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DOCUMENTOS DE TRABAJO

The Last Hurdle? Unyielding Motherhood Effects in the Context of Declining Gender Inequality in Latin America

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Documento de Trabajo Nro. 321
Noviembre, 2023
ISSN 1853-0168
www.cedlas.econo.unlp.edu.ar

Cita sugerida: Marchionni, M. y J. Pedrazzi (2023). The Last Hurdle? Unyielding Motherhood Effects in the Context of Declining Gender Inequality in Latin America. Documentos de Trabajo del CEDLAS Nº 321, Noviembre, 2023, CEDLAS-Universidad Nacional de La Plata.

The Last Hurdle? Unyielding Motherhood Effects in the Context of Declining Gender Inequality in Latin America *

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March, 2025

Abstract

This paper explores the link between the effect of children on mothers' earnings—the so-called child penalty—and the observed gender earnings gap in Latin America over the last two decades. Leveraging repeated cross-sectional data from harmonized household surveys spanning the 2000-2021 period in 14 countries, we estimate the impact of motherhood on earnings using a pseudo-event study approach around the birth of the first child (Kleven, 2022). Unlike traditional event studies that rely on panel data, we build pseudo-panels at the individual level by matching individuals with similar observable characteristics, including birth cohort, allowing us to track fathers and mothers over time, and estimate the effect of children on their earnings. These effects are then used as inputs in an Oaxaca-Blinder decomposition to quantify their contribution to the observed gender earnings gap. Our findings reveal that the motherhood effect is possibly the single most important factor contributing to the remaining income disparities between men and women in the region: it represents 41% of the gender gap among parents and 34% of the overall gender earnings gap. Importantly, its relative importance has been increasing over the years. Specifically, while the overall earnings gap between fathers and mothers decreased by more than eight percentage points over the last two decades, the motherhood-related gap remained nearly constant. As a result, the share of the motherhood-related gap within the total gender earnings gap increased from 37% to over 46%. Furthermore, a country-by-country analysis reveals that the motherhood-related gap shows little variation across countries and does not correlate with GDP per capita, suggesting the distinct rigidity of gender gaps stemming from the motherhood effect compared to other determinants of gender income inequality. We also provide a comprehensive overview of the motherhood effects on labor market outcomes beyond mere employment status and earnings, such as hours worked and labor informality. This sheds light on key mechanisms underlying labor market adjustments upon motherhood in Latin America.

JEL Classification: D63, J13, J16, J22, J31
Keywords: decomposition, gender inequality, child penalty, developing countries, Latin America

*We are very grateful to Inés Berniell, Cristian Bonavida, Matías Ciaschi, Guillermo Falcone, Javier García-Cicco, Leonardo Gasparini, Luis Laguinge, Carlos Lamarche, Carlo Lombardo, Ignacio Lunghi, Lucía Ramírez, and Martín Rossi, as well as participants of the CEDLAS seminar at Universidad Nacional de La Plata and the LVIII AAEP meeting for valuable discussions and insightful suggestions. We also thank the anonymous reviewers for their very valuable comments that have improved the paper. The usual disclaimer applies.

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1 Introduction

Despite significant progress towards gender equality, large gender gaps persist in labor markets worldwide. Research from high-income countries identifies motherhood—i.e., the arrival of children and the caregiving responsibilities that predominantly fall on women—as the primary factor explaining much of the remaining gender income inequality (Kleven et al., 2019b; Cortés and Pan, 2023; Kleven et al., 2024b). While Latin America is one of the regions with the highest income inequality (Alvaredo and Gasparini, 2015) and exhibits some of the largest gender gaps globally (Marchionni et al., 2019; Berniell et al., 2024b), the extent to which motherhood contributes to these disparities remains unclear. This lack of understanding is primarily due to the absence of comprehensive estimates of the effects of motherhood on earnings across the region.

In this paper, our aim is to address this issue by investigating whether motherhood can be considered the final hurdle to achieving gender income equality in developing countries. Specifically, we examine how the effect of children on earnings relates to the overall gender gap in labor income in Latin America over the last two decades. Leveraging repeated cross-sectional data from harmonized household surveys spanning the 2000-2021 period in 14 Latin American countries from the SEDLAC and LABLAC datasets (CEDLAS and The World Bank, 2022, 2021), we build pseudo-panels at the individual level to estimate the impact of children on mothers' and fathers' earnings and other labor market outcomes using an event study approach around the birth of the first child, following the methodology proposed by Kleven (2022). We then incorporate these effects into an extended Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973; Kleven et al., 2019b) to quantify their contribution to the earnings gap between fathers and mothers. A back-of-the-envelope calculation suggests that the earnings gap among parents accounts for nearly 84% of the overall gender earnings gap in the region. Thus, understanding motherhood effects in this context is key to understanding their role in total gender income inequality.

We show that not only is the motherhood effect possibly the single most important factor contributing to the remaining income disparities between men and women in Latin America, but also its relative importance has been increasing over the last two decades, contrasting with the declining trend of the gender income gap. The decomposition reveals that 23 percentage points of the 55.9% earnings gap between fathers and mothers in Latin America are due to the effect of motherhood. In other words, the motherhood-related gap represents 41% of the gender gap among parents and 34% of the overall earnings gap between men and women in the region over the past two decades. Importantly, while the earnings gap among parents has decreased from 59.7% in 2005-2011 to 51.5% in 2017-2021, the portion attributable to the motherhood effect has become more significant, rising from 36.7% to 46.4%. In contrast, other contributing factors, such as education and its associated returns, have shown a waning impact. Furthermore, our country-by-country analysis reveals that the motherhood-related gap shows little variation across

countries and is not correlated with each country's development level, as proxied by GDP per capita. In contrast, other sources of income disparity between fathers and mothers exhibit a strong negative cross-country correlation with GDP per capita. Overall, these results highlight the quantitative significance of gender gaps in earnings stemming from the motherhood effect, and emphasize the distinct rigidity of this motherhood-related gap compared to other determinants of income inequality between men and women. While it is not straightforward to assert that motherhood constitutes "the last hurdle," these findings suggest that it represents one of the main and more persistent barriers to income convergence between men and women in Latin America.

The decompositions rely on the estimation of motherhood and fatherhood effects across countries and periods. Thus, while assessing the contribution of motherhood to gender income inequality, we also provide a comprehensive overview of the effects of children—the so-called child penalties—on the region's labor markets. We show that, on average, Latin American mothers experience a sharp and abrupt decline of about 44% in their earnings that persists even ten years after the birth of their first child. This significant and long-lasting decline in women's earnings after their first childbirth can be explained by the motherhood effects on employment and the type of job. We find an average 28% drop in women's probability of working upon motherhood, which implies a child penalty—a drop in mothers' earnings relative to fathers'—of 34% on average across the region. These estimates of the effect of children on employment align with previous findings for developed countries, which, unlike ours, are based on actual panel data (Kleven et al., 2019b; Kleven et al., 2019a; Kuziemko et al., 2018; Berniell et al., 2024a). They are also consistent with the limited evidence available for Latin America, which likewise relies on panel data (Berniell et al., 2021, 2023a).

Our average child penalty in employment is also similar to the 38% reported by Kleven et al. (2024a) for Latin American countries in their Child Penalty Atlas. However, our country-by-country analysis reveals significant differences compared to the Atlas. Given this divergence, we argue for the superior reliability of our estimations. Unlike the Atlas, which relies on census data for most countries in the region, we utilize data from harmonized household surveys. National household and labor surveys provide a superior source of information for characterizing the region's labor markets compared to census data. Importantly, because household surveys are conducted annually, we have repeated cross-sectional data that allow us to build pseudo-panels by matching each individual with someone from the same birth-year cohort. This approach achieves better matching and a cleaner estimation of the motherhood effects, free from cohort effects. Moreover, our analysis focuses on the last two decades (2000-2021), while the census data used in the Atlas generally dates back to before 2010, including data from the 1960s and 1970s. In the context of the significant increase in womens labor force participation in the region (Marchionni et al., 2019; Berniell et al., 2024b), this exacerbates the challenge of not controlling for cohort effects in the matching process—something the Atlas cannot address due to its lack of repeated cross-sectional data for the region.

In addition, by leveraging household survey data, we are able to extend our analysis to encompass additional labor market outcomes beyond mere employment status, such as hours worked and labor informality. This expanded scope not only provides a comprehensive panorama of motherhood effects on the region's labor markets, but also sheds light on crucial underlying mechanisms. For instance, the prevalence of informal employment is thought to mitigate the decline in female employment following motherhood, thus tempering the overall impact of motherhood on employment in countries like Chile (Berniell et al., 2021). Our results confirm the pervasiveness of this mechanism across countries within the region.

This paper contributes to the gender inequality literature—see Marchionni et al. (2019) and Berniell et al. (2024b) for studies specific to Latin America—and, in particular, to the literature on motherhood effects or child penalties, by assessing its role in the overall gender gap in earnings in a developing region. Our study complements the limited existing research that has documented the effects of children on mothers labor market outcomes in Latin America using an event study approach with actual panel data, which is a scarce resource in the region—see Berniell et al. (2022) for a review. Most of these studies focus on a single country, such as Berniell et al. (2021) for Chile, Campos-Vazquez et al. (2022) and Aguilar-Gomez et al. (2019) for Mexico, and Querejeta and Bucheli (2023) for Uruguay, while, to the best of our knowledge, the only paper providing cross-country estimates based on actual panel data for the region is Berniell et al. (2023a), which compares motherhood effects on multiple labor market outcomes in Chile, Mexico, Peru, and Uruguay. Beyond documenting motherhood effects at the regional level, in this paper we unveil the distinct rigidity of gender gaps linked to motherhood compared to other determinants of gender inequality by quantifying its contribution to the observed gender gaps in earnings. Our findings underscore the necessity of recognizing the persistent challenges faced by mothers in the labor market and highlight the need for targeted policies to address and mitigate the enduring gender disparities arising from motherhood effects.

Another contribution of our paper is providing estimates of motherhood effects across a diverse range of labor market outcomes beyond mere employment status, covering multiple countries, thereby complementing the estimates of child penalties in employment by Kleven et al. (2024a). More importantly, these additional outcomes shed light on key mechanisms underlying the changes we observe in employment and earnings upon motherhood, such as the increase in female labor informality. While previous studies have provided evidence of this effect in a few specific countries based on actual panel data (Berniell et al., 2021, 2023a), our work confirms that the motherhood effect on informality is pervasive across the entire region. Given the prevalence of labor informality in Latin American economies, where approximately half of the workforce has an informal job (Gasparini and Tornarolli, 2009; Perry, 2007), it is crucial to recognize that the motherhood effect extends beyond its impact on employment to shape the nature of employment and, consequently, on labor earnings.

The remaining of this paper is organized as follows. Sections 2 and 3 describe the methodology and the data, respectively. Section 4 presents evidence on the motherhood effects in Latin America, both for the pool of countries and across countries. Section 5 assess the quantitative relevance of the motherhood effects in explaining the observed gender gaps in earnings. Section 6 concludes.

2 Empirical strategy

Our empirical strategy involves two steps. First, estimating the effect of the arrival of the first child on mothers' and fathers' earnings—i.e., the motherhood and fatherhood effects—and the consequent gap that opens upon childbirth between mothers and fathers, which is commonly referred to as the child penalty.[1] We then use the estimated motherhood and fatherhood effects to decompose the observed gender earnings gap between the portion attributable to children—i.e., the motherhood-related gap—and other factors—i.e., the residual gap. We explain the first step in Subsection 2.1, and the second step in Subsection 2.2.

2.1 Pseudo-event study approach

We adopt a pseudo-event study approach around the birth of the first child (Kleven, 2022). This approach essentially involves an event study based on pseudo-panel data at the individual level, instead of actual panel data, which are usually not available in Latin American countries. We start with a brief explanation of what an event study entails, deferring the details of how pseudo-panels are built to the data section.

