more than 50 employees, green squares indicate public sector. Dashed lines indicate the control group of women who did not give birth and solid lines indicate mothers. Number of individuals in panel (a): no childbirth group – 64 861; childbirth group – 32 180. Number of individuals in panel (b): no childbirth group – 56 631; childbirth group – 35 321. Number of individuals in panel (c): no childbirth group – 45 275; childbirth group – 48 970. Number of individuals in panel (d): no childbirth group – 32 216; childbirth group – 33 785.

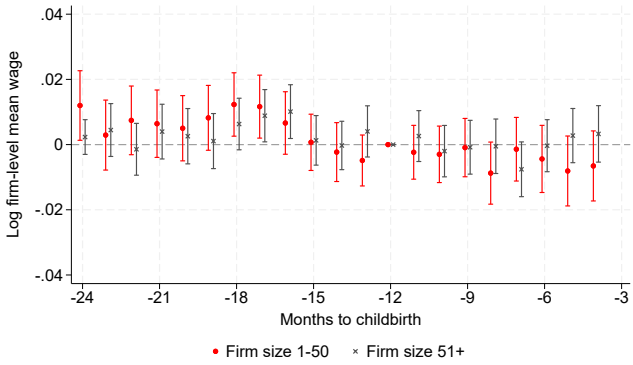
Appendix Figure A9: Firm-Level Mean Wage Before Childbirth