We define the event as the year the first child is born. Let τ denote the number of years relative to the event; thus, $\tau = 0$ represents the year of the first childbirth. Equation 1 represents an event-study around the birth of the first child:

$$y_{itc\tau} = \sum_{k \neq -1} \beta_k I(k = \tau_{itc}) + \sum_j \gamma_j I(j = age_{itc\tau}) + \sum_y \delta_y I(y = t) + \sum_s \lambda_s I(s = c) + \epsilon_{itc\tau}, \tag{1}$$

where $y_{itc\tau}$ is labor earnings or other labor market outcome for individual i at calendar year t in country c at event time τ. The first term on the right-hand side is a set of event-time dummies. The second and third terms are a full set of age-in-year and calendar-year dummies to control non-parametrically for life-cycle and time trends, and $\epsilon_{itc\tau}$ is the idiosyncratic error term. When we pool all the countries together, the model also includes country dummies.

[1] The term child penalty has become widely used in the literature to describe the persistent gender gap in labor market outcomes following parenthood. While we adopt this terminology for consistency with prior research, we acknowledge that it carries an implicit value judgment, and a more neutral term might be preferable.

We estimate Equation 1 separately for mothers and fathers. The coefficients of interest are β_τ for $\tau \geq 0$, which measure the effect of the first childbirth on women's and men's earnings or other labor market outcome, relative to the year before the first childbirth, that is, relative to $\tau = -1$. The key identification assumption is that the timing of the first childbirth is not correlated with parents' labor outcomes conditional on the included controls.[2] For the sake of interpretation, we scale $\hat{\beta}_\tau$ from level effects to percentage effects relative to the counterfactual outcome without children. Formally, the percentage effect for each event time τ is given by $P_\tau = \frac{\hat{\beta}_\tau}{E[\tilde{Y}_{itc\tau}|\tau]}$, where $\tilde{Y}_{itc\tau}$ is the predicted outcome at event time τ from Equation 1 when subtracting the event time terms.

To summarize the results from the event studies, we report the average motherhood effect, defined as the average P_τ for women over event times 0 through 10. We also report the child penalty, defined as the average effect of having children on women relative to men (Kleven et al., 2019b, 2024a). Formally:

$$\text{Child Penalty} \equiv \mathbb{E}\big[P_\tau^m - P_\tau^w \,\big|\, \tau \geq 0\big] - \mathbb{E}\big[P_\tau^m - P_\tau^w \,\big|\, \tau < 0\big], \tag{2}$$

where the superscripts m and w refer to men and women, respectively. As we will see later, motherhood effects and child penalties are often similar, as men's β_τ coefficients are typically close to zero.

Our primary variable of interest is monthly earnings; however, we will also estimate the effect of motherhood on other labor market outcomes as explained in the data section.

2.2 Decomposing the gender gap in earnings

To assess the quantitative relevance of the motherhood effects in explaining the observed gender gaps in earnings, we apply an Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973), but instead of using the typical Mincer equation we apply the decomposition to our event study in Equation 1. This approach, initially employed by Kleven et al. (2019b) in the case of Denmark, enables us to decompose the observed gender gap into components associated with motherhood, other distinguishing characteristics between men and women—e.g., age—and their corresponding returns—e.g., returns to age.

We define the gender gap in earnings (GGE) as the difference in earnings between fathers and mothers, expressed as a proportion of fathers' earnings. Formally, $GGE = \{E[y^m_{itc\tau}] - E[y^w_{itc\tau}]\}/E[y^m_{itc\tau}]$. To obtain the decomposition of the GGE, we first rewrite Equation 1 with slight changes in notation.

$$y^g_{itc\tau} = \sum_{k \neq -1} \beta^g_k I(k = \tau^g_{itc}) + \sum_l \psi^g_l X^m_{l,itc\tau} + \epsilon^g_{itc\tau}, \tag{3}$$

where superscript g stands for gender, and the term $\sum_l \psi^g_l X^m_{l,itc\tau}$ collapses the three terms

[2] Kleven et al. (2019b) show that this approach performs well in identifying both short- and long-run effects of children on women's earnings and labor force participation compared to widely used alternative approaches, such as instrumental variables and differences-in-differences. For a formal discussion about the identifying assumptions in an event study see Borusyak et al. (2024) and Sun and Abraham (2021).

of Equation 1 that include the control variables age, calendar year, and, in the case of the pooled sample, country as well. Based on Equation 3 and rearranging terms, the estimated *GGE* is given by:

$$\frac{\bar{\hat{y}}^m - \bar{\hat{y}}^w}{\bar{\hat{y}}^m} = \frac{\sum_\tau (\hat{\beta}_\tau^m - \hat{\beta}_\tau^w)\rho_\tau^m}{\bar{\hat{y}}^m} + \frac{\sum_\tau (\rho_\tau^m - \rho_\tau^w)\hat{\beta}_\tau^w}{\bar{\hat{y}}^m} + \frac{\sum_l (\hat{\psi_l}^m - \hat{\psi_l}^w)\bar{X}_l^m}{\bar{\hat{y}}^m} + \frac{\sum_l (\bar{X}_l^m - \bar{X}_l^w)\hat{\psi_l}^w}{\bar{\hat{y}}^m}, \tag{4}$$

where ρ_τ^g represents the share of individuals of gender g that we observe τ years after becoming parents. Equation 4 decomposes the *GGE* into the motherhood-related gender gap—the first two terms on the right hand side—and other sources of gender inequality—the residual gap. The motherhood-related gap captures the effect of differential returns to children across genders—i.e., the motherhood and fatherhood effects in the first term of the equation—and the effect of differences in the distribution of mothers and fathers over the event-time variable—i.e., the second term in the equation. Importantly, as highlighted by Kleven et al. (2019b), provided motherhood and fatherhood effects are correctly identified, the motherhood-related gap has a causal interpretation rather than mere correlation. The remaining terms—i.e., the residual gender gap—capture the effect of returns on other characteristics (age, year and country) and the effect of differences on these characteristics between men and women. In an augmented version of Equation 3, we include education dummy variables and then estimate the decomposition of Equation 4.

3 Data

3.1 Data sources and variables

Our analysis relies on repeated cross-sectional data from national household surveys conducted across 14 Latin American countries from 2000 to 2021. The countries included are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Mexico, Panama, Paraguay, Peru, El Salvador, and Uruguay. Table A.1 in the Appendix lists the surveys used in each country.

Since household surveys are not uniform across countries and over time, we process the raw data to make them as comparable as possible by using similar definitions of variables in each country and year. To that end, we follow the Socioeconomic Database for Latin America and the Caribbean (SEDLAC) protocol, a joint project between the CEDLAS at Universidad Nacional de La Plata and the World Bank (CEDLAS and The World Bank, 2022). For Chile and Mexico, we use the Labor Database for Latin America and the Caribbean (LABLAC), which complements SEDLAC and follows a similar protocol, but is based on labor surveys rather than household surveys (CEDLAS and The World Bank, 2021).[3]

[3]For the cases of Chile and Mexico, the national household surveys included in the harmonized SED-

Using household or labor survey data has clear advantages in this context over other alternative sources used in the literature, such as administrative data or censuses. Firstly, administrative data are generally not available in most Latin American countries, but even if they were available, they have a serious limitation: they do not capture informal employees, who represent roughly half of the total workforce in Latin America (Gasparini and Tornarolli, 2009; Tornarolli et al., 2014). Therefore, relying on household surveys allows for a more complete representation of the labor market in the region. Also, household surveys have advantages over censuses, which is the source used by Kleven et al. (2024a) in their Child Penalty Atlas to estimate the effects of motherhood on employment in most Latin American countries. The superiority of household surveys over censuses can be justified because the former are primarily designed to collect information on employment and income, including a comprehensive questionnaire with carefully crafted questions on these aspects. In addition to enabling a more accurate characterization of the labor market, surveys provide information on labor market outcomes beyond employment that is typically unavailable in censuses, such as hours worked, occupation type, and earnings. Importantly, another distinct advantage of household surveys over censuses is their annual frequency compared to the typical 10-year census interval. As will be discussed later, this feature is crucial in our context, as it allows us to match individuals from the same birth cohort and thus control for cohort effects.

The SEDLAC and LABLAC datasets contain annual microdata for all Latin American countries, encompassing a range of socioeconomic, demographic, and labor-related variables. Specifically, we focus on four key labor market outcomes: (i) *Earnings* (monthly earnings from all occupations), (ii) *Employment* (coded as 1 if an individual is employed, and 0 otherwise), (iii) *Hours worked* (working hours per week), (iv) *Informality* (coded as 1 if an individual is a non-registered worker, and 0 otherwise). Hours worked and informality are defined solely for those who are employed, thereby representing conditional outcomes based on employment status. As in Berniell et al. (2021) and Berniell et al. (2023a), we use an extended measure of informality, classifying workers as informal if they lack access to social security benefits, low-skilled self-employed workers, or unpaid workers with zero earnings. The earnings variable includes earnings from all occupations and is expressed in US dollars at 2005 PPP.

3.2 Pseudo-panels and estimation sample

We build pseudo-panels at the individual level based on repeated cross-sectional microdata from household surveys. To identify individuals who are parents in the sample, we retain a subset of individuals who are heads of households and their spouses. For those who are already parents, we infer the calendar year of their first childbirth from the age

LAC database—CASEN and ENIGH, respectively—are conducted every 2 or 3 years, which poses a limitation for the matching procedure described in the following subsection. For this reason, for these two countries, we utilize the harmonized employment surveys included in the LABLAC database, for which we do have annual information.

of their oldest child. Although we can identify parents after the event, identifying parents before the event is unfeasible: with cross-sectional data we cannot anticipate if or when childless individuals will become parents. To overcome this challenge, Kleven (2022) proposes matching parents with non-parents with similar observable characteristics. To match observations, we use age (in years), gender (male or female), education (incomplete primary, complete primary, incomplete secondary, complete secondary, incomplete tertiary, and complete tertiary), and geographic region (urban or rural areas).[4]

Additionally, using annual household surveys allows us to match each individual with someone who, in addition to sharing observable characteristics such as gender, age, education, and region, is from the same birth-year cohort, potentially leading to a cleaner matching. This is not possible with census data, as used in Kleven et al. (2024a)'s Child Penalty Atlas, which are typically available only every ten years. Additionally, the censuses in the Atlas mostly date from before 2010, with some extending back to the 1960s and 1970s. During this period, female labor force participation experienced substantial growth in the region (Marchionni et al., 2019; Berniell et al., 2024b), which makes it crucial to account for cohort-specific dynamics in order to avoid biased estimations. Thus, this feature represents a key advantage of using household surveys over censuses.[5]

In summary, our specific approach to matching parents with their observable non-parent equivalent is as follows. Consider a parent i observed in survey year t, which is the year of the birth of her first child—i.e., the survey year is the year of the event in this example. This parent, with age a and characteristics C (gender, education, and region), is matched to a non-parent j from the survey in year $t-p$, who is $a-p$ years old and shares the same characteristics C, where p ranges from 1 to 5. For young individuals who are likely to still be in the education system, we allow education to vary, just as we do with age. Following this methodology, we build time events before childbirth for each parent in the sample. Table A.2 in the Appendix illustrates the construction of the pseudo-panels. As multiple matched observations may exist for each parent, we collapse them using sampling weights to leverage the full sample of individuals with similar characteristics.

A concern that arises here, as in any matching procedure, is whether observationally similar childless individuals constitute a suitable counterfactual for the pre-childbirth periods of individuals who eventually become parents. In other words, the question is whether the estimated pre-childbirth labor market outcomes in the pseudo-panel offer a reliable approximation of the actual but unobservable pre-childbirth labor market outcomes for fathers and mothers. To assess this, we compare the outcomes that emerge from the pseudo-panels with the results from the actual panel used in Berniell et al. (2021) for Chile. We find that the results from the two approaches are remarkably simi-

[4]Regarding geographic region, we distinguish between urban and rural areas, but for Chile, Mexico, and Colombia, the matching is based on a combination of region and urban/rural indicators.

[5]Table B.1 in Appendix B illustrates the construction of pseudo-panels based on both repeated cross-sectional data and census data. In the first case, the pseudo-panels include individuals from the same birth-year cohort. In the latter case, the pseudo-panels can include individuals from cohorts with more than a 10-year difference.

lar, suggesting that the pseudo-panel is a reliable approximation of the true panel.[6] See Figure B.1 in Section B of the Appendix.

Our sample includes women and men whose age at the birth of the first child is between 20 and 45 years old. The resulting sample includes 1,096,309 women and 1,149,432 men, who had children at some point before the survey takes place. Table A.3 in the Appendix describes the sample for the pool of countries (pooled sample), while the statistics for each country are shown in Tables A.4 and A.5. In our pooled sample, 90% of men and 63% of women are working in the year prior to the birth of the first child, and men work more hours per week in the market than women—48 and 42 hours, respectively. These gender gaps in labor supply partly explain why men's earnings are 69% higher than those of women. Also, women are more likely than men to have some college education—41% and 30%, respectively—, while men are more likely than women to have an informal job once employed—39% and 34%, respectively. On average, women first become mothers at 26.6 years old—the range varies from 24.3 in Honduras to 28.7 in Uruguay—, while men first become fathers when they are 28.6 years old. Most of the individuals in our sample gave birth to their first child between 2006 and 2015. At the time they participated in the survey, 63% and 94% of the women had at most one child or two children, respectively.

4 Motherhood effects in Latin American labor markets

In this section, we explore the effects of having children on women's and men's labor market outcomes, setting the stage for the subsequent decomposition analysis in Section 5. We begin by presenting the results from estimating Equation 1 for the pooled sample of 14 Latin American countries.[7] Figure 1 shows the standardized estimates of β_τ—i.e., the P_τ defined in Section 2—from five years before the first childbirth to 10 years after. In other words, the series show the percentage effects of having children relative to the counterfactual outcome without children. The figure also displays the child penalty and the average motherhood effect over event times 0-10. Tables A.6 and A.7 in the Appendix report the estimated coefficients in levels and the corresponding standard errors.

Figure 1a illustrates the motherhood and fatherhood effects on monthly earnings. After the first childbirth, women experience a sharp decline in earnings, with this effect persisting and even intensifying over time. The average motherhood effect is a 44% reduction in women's earnings. In contrast, childbirth is a non-event for men, i.e., men's earnings show virtually zero immediate effect, with a slightly negative trend that follows the pre-birth pattern. As a result, the child penalty in earnings—the average effect of having children on women's earnings relative to men's—is 29%. Behind this average

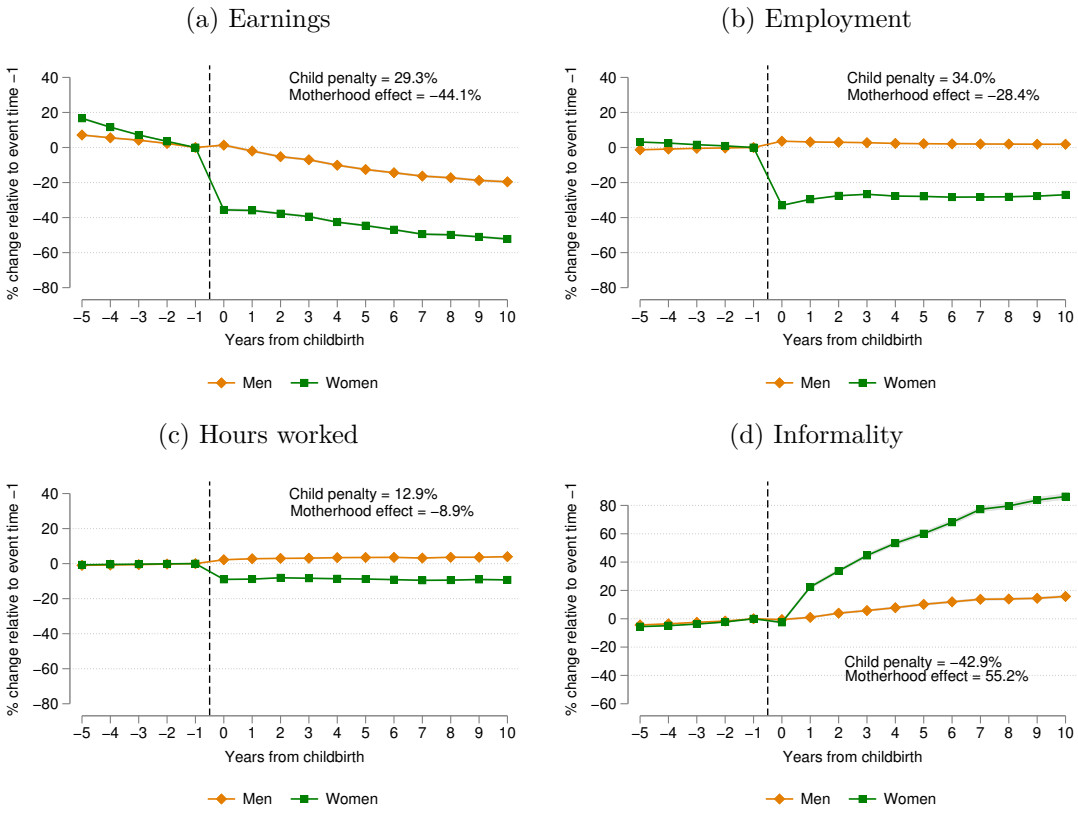
[6] The panel data for Chile used in Berniell et al. (2021) is derived from the Social Protection Survey, conducted by the Ministry of Labor and Social Protection. Since 2004, the survey has followed a sample of around 16,000 individuals aged 18 years and older who are representative of the Chilean population.

[7] Results are similar when excluding 2020-2021, an anomalous period due to COVID-19-related restrictions, which had documented adverse effects on women's labor market outcomes in the region (Berniell et al., 2023b). The results also hold when including country-specific time trends.

penalty, Figure 1a shows that the gap between men's and women's earnings that opens up with the birth of the first child remains largely unchanged over time, persisting for at least a decade.

The significant and long-lasting child penalties in earnings can be explained by the effects of children on mothers' employment and type of job. Figure 1b shows a 28.4% decline in women's probability of working after the first child is born, while fathers' employment rate remains virtually unchanged, following a nearly flat line over event times. The child penalty in the employment rate is 34% for the entire region, which lies within the [-40%, -20%] range identified in the literature for developed countries based on actual panel data (Kleven et al., 2019b; Kleven et al., 2019a; Kuziemko et al., 2018; Berniell et al., 2024a). It is also close to the 38% reported by Kleven et al. (2024a) for the Latin American average in their Child Penalty Atlas. Although this difference in the average child penalty seems small, we will show later that our estimates for specific countries differ significantly from the figures reported in the Atlas.

Figure 1: Effects of the first childbirth on earnings and employment



Note: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, age-in-years, and country fixed effects. The effects on hours worked and informality are estimated conditional on being employed. The reported Child penalty and Motherhood effect correspond to the average from $\tau = 0$ through $\tau = 10$. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

Regarding the effects of children on other labor outcomes beyond mere employment status, Figure 1c reveals an 8.9% drop in working hours for those women who remain in the labor market after becoming mothers, which reflects the migration of women from full-time to part-time employment as a means of seeking flexibility upon motherhood (e.g., Kleven et al., 2019b and Berniell et al., 2021). Such a pursuit of flexibility upon motherhood may also explain the substantial 55.2% increase in labor informality among working women shown in Figure 1d, which implies a 43% negative child penalty.[8] This result is consistent with Berniell et al. (2021), who were the first to show that motherhood

[8]Naturally, given the lack of job protection in the informal labor market, a significant number of female informal workers lose their jobs immediately after becoming mothers. Figure A.1 in the Appendix shows that motherhood results in an immediate decline of approximately 30% in formal employment and 40% in informal employment, which imply the slight short-term drop in women's labor informality rate at $\tau = 0$ shown in Figure 1d. Although formal employment never recovers, informal employment begins to increase after $\tau = 0$.

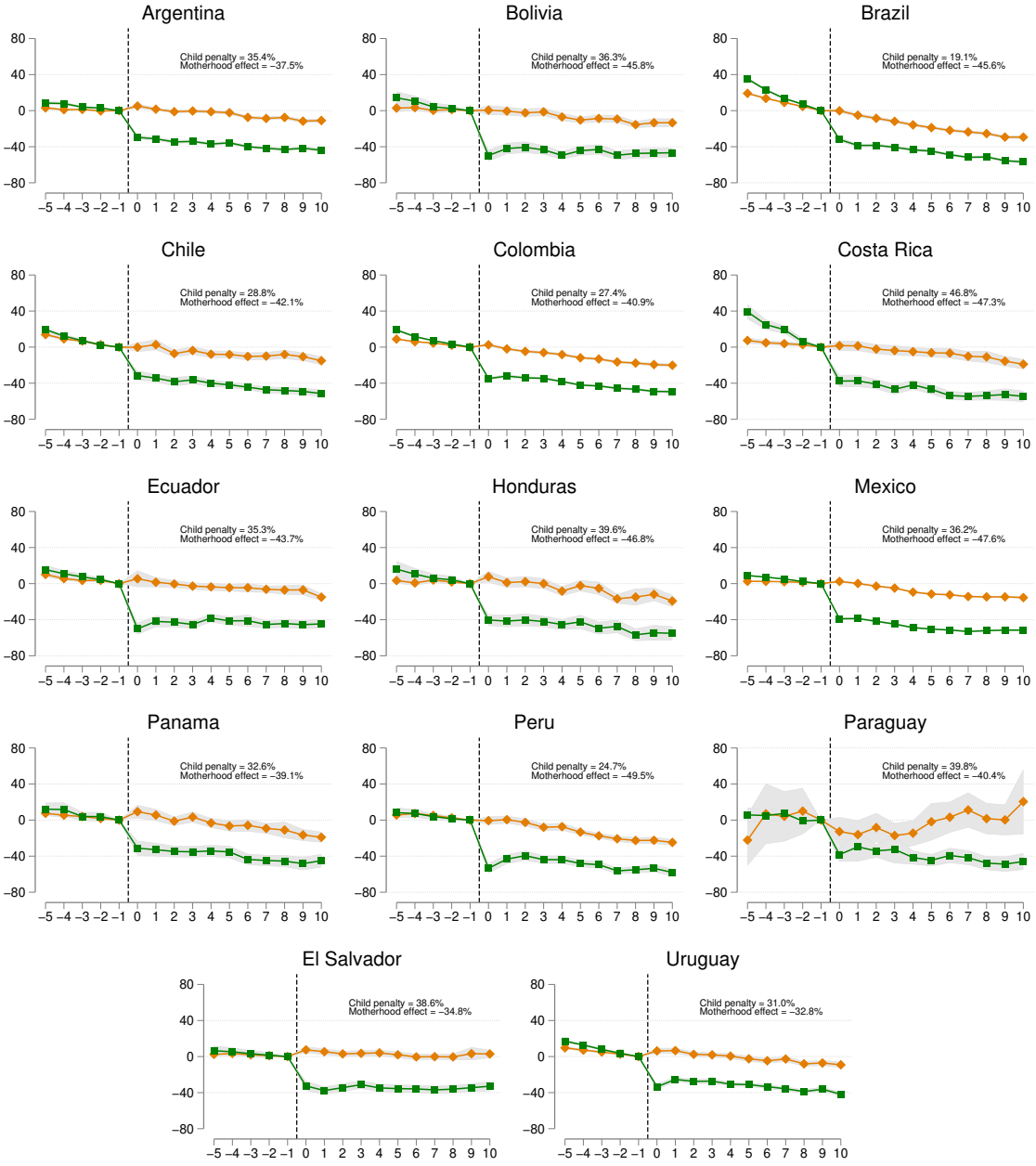
significantly contributes to the gender gap in labor informality in a developing country, specifically Chile. Later, Berniell et al. (2023a) extended this finding to Mexico, Peru, and Uruguay. Here, we show that the effect of children on increasing mothers' informality is widespread across the region. Unlike other labor market outcomes, where a negative child penalty would indicate a smaller disadvantage for women, in this case, it reflects a worsening of their labor conditions, as higher informality is associated with lower job security, fewer benefits, and reduced earnings.

Beyond the regional average, examining the heterogeneities across countries could reveal important differences, offering a more comprehensive overview of the effects of children in Latin American labor markets. To explore the cross-country variation in child penalties we estimate Equation 1 separately for each of the 14 countries. The event studies for each country are shown in Figure 2, revealing that the motherhood effects on earnings are pervasive in the region. The effect of the first childbirth on female earnings is abrupt and persistent in all countries, while childbirth is a non-event for men.[9] Despite these regularities, child penalties in earnings vary considerably, ranging from 19% in Brazil to around 39% in El Salvador, Honduras, and Paraguay, with Costa Rica exhibiting the highest penalty at 47%, marking a clear outlier.