Hungary

(a) January 2013 to December 2014

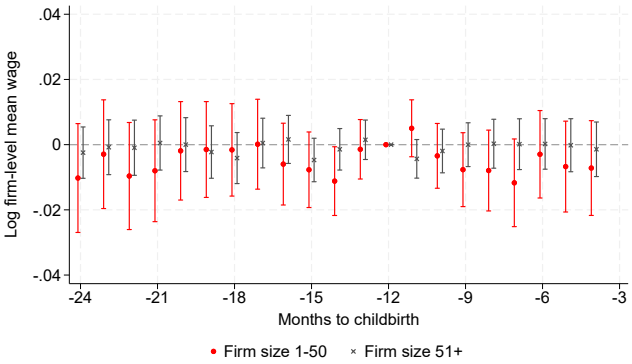


(b) October 2015 to December 2017

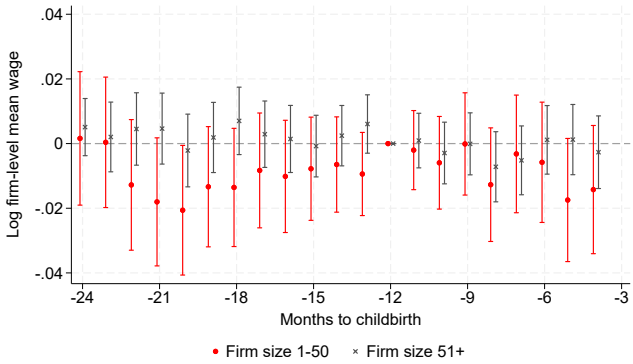


Latvia

(c) January 1999 to December 2004



(d) May 2005 to December 2008

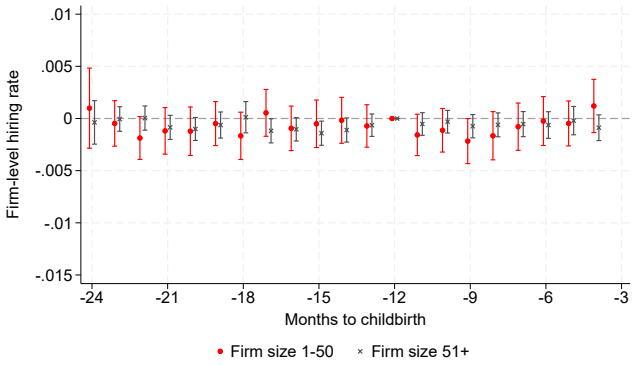


Note: Figure shows time patterns of leave-out mean of firm-level wage before giving birth. Panel (a) shows estimates for births between January 2013 and December 2014 in Hungary. Panel (b) shows estimates for births between October 2015 and December 2017 in Hungary. Panel (c) shows estimates for births between January 1999 and December 2004 in Latvia. Panel (d) shows estimates for births between May 2005 and December 2008 in Latvia. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). Sample is restricted to women who did not switch firms between event time -24 to -4. Number of individuals in panel (a): 6 272 for firm size 1-50 and 10 718 for firm size 51+; panel (b): 6 325 for firm size 1-50 and 10 023 for firm size 51+; panel (c): 5 284 for firm size 1-50 and 9 318 for firm size 51+; panel (d): 4 072 for firm size 1-50 and 7 223 for firm size 51+.

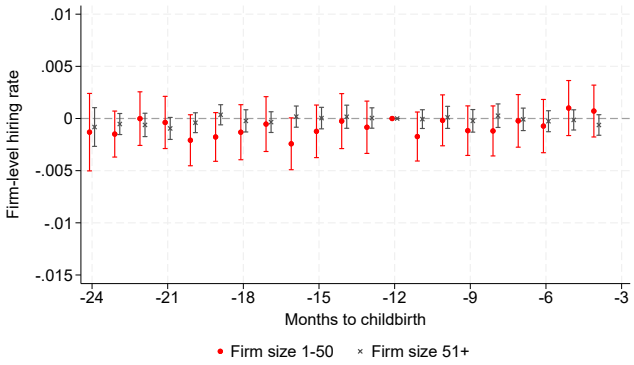
Appendix Figure A10: Firm-Level Hiring Rate Before Childbirth

Hungary

(a) January 2013 to December 2014

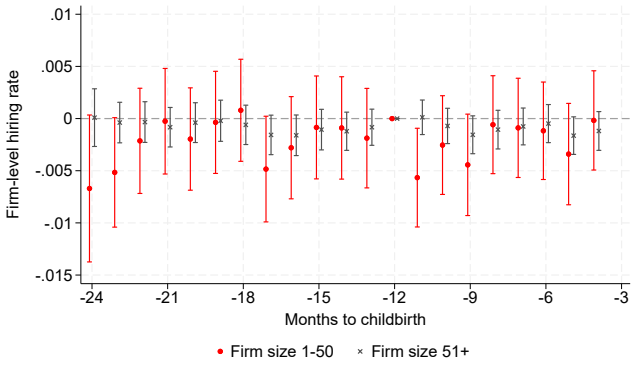


(b) October 2015 to December 2017

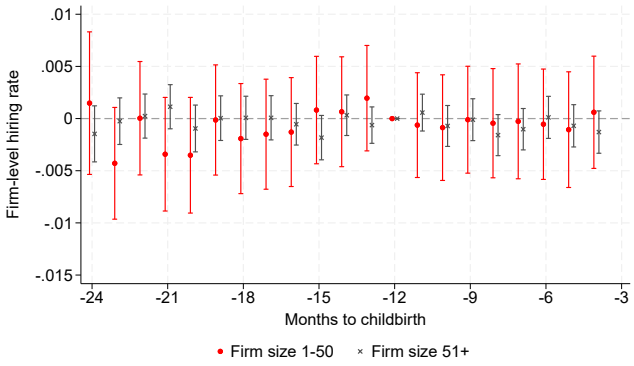


Latvia

(c) January 1999 to December 2004



(d) May 2005 to December 2008



Note: Figure shows monthly firm-level hiring rates. Panel (a) shows estimates for births between January 2013 and December 2014 in Hungary. Panel (b) shows estimates for births between October 2015 and December 2017 in Hungary. Panel (c) shows estimates for births between January 1999 and December 2004 in Latvia. Panel (d) shows estimates for births between May 2005 and December 2008 in Latvia. Each panel shows estimated β parameters and 95% confidence intervals from equation (1). Sample is restricted to women who did not switch firms between event time -24 to -4. Number of individuals in panel (a): 7 203 for firm size 1-50 and 10 718 for firm size 51+; panel (b): 7 191 for firm size 1-50 and 10 024 for firm size 51+; panel (c): 5 319 for firm size 1-50 and 9 318 for firm size 51+; panel (d): 4 090 for firm size 1-50 and 7 223 for firm size 51+.