[9]The result that there are no fatherhood effects—i.e., no discontinuities in earnings when children are born—is not unique to the literature on child penalties based on event studies. For example, Kunze (2020), based on a comparison of twin brothers, also finds no significant effect of children on earnings. However, while fatherhood is typically a non-event in terms of earnings, in some countries fathers do experience a decline in earnings over time. In certain cases, this downward trend is particularly pronounced, which helps explain some striking differences between the child penalty and the average motherhood effect on earnings, as shown in Figure 2. Brazil presents the most notable case: while the average motherhood effect corresponds to a 46% decline in womens earnings, the child penalty is only 19%—the lowest in the region. Another example is Peru, where the highest motherhood effect (-49.5%) contrasts with a child penalty of only 25%.

Figure 2: Effects of the first childbirth on earnings by country

lS



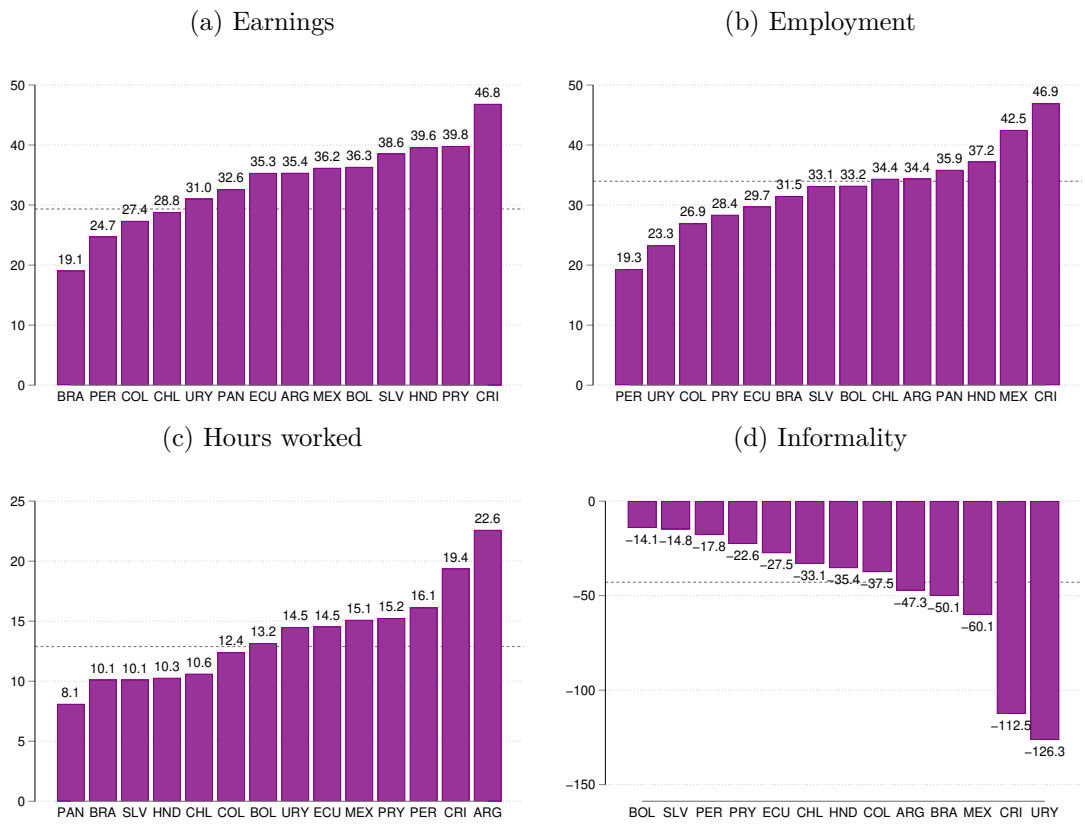
Note: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, and age-in-years fixed effects. The reported Child penalty and Motherhood effect correspond to the average from $\tau = 0$ through $\tau = 10$. For each country, we rely on repeated cross-sectional data from harmonized households surveys spanning the 2000-2021 period. The estimation sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

Figure 3a summarizes these results presenting the cross-country ranking based on the child penalties in earnings. Rankings for the child penalties in employment, working hours, and labor informality are shown in Figures 3b through 3d, while the corresponding event studies are shown in Figures A.2 through A.4 in the Appendix. These results

align with previous evidence based on panel data for a few countries in the region. For example, our estimate of the motherhood effect on employment in Chile (-27.7%), shown in Figure A.2, is broadly consistent with the rather imprecisely estimated -22% reported by Berniell et al. (2021). Similarly, our estimates for Peru and Uruguay are close to those reported by Berniell et al. (2023a). In contrast, while our estimated child penalty for the entire region is relatively similar to that reported in the Child Penalty Atlas (Kleven et al., 2024a), there are substantial discrepancies at the country level. For instance, the Atlas reports a child penalty for Peru that is 23 percentage points higher than our estimate, while the penalties for Paraguay and Uruguay exceed ours by 16 and 12 percentage points, respectively. As discussed earlier, these differences with the Atlas are not unexpected and can be attributed to the use of different data sources. Unlike the Atlas, we rely on repeated cross-sections, which allow us to match individuals from the same birth cohort. Since the female employment rate has been increasing across cohorts (Marchionni et al., 2019; Berniell et al., 2024b), failing to control for the birth cohort in the matching procedure would lead to an overestimation of the negative effect of motherhood on employment. This issue is further exacerbated by the fact that, while our estimates are based on data from 2000 to 2021, the Atlas primarily relies on census data, which are often much older. For example, in the three cases mentioned above, the Atlas uses census data from 1993-2007 for Peru, 1962-2002 for Paraguay, and 1963-2011 for Uruguay.

The child penalties in informality reported in Figure 3d reveal striking differences across countries, likely driven by institutional, cultural, and policy factors. For instance, Costa Rica and Uruguay, which have some of the lowest overall informality rates in Latin America, exhibit particularly pronounced effects, while Bolivia and Peru, where motherhood has a much smaller impact on informality, are at the opposite extreme (Gasparini and Tornarolli, 2009; Tornarolli et al., 2014). One possible explanation is that in contexts of widespread informality, women are often already informal workers before becoming mothers, making a substantial increase in informality due to motherhood less likely. Indeed, in our sample, the informality rate among women one year before the birth of their first child was 75% in Bolivia and 77% in Peru, compared to just 20% in Uruguay and 25% in Costa Rica (see Tables A.4 and A.5 in the Appendix). While a detailed cross-country analysis of the factors underlying these patterns is beyond the scope of this paper, our findings suggest that preexisting labor market structures play a crucial role in shaping how motherhood affects informality.

Figure 3: Child penalties across Latin American countries.



Note: These figures report the child penalties for time events 0-10 for each country as defined in Equation 2. The effects on hours worked and informality are estimated conditional on being employed. The dashed line shows the average Child penalty for the pool of the 14 Latin American countries. Data cover the 14 Latin American countries from 2000-2021. Due to the lack of information on labor informality, Panama is not included in Figure 3d.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

Lastly, examining how the effects of children on different labor market outcomes relate to each other within and across countries provides valuable insight into the strategies mothers employ to balance work and family responsibilities. For instance, a U-shaped relationship emerges between child penalties in hours worked and employment (see Figure A.5 in the Appendix), suggesting distinct patterns of labor market adjustment. In some countries, such as Peru and Uruguay, the primary response to motherhood is a reduction in working hours rather than labor market withdrawal. In contrast, in others, like Mexico and Costa Rica, mothers adjust along both margins, with declines in employment and hours worked, alongside a substantial increase in labor informality. Furthermore, adjustments in employment, working hours, and labor informality appear to elucidate the effect of children on earnings, as evidenced by its positive correlation with each of these outcomes. Building on this rationale, the next section will specifically address the effects of motherhood on earnings.

5 Quantifying the role of children in the gender earnings gap: a decomposition analysis

In this section, we apply the decomposition from Equation 4 to assess the quantitative impact of the motherhood and fatherhood effects estimated in the previous section on the observed gender gaps in earnings. Previously, we defined the gender gap in earnings (GGE) as the difference in earnings between fathers and mothers, expressed as a proportion of fathers' earnings. In our pooled sample, the GGE amounts to 55.9%, meaning that in Latin America, mothers earn less than half of what fathers earn. Despite declining fertility in the region (Marchionni et al., 2019; Esteve et al., 2022), this gap remains the main driver of income disparities between men and women in our age group.[10] Specifically, our calculations indicate that the earnings gap between mothers and fathers accounts for 83.5% of the total gender earnings gap in the region. The decomposition reveals that 23 percentage points of this gap can be attributed to the presence of children. In other words, the motherhood-related gap represents 41% of the GGE and 34% of the overall earnings gap between men and women in this age range across the region over the past two decades. Moreover, this motherhood-related gender gap is mostly driven by the disparity between the motherhood and fatherhood effects—i.e., the first term in Equation 4—since the second term, which accounts for differences in the distribution of mothers and fathers over the event-time variable, is virtually null.

To asses the evolution of the GGE and its components over time, we perform the decomposition analysis for three separate sub-periods: 2005-2011, 2012-2016, and 2017-2021.[11] Figure 4a shows that while the GGE decreased by more than eight percentage points over the entire period analyzed—from 59.7% to 51.5%—, the motherhood-related gap—i.e., the gender gap in earnings associated with children—changed very little, unlike the residual gap that decreased by more than ten percentage points. Thus, the share of the motherhood-related gap within the total gap in earnings between fathers and mothers increased over time, rising from 36.7% in 2005-2011 to over 46% in the two most recent sub-periods.

This suggests that despite there having been advances towards greater gender equality, the inequality stemming from the motherhood effect exhibits greater downward rigidity compared to other sources of gender inequality. For instance, Figure 4b shows the decomposition of GGE into the motherhood-related gap, the education-related gap, and other sources. These results are obtained from estimating an augmented version of Equation

[10] The total fertility rate in Latin America has followed a steady downward trend over the past decades, declining from approximately five children per woman in 1970-75 to three in 1990-95 and 2.2 in 2010-15 (Marchionni et al., 2019). However, this regional pattern masks significant heterogeneities across countries. For instance, Ecuador, Paraguay, Bolivia, and Guatemala exhibit the highest rates circa 2015, ranging from 2.6 to 3.3 children per woman, while Brazil, Chile, Costa Rica, and Colombia have fertility levels below two children per woman, comparable to those observed in developed regions such as North America and Europe.

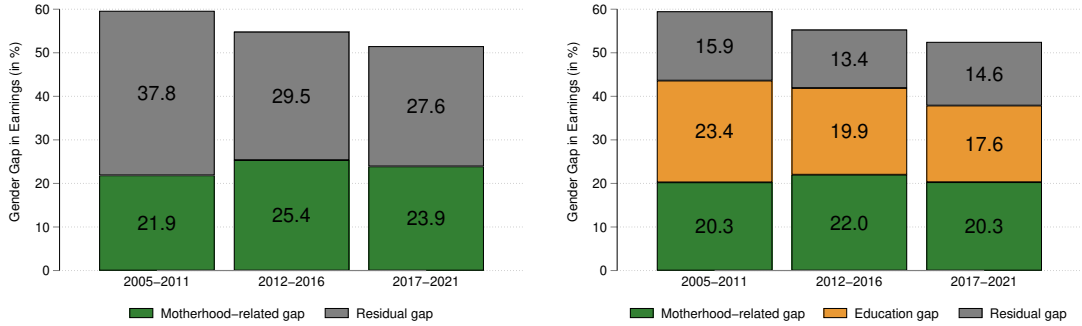
[11] Notice that data from years 2000 to 2004 are used to obtain information on childless individuals for the matching procedure explained in subsection 3.2. Consequently, we do not have estimates for the motherhood or fatherhood effects before 2005.

1, which includes education dummy variables as controls. Naturally, the values differ slightly from those in the previous figure where we do not control for education. However, the overall pattern remains consistent: the motherhood-related gap accounted for 34% of the total gender gap in earnings in 2005-2011 and increased to 39% in subsequent periods. In contrast, the significance of the education-related gap, which captures the contribution of both gender gaps in educational attainment and returns to education, has declined over time, accounting for over 39% of the *GGE* in 2005-2011 and later decreasing to 36% and 33% in the subsequent periods.

Figure 4: Decomposition of the gender gap in earnings (*GGE*) in Latin America across periods

(a) Decomposition between the motherhood-related gap and the residual gap

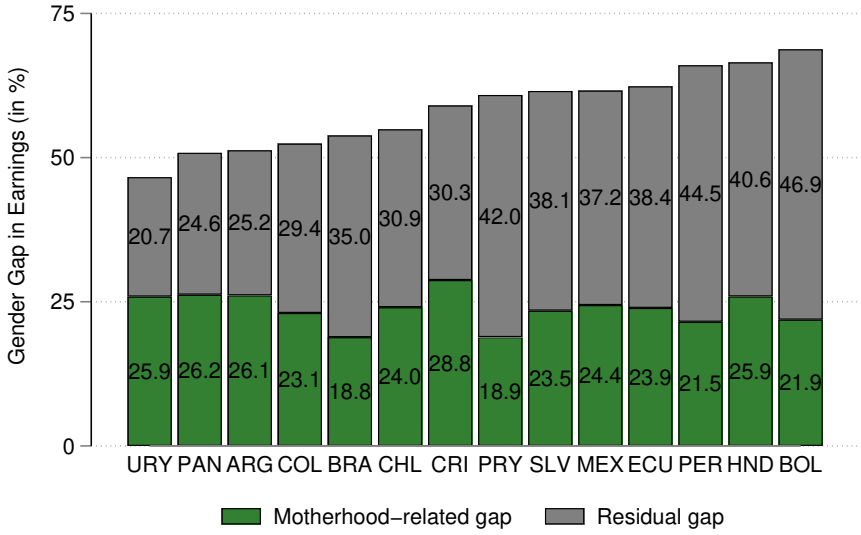
(b) Decomposition including the education-related gap



Note: These figures report an extended Oaxaca-Blinder decomposition based on Equation 4. The motherhood-related gap is the explained and unexplained effect of the time to the event dummies (the first two terms of Equation 4), the residual gap is the explained and unexplained effect of age, year and country dummies and in Figure 4b we incorporate the explained and unexplained effect of education dummies (remaining terms in Equation 4). Data cover the 14 Latin American countries from 2000-2021. We identify three different periods: 2005-2011, 2012-2016, and 2017-2021. The years 2000-2004 are reserved for the pre-periods, the moments before the birth of the first child. Data cover the 14 Latin American countries from 2000-2021.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

The downward rigidity of the motherhood-related gap is also evident in a cross-country analysis. Figure 5 presents the country-specific decomposition results. The motherhood-related gap exhibits less variation across countries than the residual term. While the motherhood-related gap ranges from 18.8 percentage points in Brazil to 28.8 percentage points in Costa Rica, the residual gap varies from 20.7 percentage points in Uruguay to 46.9 percentage points in Bolivia—the coefficients of variation are 0.11 and 0.22, respectively. In other words, irrespective of the unique characteristics and circumstances of individual countries, the motherhood-related gap remains relatively constant, unlike other sources of earnings disparity between fathers and mothers captured by the residual term.

Figure 5: Decomposition of the gender gap in earnings (GGE) by country



Note: These figures report an extended Oaxaca-Blinder decomposition based on Equation 4 for each country under analysis. The motherhood-related gap is the explained and unexplained effect of the time to the event dummies (the first two terms of Equation 4), and the residual gap is the explained and unexplained effect of age and year. Data cover the 14 Latin American countries from 2000-2021. The years 2000-2004 are reserved for the pre-periods, the moments before the birth of the first child. Data cover the 14 Latin American countries from 2000-2021.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

For instance, Figure 6 illustrates how the different components of the GGE are associated with the country's development level proxied by GDP per capita: GDP per capita exhibits a strong negative cross-country correlation with the residual gap (Figure 6a), but shows little to no relationship with the motherhood-related gap (Figure 6b).[12] This result suggests that within Latin America, even as countries develop and other sources of gender income inequality lose strength, the motherhood-related gap persists, indicating that other constraints may be at play. For instance, limited access to flexible work schedules in formal jobs (Berniell et al., 2021, 2023a), inadequate parental leave policies, or a lack of childcare services can hinder economic development from effectively reducing the impact of motherhood.

While the evidence on policies like parental leave is mixed (see Berniell et al. (2022) for a survey), a growing body of research highlights the effectiveness of expanding access to childcare in mitigating the negative labor market effects of motherhood. Indeed, interventions that provide free or subsidized childcare services have been shown to increase maternal employment both at the extensive and intensive margins. For instance, public day-care expansions in Brazil and Ecuador led to significant increases in mothers' employment rates and working hours (Paes de Barros et al., 2011; Rosero and Oosterbeek,

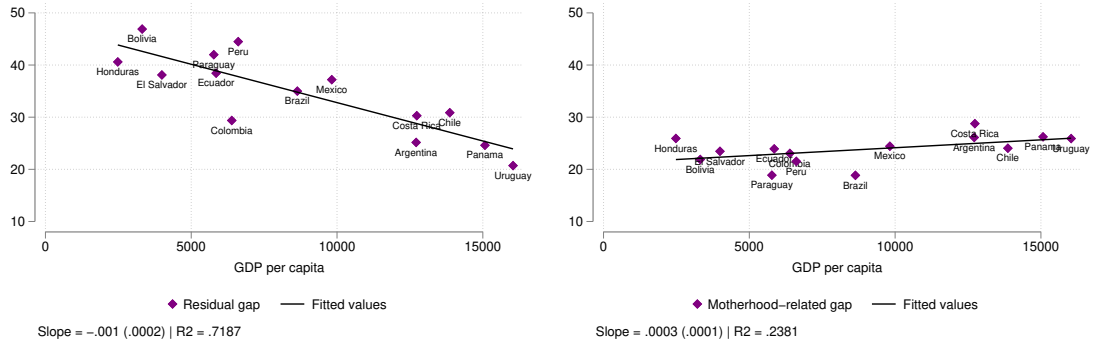
[12]This result holds even when considering child penalties instead of motherhood-related gaps: while the heterogeneity in child penalties is greater than that in motherhood-related gaps across countries, child penalties also exhibit little to no correlation with GDP per capita.

2011). Also, Garcia et al. (2023) finds that the expansion of public childcare services in São Paulo, Brazil, resulted in a significant and lasting reduction in the motherhood effect: each additional seat per child led to a 20% increase in mothers' formal employment after the birth of their first child. Similar effects have been observed in Chile, where after-school childcare services not only increased mothers' labor force participation but also indirectly boosted the use of day-care for younger siblings (Martínez and Perticará, 2017), and in rural Colombia, where community-based childcare programs substantially raised mothers employment rates and work hours (Attanasio et al., 2005). Expanding access to preschool has also proven effective in facilitating mothers' labor market participation. Large-scale preschool infrastructure investments in Argentina and compulsory preschool policies in Brazil have been linked to increases in mothers' employment and a shift from unpaid household work to market activities (Berlinski and Galiani, 2007; Berlinski et al., 2011; Ryu, 2020; Zulli, 2024).

Figure 6: Cross-country correlation between each component of the gender gap in earnings (GGE) and GDP per capita

(a) Residual gap and GDP per capita

(b) Motherhood-related gap and GDP per capita



Note: Figures 6a and 6b report the correlation between the motherhood-related gap and the residual gap calculated from an extended Oaxaca-Blinder decomposition based on Equation 4 for each country under analysis against the GDP per capita from the World Development Indicators. The motherhood-related gap is the explained and unexplained effect of the time to the event dummies (the first two terms of Equation 4), and the residual gap is the explained and unexplained effect of age and year dummies (the remaining terms of Equation 4). Data cover the 14 Latin American countries from 2000-2021.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022), LABLAC (CEDLAS and The World Bank, 2021) and the World Bank Indicators (WDI).

6 Conclusions

This paper explores the link between the motherhood effect and the overall gender gap in labor earnings in Latin America over the last two decades. Our results show that not only is the motherhood effect possibly the single most important factor contributing to the remaining income disparities between men and women in the region, but also that its relative importance has been increasing over the years, contrasting with the declining

trend of the gender income gap. While it is not straightforward to assert that motherhood constitutes the last hurdle to closing income gender gaps, these findings suggest that it represents one of the main and more persistent barriers in Latin America.

A key insight from our analysis is that, unlike other contributors to gender gaps, the motherhood-related gap remains largely invariant to GDP per capita. This suggests that economic development alone has not been sufficient to alleviate the penalties associated with motherhood, pointing to structural constraints that require targeted policy responses. The persisting rigidity of gender gaps related to motherhood highlights the pressing need for policies that address and mitigate the challenges faced by mothers in the region. In particular, expanding access to subsidized childcare services, implementing family-friendly workplace policies, and promoting household co-responsibility can help support women's labor force participation and minimize the negative impact of motherhood on their careers and earnings.

Furthermore, the persistence of the motherhood effect across different levels of economic development underscores the need for further research into the underlying mechanisms driving this rigidity. Examining the interplay between cultural norms, social support structures, and workplace policies could provide valuable insights for designing more effective interventions. In particular, exploring how labor market informality exacerbates motherhood penalties, and whether reforms targeting informal employment could help mitigate these effects, remains an important avenue for future research. Ultimately, addressing the effects of motherhood in the labor market is vital for achieving true gender equality and promoting inclusive economic growth in Latin America.

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Appendix

A Tables and figures

Table A.1: National household surveys used in the analysis

Country	Survey	Years
Argentina	Encuesta Permanente de Hogares	2000-2002
	Encuesta Permanente de Hogares Hogares-Continua	2003-2021
Bolivia	Encuesta Continua de Hogares - MECOVI	2000
	Encuesta de Hogares - MECOVI	2001-2002, 2005-2009 & 2010 – 2021
Brazil	Pesquisa Nacional por Amostra de Domicilios	1999, 2001-2009 & 2011
	Pesquisa Nacional por Amostra de Domicilios - Contínua	2012-2021
Chile	Encuesta de Caracterización Socioeconómica Nacional	2000 & 2003
	Encuesta Nacional de Empleo	2005-2009
	Nueva Encuesta Nacional de Empleo	2009-2021
Colombia	Encuesta Continua de Hogares	2001-2005
	Gran Encuesta Integrada de Hogares	2008-2021
Costa Rica	Encuesta de Hogares de Propósitos Múltiples	2000-2009
	Encuesta Nacional de Hogares	2010-2021
Ecuador	Encuesta de Condiciones de Vida	1999
	Encuesta de Empleo, Desempleo y Subempleo	2003-2021
El Salvador	Encuesta de Hogares de Propósitos Múltiples	2000-2021
Honduras	Encuesta Permanente de Hogares de Propósitos Múltiples	2001-2019
Mexico	Encuesta Nacional de Ingresos y Gastos de los Hogares	2000, 2002, 2004, 2005 & 2006
	Encuesta Nacional de Ocupación y Empleo	2007-2021
Panama	Encuesta de Hogares	2000-2021
Paraguay	Encuesta Integrada de Hogares	2001
	Encuesta Permanente de Hogares	2002-2021
Peru	Encuesta Nacional de Hogares	2000-2021
Uruguay	Encuesta Continua de Hogares	2000-2021

Notes: Own elaboration based on household surveys used in the SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) project.

Table A.2: Pseudo panel example

		Observable characteristics						Outcomes
Individual identifier	**Time relative to the event**	**Gender**	**Country**	**Region**	**Educational level**	**Age**	**Year**	**Employed**
1059	-5	women	Argentina	CABA	incomplete secondary	20	2008	0
1059	-4	women	Argentina	CABA	incomplete secondary	21	2009	0
1059	-3	women	Argentina	CABA	incomplete secondary	22	2010	1
1059	-2	women	Argentina	CABA	incomplete secondary	23	2011	1
1059	-1	women	Argentina	CABA	incomplete secondary	24	2012	1
1059	0	women	Argentina	CABA	incomplete secondary	25	2013	0
1059	1	women	Argentina	CABA	incomplete secondary	26	2014	.
1059	2	women	Argentina	CABA	incomplete secondary	27	2015	.
1059	3	women	Argentina	CABA	incomplete secondary	28	2016	.
1059	4	women	Argentina	CABA	incomplete secondary	29	2017	.
1059	5	women	Argentina	CABA	incomplete secondary	30	2018	.
1059	6	women	Argentina	CABA	incomplete secondary	31	2019	.