Appendix Table A1: Benefit Response by Month of Birth in Hungary in the Pre-Reform Period

Birth month	Overlapping months Maternity leave	Overlapping months Parental and home care leave
January	6	6
February	6	6
March	6	6
April	5.5	5.5
May	4.5	4.5
June	3.5	3.5
July	2.5	2.5
August	1.5	1.5
September	0.5	0.5
October	0	11.08
November	0	9.6
December	0	8.47
Average	3	5.43
Increase in monthly benefit items		
Gross	0.175	0.317
Gross (weighted) average	0.281	
Net	0.147	0.234
Net (weighted) average	0.213	

Note: Table shows by birth month the number of months in the benefit qualification period (the previous calendar year) that overlapped with the first six months of term pregnancies in Hungary before the policy change (top panel) and the implied average increase in benefits (bottom panel). The reference period for calculating both maternity leave and parental and home care leave benefits was the calendar year preceding the start of benefit receipt. Special regulations applied when the mother had not worked at least 180 days during that year. Paid maternity leave starts up to four weeks before birth. For example, a woman giving birth on April 1 had a reference period of January–December of the previous year, which completely overlapped with the first six months of her pregnancy. A woman giving birth on October 1 had no overlap between pregnancy and the reference year. Assuming births are uniformly distributed across the year and accounting for partial months, the average overlap between the reference period and the first six pregnancy months was about three months. Paid parental and home care leave starts 24 weeks after starting maternity leave. For women giving birth in the first half of a year, the reference period was again the previous year, resulting in a gradually decreasing overlap with early pregnancy months. For births in the second half of a year, the reference period is the same year and we assume that the woman worked during pregnancy months 1–6, then took sick leave or exited employment during months 7–9. Hence, a woman who gave birth on October 1 was assumed to be in employment in the first half of the year, meaning that in principle earnings could be fully adjusted before parental and home care leave calculation. Slightly less relative adjustment was possible for births later in the fourth quarter. For instance, for an average birth in December, we assume an adjustment of 6 months over 8.5 months of employment, i.e., $6/8.5 \times 12 = 8.47$ annualized months. Special regulations applied for births in the third quarter because, then, the woman did not work at least 180 days in the reference year according to our assumptions. These calculations are illustrative and intended to demonstrate the logic of reference-period overlap before the policy change. The bottom panel shows the corresponding average increase in monthly benefit items, e.g., $3/12 \times 0.7 = 0.175$ for paid maternity leave. We take into account that paid maternity leave is received for 6 months (25% of the overall duration) and paid parental and home care leave for 18 months (75% of the duration), hence the average monthly gross increase is $0.175 \times 0.25 + 0.317 \times 0.75 = 0.281$. Paid maternity leave is subject to the 16% PIT and is exempt from SSC, while parental and home care leave is subject to a 26% effective tax rate (16% PIT and a reduced 10% SSC rate).

Appendix Table A2: Government Costs Associated With the Wage Response

(a) Hungary

	January 2013 to December 2014	October 2015 to December 2017
Monthly average wage unit	1.00	1.00
Net government loss per childbirth	0.02	0.48
Total gross benefit amount per childbirth	14.0	14.0
Ratio of net government loss and total benefit	0.2%	3.4%

(b) Latvia

	January 1999 to December 2004	May 2005 to December 2008
Monthly average wage unit	1.00	1.00
Net government loss per childbirth	0.07	0.75
Total gross benefit amount per childbirth	4.1	11.1
Ratio of net government loss and total benefit	1.6%	6.7%

Note: Table shows a rough estimation of the government costs of the wage response measured in the unit of the monthly average wage. Net government loss per childbirth is given by multiplying the "government" row of panel (e) of Table 1 with the wage response of panel B of Table 3. The total gross benefit amount per childbirth is calculated using the benefit payment regulations, in Hungary also taking into account the benefit cap (for details see Figure 1). The ratio is calculated by the division of the two terms.