Notes: Values in red are build by collapsing the sample of non-parent which have the same observable characteristics as the parent under analysis. Values in **black** belong to an individual who is already a parent in the sample.

Table A.3: Summary statistics at $\tau = -1$, pooled sample

	Mothers	Fathers
Complete sample		
Year of first child's birth	2010	2010
	(4.49)	(4.50)
Age at first child	26.62	28.58
	(5.37)	(5.89)
With some college education	0.41	0.30
	(0.49)	(0.46)
Maximum one child	0.63	0.59
	(0.48)	(0.49)
Maximum two children	0.94	0.92
	(0.23)	(0.26)
Monthly labor earnings (PPP 2005)	343.17	581.82
	(421.00)	(750.06)
Employed	0.63	0.90
	(0.35)	(0.21)
No. of individuals	1,096,309	1,149,432
Sample of workers		
Working hours per week	42.17	48.33
	(11.63)	(11.56)
No. of individuals	412,173	759,884
Informal worker	0.34	0.39
	(0.37)	(0.37)
No. of individuals	490,909	961,795

Notes: The table shows the mean and the standard deviation (in parentheses) of sociodemographic and labor market variables for both mothers and fathers one year before the first childbirth. Monthly labor earnings take the value 0 when the individual is not working in a given month. Hours worked and informality are conditional on being employed. Data cover the 14 Latin American countries from 2000-2021, except for labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021),

Table A.4: Summary statistics at $\tau = -1$ by country

	Argentina		Bolivia		Brazil		Chile		Colombia		Costa Rica	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
Complete sample												
Year of first child's birth	2009	2009	2011	2011	2009	2009	2010	2010	2011	2011	2008	2007
	(4.64)	(4.60)	(4.78)	(4.78)	(5.24)	(5.22)	(4.31)	(4.35)	(4.31)	(4.30)	(4.68)	(4.61)
Age at first child	28.06	29.85	25.54	27.08	26.96	29.02	28.19	30.19	26.22	28.74	25.88	28.70
	(5.10)	(5.34)	(5.08)	(5.59)	(5.45)	(5.90)	(5.72)	(5.96)	(5.23)	(5.92)	(5.13)	(5.90)
With some college education	0.63	0.41	0.44	0.37	0.26	0.17	0.51	0.43	0.51	0.36	0.29	0.19
	(0.48)	(0.49)	(0.50)	(0.48)	(0.44)	(0.37)	(0.50)	(0.50)	(0.50)	(0.48)	(0.45)	(0.39)
Maximum one child	0.59	0.57	0.55	0.50	0.71	0.68	0.63	0.61	0.70	0.66	0.66	0.63
	(0.49)	(0.50)	(0.50)	(0.50)	(0.45)	(0.47)	(0.48)	(0.49)	(0.46)	(0.47)	(0.47)	(0.48)
Maximum two children	0.93	0.92	0.89	0.86	0.96	0.95	0.95	0.94	0.97	0.95	0.95	0.94
	(0.25)	(0.27)	(0.32)	(0.35)	(0.19)	(0.23)	(0.22)	(0.23)	(0.18)	(0.21)	(0.21)	(0.23)
Monthly labor earnings (PPP 2005)	470.36	747.10	269.20	563.11	368.67	601.07	439.27	675.07	349.41	587.74	419.24	765.56
	(454.36)	(629.38)	(383.49)	(571.01)	(481.27)	(670.29)	(505.29)	(690.09)	(397.47)	(497.01)	(552.43)	(704.73)
Employed	0.69	0.89	0.61	0.86	0.68	0.92	0.65	0.88	0.61	0.89	0.56	0.95
	(0.40)	(0.27)	(0.36)	(0.23)	(0.32)	(0.18)	(0.35)	(0.24)	(0.31)	(0.21)	(0.39)	(0.16)
No. of individuals	58,892	55,368	11,689	13,544	172,227	185,920	103,197	97,197	222,650	209,353	14,323	15,212
Sample of workers												
Working hours per week	35.74	45.03	41.39	48.80	40.46	45.40	41.59	45.63	45.84	53.57	43.31	50.96
	(13.62)	(14.49)	(15.46)	(13.75)	(9.20)	(8.19)	(9.14)	(10.08)	(11.05)	(11.09)	(12.59)	(10.96)
No. of individuals	32,130	49,998	5,622	12,898	90,540	167,849	55,462	87,634	119,681	190,759	4,985	13,982
Informal worker	0.30	0.35	0.75	0.79	0.32	0.40	0.24	0.23	0.50	0.56	0.25	0.28
	(0.38)	(0.41)	(0.34)	(0.29)	(0.34)	(0.36)	(0.30)	(0.30)	(0.34)	(0.32)	(0.38)	(0.33)
No. of individuals	32,165	50,118	4,891	11,064	90,540	167,848	29,433	41,953	100,558	158,255	2,111	5,037

Notes: The table shows the mean and the standard deviation (in parentheses) of sociodemographic and labor market variables for both mothers and fathers one year before the first childbirth. Monthly labor earnings take the value 0 when the individual is not working in a given month. Hours worked and informality are conditional on being employed. Data cover the 14 Latin American countries from 2000-2021, except for labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021),

Table A.5: Summary statistics at $\tau = -1$ by country

	Ecuador		El Salvador		Honduras		Mexico		Panama		Paraguay		Peru		Uruguay	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
Complete sample																
Year of first child's birth	2010	2010	2009	2009	2007	2007	2011	2011	2008	2007	2009	2009	2009	2009	2008	2008
	(4.06)	(4.15)	(4.87)	(4.84)	(3.73)	(3.76)	(3.63)	(3.64)	(4.14)	(4.12)	(4.65)	(4.60)	(4.56)	(4.54)	(4.45)	(4.45)
Age at first child	26.30	27.77	24.97	26.91	24.29	26.37	26.17	27.88	26.30	28.70	25.34	28.06	26.40	28.41	28.67	30.68
	(5.58)	(6.07)	(4.86)	(5.68)	(4.48)	(5.39)	(5.16)	(5.74)	(5.64)	(6.16)	(4.75)	(5.34)	(5.64)	(6.00)	(5.62)	(5.92)
With some college education	0.33	0.22	0.13	0.09	0.10	0.07	0.39	0.32	0.41	0.21	0.36	0.22	0.48	0.35	0.38	0.23
	(0.47)	(0.41)	(0.33)	(0.29)	(0.29)	(0.26)	(0.49)	(0.46)	(0.49)	(0.41)	(0.48)	(0.41)	(0.50)	(0.48)	(0.49)	(0.42)
Maximum one child	0.59	0.54	0.62	0.59	0.63	0.59	0.57	0.53	0.61	0.55	0.62	0.59	0.56	0.49	0.65	0.63
	(0.49)	(0.50)	(0.48)	(0.49)	(0.48)	(0.49)	(0.50)	(0.50)	(0.49)	(0.50)	(0.49)	(0.49)	(0.50)	(0.50)	(0.48)	(0.48)
Maximum two children	0.92	0.89	0.94	0.92	0.92	0.90	0.92	0.91	0.92	0.88	0.92	0.90	0.91	0.88	0.95	0.94
	(0.27)	(0.31)	(0.24)	(0.26)	(0.28)	(0.30)	(0.27)	(0.29)	(0.27)	(0.33)	(0.28)	(0.30)	(0.28)	(0.33)	(0.21)	(0.23)
Monthly labor earnings (PPP 2005)	260.00	530.91	189.30	389.04	186.08	398.96	301.02	544.53	366.49	611.79	302.24	744.49	241.86	462.89	479.17	704.33
	(321.88)	(405.88)	(360.81)	(382.10)	(277.97)	(387.48)	(360.16)	(507.90)	(731.47)	(494.35)	(455.71)	(5572.12)	(351.44)	(484.82)	(381.88)	(513.95)
Employed	0.59	0.94	0.45	0.89	0.45	0.92	0.60	0.90	0.54	0.93	0.62	0.94	0.71	0.93	0.80	0.94
	(0.36)	(0.15)	(0.33)	(0.19)	(0.36)	(0.17)	(0.36)	(0.21)	(0.37)	(0.15)	(0.38)	(0.20)	(0.38)	(0.20)	(0.28)	(0.15)
No. of individuals	20,734	24,901	32,102	38,990	11,384	14,152	365,461	399,636	13,362	15,489	7,948	9,218	22,971	32,078	39,369	38,374
Sample of workers																
Working hours per week	40.67	46.22	45.80	46.70	44.14	48.61	41.91	48.89	41.68	45.54	45.42	53.07	40.75	47.47	39.87	46.80
	(12.30)	(10.09)	(11.96)	(8.03)	(13.79)	(11.16)	(12.42)	(12.84)	(10.58)	(9.11)	(16.16)	(20.65)	(19.57)	(16.78)	(8.98)	(8.74)
No. of individuals	10,002	24,153	11,504	36,176	3,688	13,391	27,323	72,429	6,181	14,998	3,892	8,744	13,243	30,156	27,920	36,717
Informal worker	0.59	0.66	0.59	0.70	0.48	0.70	0.21	0.23	0.28	0.42	0.72	0.77	0.77	0.76	0.20	0.28
	(0.40)	(0.33)	(0.40)	(0.32)	(0.40)	(0.33)	(0.31)	(0.30)	(0.36)	(0.33)	(0.38)	(0.34)	(0.37)	(0.35)	(0.28)	(0.30)
No. of individuals	10,002	24,153	11,490	36,165	2,075	7,728	158,632	373,383	6,190	15,009	3,893	8,746	12,449	27,731	26,480	34,605

Notes: The table shows the mean and the standard deviation (in parentheses) of sociodemographic and labor market variables for both mothers and fathers one year before the first childbirth. Monthly labor earnings take the value 0 when the individual is not working in a given month. Hours worked and informality are conditional on being employed. Data cover the 14 Latin American countries from 2000-2021, except for labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021),

Table A.6: Regression coefficients, sample of mothers

	Earnings	Employed	Hours worked	Informality
Relative time = -5	29.386***	0.006***	-0.450***	-0.024***
	(0.608)	(0.001)	(0.032)	(0.001)
Relative time = -4	24.684***	0.006***	-0.303***	-0.020***
	(0.572)	(0.001)	(0.029)	(0.001)
Relative time = -3	17.999***	0.005***	-0.204***	-0.014***
	(0.544)	(0.000)	(0.027)	(0.001)
Relative time = -2	10.335***	0.004***	-0.078***	-0.008***
	(0.523)	(0.000)	(0.026)	(0.001)
Relative time = 0	-137.225***	-0.220***	-3.811***	-0.009***
	(1.628)	(0.001)	(0.079)	(0.002)
Relative time = 1	-150.012***	-0.204***	-3.745***	0.062***
	(1.590)	(0.001)	(0.075)	(0.002)
Relative time = 2	-170.097***	-0.197***	-3.435***	0.086***
	(1.548)	(0.001)	(0.077)	(0.002)
Relative time = 3	-189.647***	-0.197***	-3.589***	0.106***
	(1.599)	(0.001)	(0.070)	(0.002)
Relative time = 4	-216.889***	-0.209***	-3.694***	0.120***
	(1.605)	(0.001)	(0.076)	(0.002)
Relative time = 5	-235.273***	-0.212***	-3.747***	0.129***
	(1.684)	(0.001)	(0.082)	(0.002)
Relative time = 6	-255.881***	-0.217***	-3.895***	0.143***
	(1.710)	(0.001)	(0.078)	(0.002)
Relative time = 7	-276.283***	-0.217***	-4.059***	0.161***
	(1.739)	(0.001)	(0.077)	(0.002)
Relative time = 8	-282.975***	-0.217***	-4.002***	0.167***
	(1.894)	(0.002)	(0.084)	(0.002)
Relative time = 9	-291.851***	-0.213***	-3.840***	0.179***
	(1.983)	(0.002)	(0.090)	(0.002)
Relative time = 10	-299.958***	-0.206***	-3.950***	0.189***
	(2.133)	(0.002)	(0.096)	(0.002)
Constant	26.655***	0.315***	33.270***	0.647***
	(2.196)	(0.002)	(0.118)	(0.003)
No. of observations	5,444,649	5,415,349	2,085,834	2,348,213
R-squared	0.172	0.155	0.064	0.208

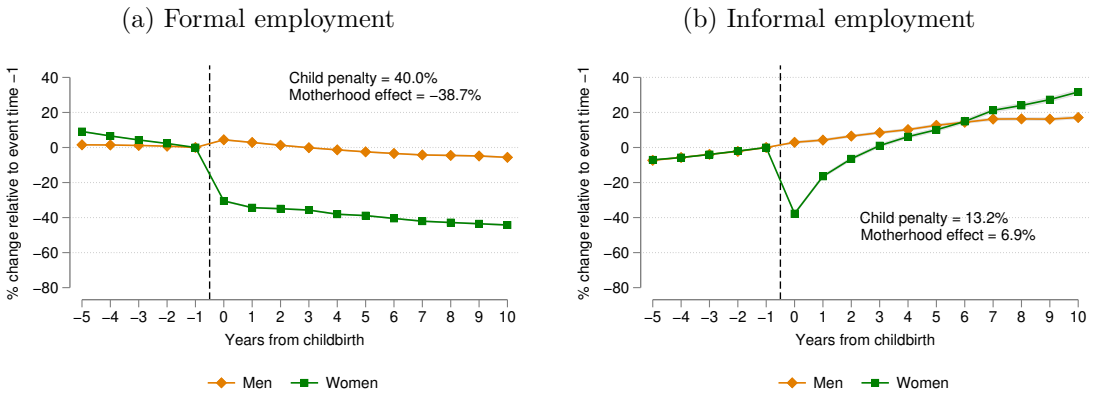
Notes: This table shows the β_τs coefficient (not scaled) from Equation 1 for the sample of mothers, The omitted category is $\tau = -1$ (the year before the first childbirth). Controls include year, age-in-years, and country fixed effects. The effects on hours worked and informality are estimated conditional on being employed. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old. Standard errors are reported in parentheses.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets. $p < 0.01, p < 0.05, p < 0.10$.

Table A.7: Regression coefficients, sample of fathers

	Earnings	Employed	Hours worked	Informality
Relative time = -5	26.241***	-0.022***	-0.612***	-0.019***
	(1.139)	(0.000)	(0.023)	(0.001)
Relative time = -4	23.151***	-0.015***	-0.474***	-0.015***
	(1.245)	(0.000)	(0.021)	(0.001)
Relative time = -3	19.539***	-0.008***	-0.326***	-0.010***
	(1.132)	(0.000)	(0.020)	(0.001)
Relative time = -2	12.002***	-0.004***	-0.142***	-0.006***
	(1.091)	(0.000)	(0.019)	(0.000)
Relative time = 0	10.407***	0.035***	1.082***	-0.003**
	(2.434)	(0.001)	(0.051)	(0.001)
Relative time = 1	-10.317***	0.030***	1.327***	0.002*
	(2.296)	(0.001)	(0.050)	(0.001)
Relative time = 2	-32.639***	0.026***	1.399***	0.012***
	(2.274)	(0.001)	(0.051)	(0.001)
Relative time = 3	-46.332***	0.023***	1.420***	0.017***
	(2.326)	(0.001)	(0.052)	(0.001)
Relative time = 4	-69.411***	0.019***	1.567***	0.023***
	(2.369)	(0.001)	(0.053)	(0.001)
Relative time = 5	-87.952***	0.018***	1.611***	0.030***
	(2.420)	(0.001)	(0.056)	(0.001)
Relative time = 6	-103.146***	0.017***	1.623***	0.035***
	(2.433)	(0.001)	(0.057)	(0.001)
Relative time = 7	-119.154***	0.016***	1.443***	0.042***
	(2.483)	(0.001)	(0.056)	(0.002)
Relative time = 8	-127.383***	0.016***	1.650***	0.043***
	(2.724)	(0.001)	(0.064)	(0.002)
Relative time = 9	-140.260***	0.015***	1.658***	0.045***
	(2.834)	(0.001)	(0.062)	(0.002)
Relative time = 10	-147.050***	0.015***	1.818***	0.051***
	(3.189)	(0.001)	(0.070)	(0.002)
Constant	195.075***	0.713***	44.163***	0.585***
	(3.902)	(0.001)	(0.078)	(0.002)
No. of observations	5,668,657	5,772,140	3,867,392	4,630,546
R-squared	0.056	0.079	0.070	0.213

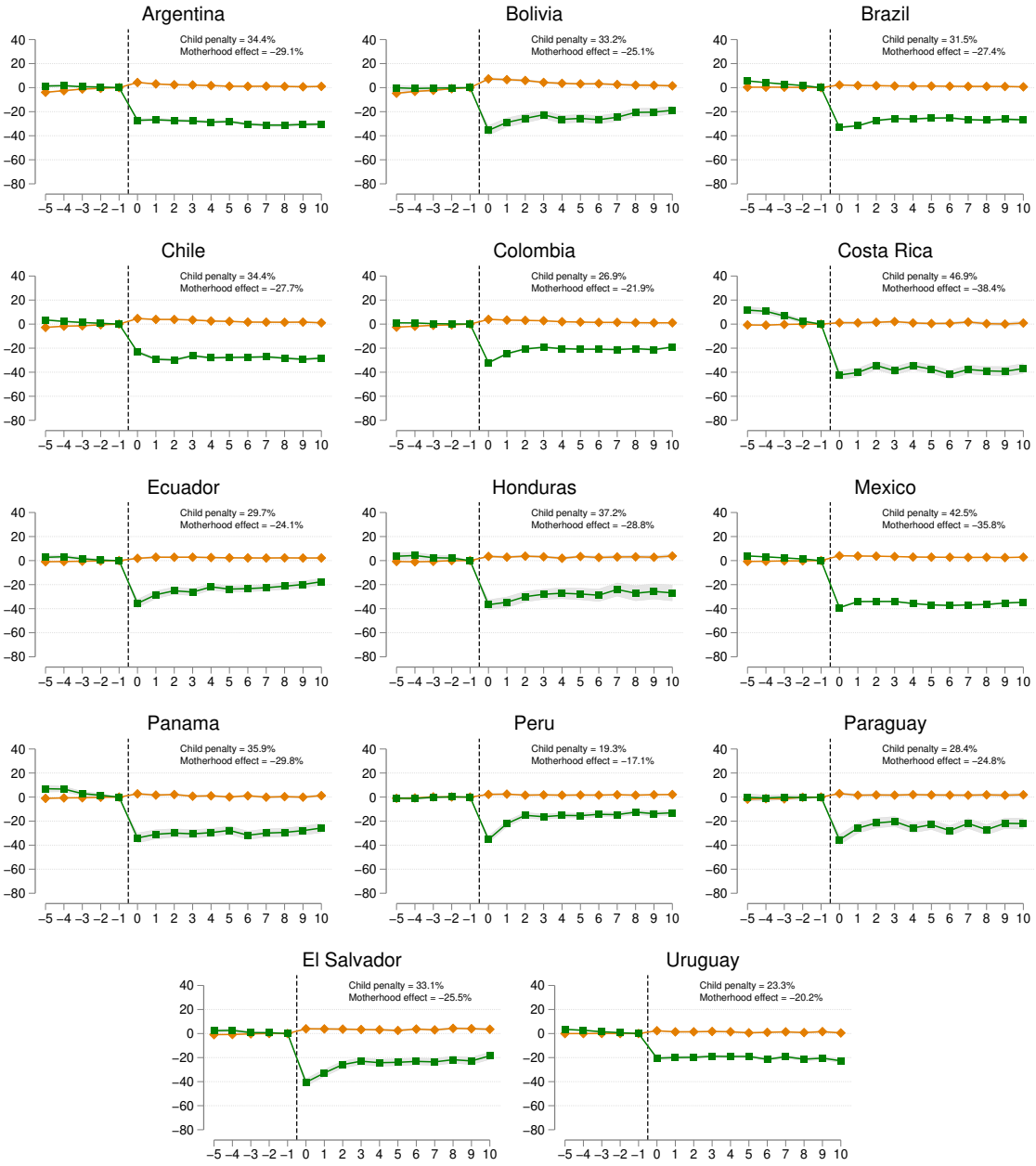
Notes: This table shows the β_τs coefficient (not scaled) from Equation 1 for the sample of fathers, The omitted category is $\tau = -1$ (the year before the first childbirth). Controls include year, age-in-years, and country fixed effects. The effects on hours worked and informality are estimated conditional on being employed. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old. Standard errors are reported in parentheses.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets. $p < 0.01, p < 0.05, p < 0.10$.

Figure A.1: Effects of the first childbirth on formal and informal employment



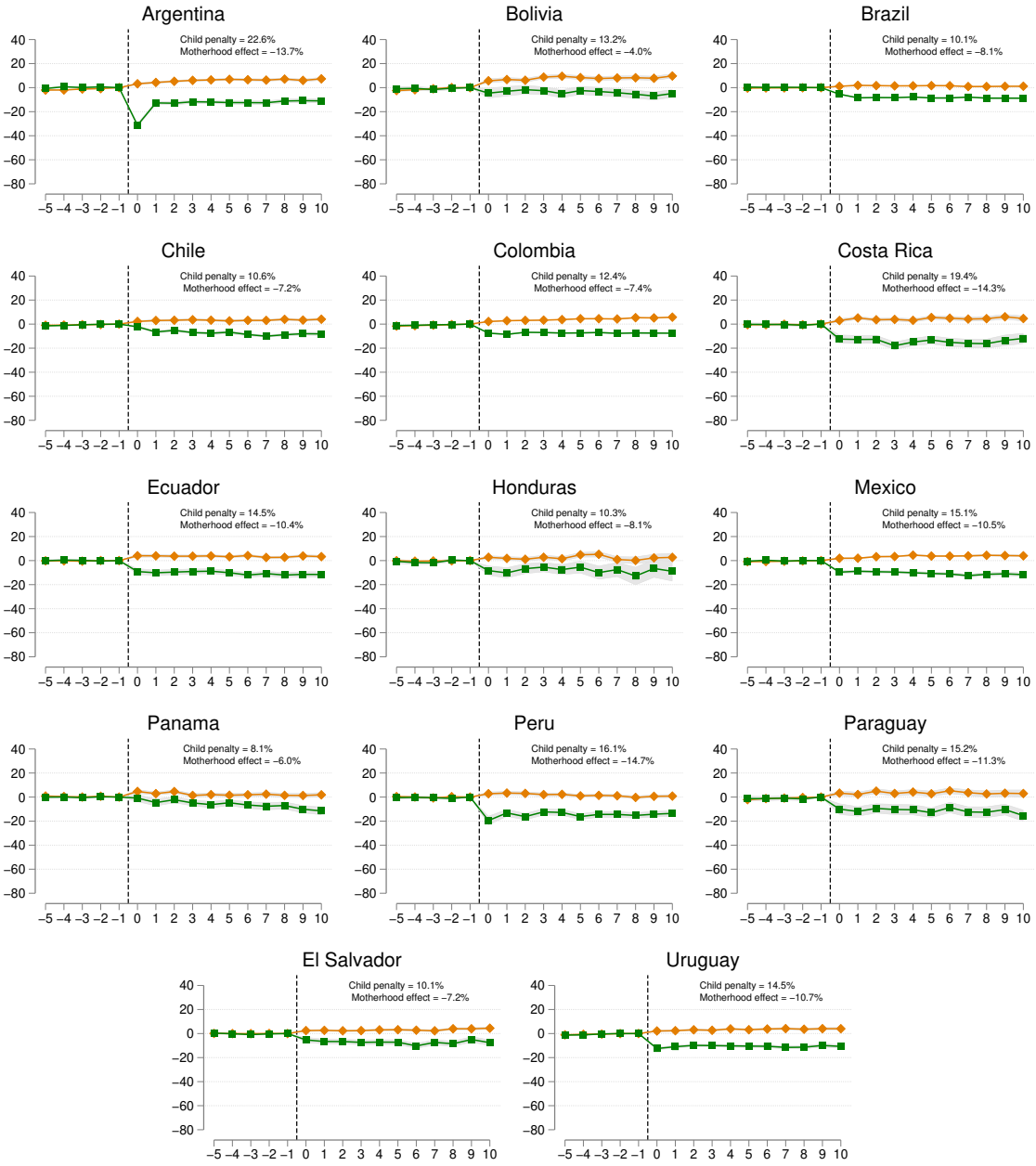
Note: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, age-in-years, and country fixed effects. The effects on formal and informal employment are not conditional on being employed. Formal and informal employment take the value 0 when the individual is not working in a given month. The reported Child penalty and Motherhood effect correspond to the average from $\tau = 0$ through $\tau = 10$. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets

Figure A.2: Effects of the first childbirth on employment by country



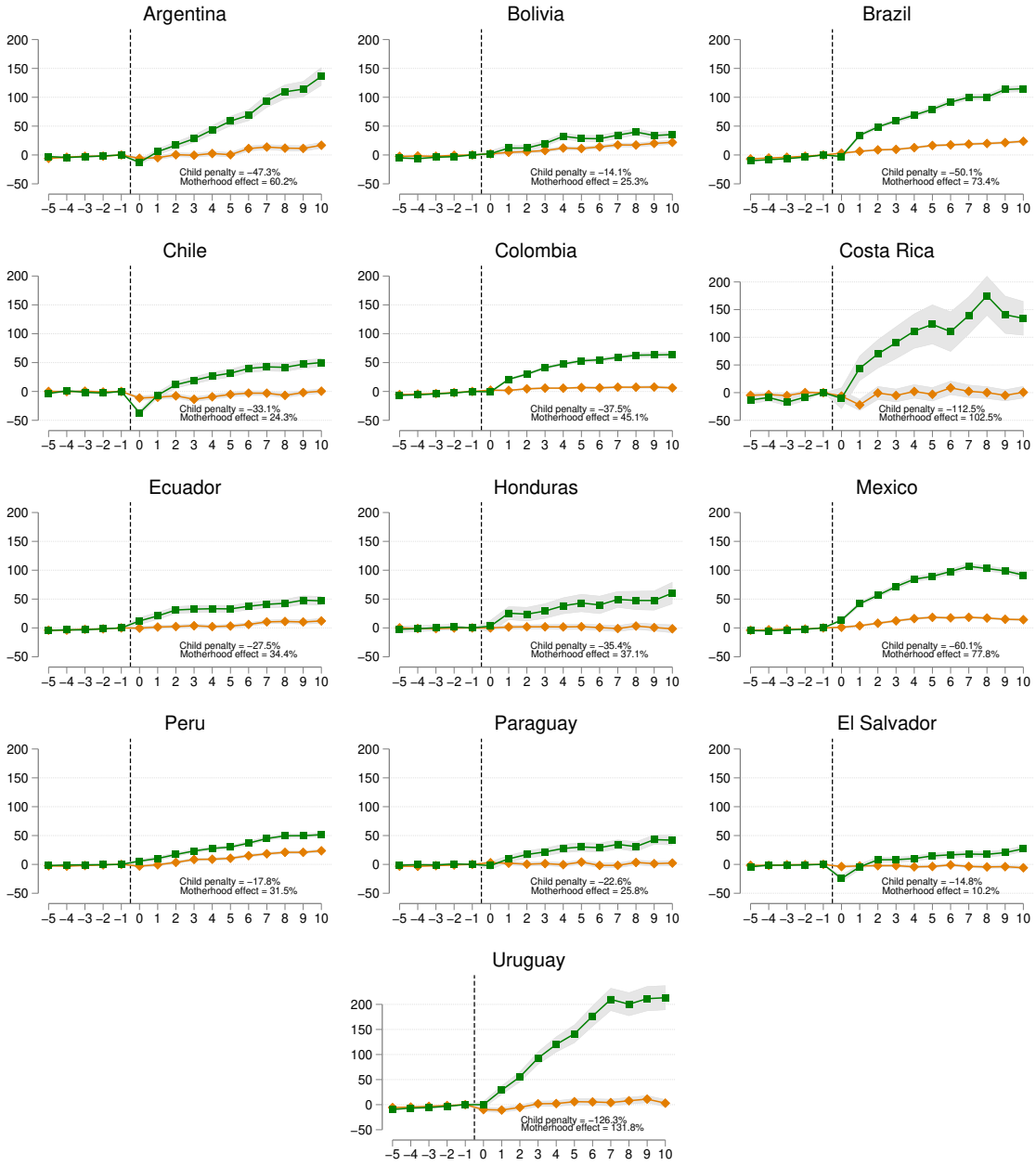
Note: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, and age-in-years fixed effects. The effects on hours worked and informality are estimated conditional on being employed. The reported Child penalty and Motherhood effect correspond to the average from $\tau = 0$ through $\tau = 10$. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

Figure A.3: Effects of the first childbirth on weekly working hours by country



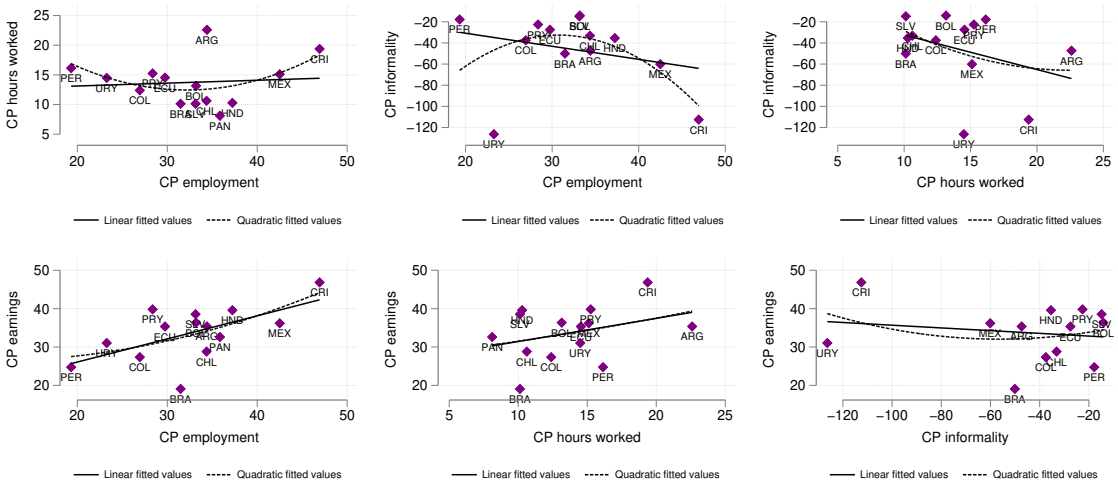
Note: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, and age-in-years fixed effects. The effects on hours worked and informality are estimated conditional on being employed. The reported Child penalty and Motherhood effect correspond to the average from $\tau = 0$ through $\tau = 10$. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

Figure A.4: Effects of the first childbirth on labor informality by country



Note: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, and age-in-years fixed effects. The effects on hours worked and informality are estimated conditional on being employed. The reported Child penalty and Motherhood effect correspond to the average from $\tau = 0$ through $\tau = 10$. Data cover the 14 Latin American countries from 2000-2021, except when estimating the effects on labor informality, where Panama is excluded from the sample. The sample is restricted to mothers and fathers whose age at first childbirth is between 20 and 45 years old.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

Figure A.5: Cross-country relationship of child penalties across labor market outcomes



Note: These figures report the correlation between the standardized estimates of the β_τs from Equation 1 for women for each country across the different outcomes under analysis. The value shown at each point is the average Child penalty from $\tau = 0$ through $\tau = 10$. The effects on hours worked and informality are estimated conditional on being employed. Data cover the 14 Latin American countries from 2000-2021. Estimates of the effects of motherhood on labor informality are not available for Panama due to a lack of data.
Source: Own estimations based on SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.

B Robustness

This appendix reports the results of various robustness exercises that provide more confidence in the pseudo-panel event study approach.

B I Pseudo panels relying on repeated cross-sectional data from household surveys vs. census data

In Table B.1 we show an example of the matching procedure to build pseudo panels using gender (female) and age (in years) with repeated cross-sectional data from household surveys compared to census data. The greater the difference between the corresponding year and the census year, the greater the cohort difference among women when using the survey data for matching compared to the census data. Additionally, this difference increases the latter the moment at which we observe the mother, $\tau \geq 0$, and the moment used to build the counterfactual, $\tau < 0$. For example, the counterfactual at $\tau = -5$ for a mother born in 1972 who is 38 years old and was observed at $\tau = 10$ in 2010 should be built with a woman born in 1972, however, with the census data, we would be using a woman born in 1987, 15 years later.

Table B.1: Comparison between using the survey year or the census year to match observations

		Non-mothers					Mothers									
	Time relative first child (tao)	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Matching with survey	Age	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	**38**
	Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	**2010**
	Cohort	1972	1972	1972	1972	1972	1972	1972	1972	1972	1972	1972	1972	1972	1972	1972	**1972**
Matching with census	Age	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	**38**
	Year	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	2010	**2010**
	Cohort	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973	**1972**

Notes: Values in red are the counterfactual values of a mother before having their first child build using a non-mother with identical characteristics. Values in **black** belong to a woman who is already a mother in the sample.

B II Results based on panel data versus pseudo-panel data: the case of Chile

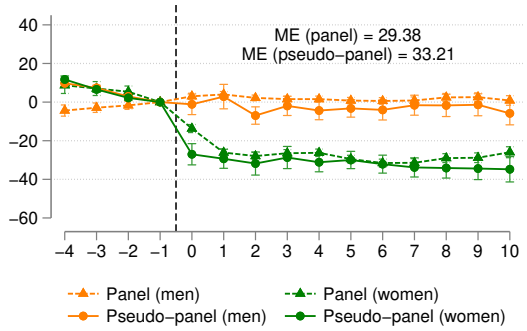
In Figure B.1 we show a comparison between an estimation of the Equation 1 using the pseudo panel built for Chile and the estimation of the same equation using the longitudinal data from the Social Protection Survey of Chile, previously used by Berniell et al. (2021).[13] Although some differences are found in the first year after the birth of the first child, the coefficients do not differ considerably for women, providing evidence in favor of the use of pseudo panels. The difference in event time zero relates to how event time is measured in the actual panel and in the pseudo-panel. In the actual panel, event time zero corresponds to the year ending with the birth month of the first child. Therefore, event time zero in the actual panel includes conception and pregnancy, while the child is only present in the household starting from event time 1. In contrast, in the pseudo-panel, event time zero is defined as the calendar year in which the first child was

[13] Note that the differences between the results shown in these figures and those in Figures 2 and A.2 are explained by the sample selection in Berniell et al. (2021), including the age at which individuals have their first child and the birth cohorts considered.

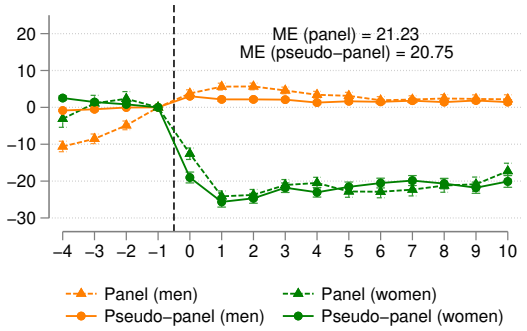
born, allowing the child to be present in the household for anywhere from 1 to 12 months. This way of measuring event time arises from the limitation in most household surveys, which do not provide the exact month of children's birth. Naturally, this difference explains why pseudo-panels tend to yield larger motherhood effects than current panels at event time zero.

Figure B.1: Comparison with panel microdata

(a) Earnings



(b) Employment



Notes: These figures report the standardized estimates of the β_τs from Equation 1 for fathers and mothers, separately. The dashed line reports the standardized estimates from the actual panel and the solid lines report the standardized estimates from the pseudo panel. Since the omitted category is $\tau = -1$, the standardized coefficients measure the impact of children as a percentage of the counterfactual outcome absent children relative to the year before the first childbirth. Controls include year, and age-in-years fixed effects.
Source: Own estimations based on the Social Protection Survey, SEDLAC (CEDLAS and The World Bank, 2022) and LABLAC (CEDLAS and The World Bank, 2021) datasets.