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The child penalty in Sweden: evidence, trends, and child gender

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Abstract

This paper examines the impact of parenthood on labor market outcomes for both men and women using population-wide annual income data from 1960 to 2021 in Sweden. First, I document the contemporary child penalties across several labor market outcomes. Second, I show that while the motherhood penalty in earnings declined significantly during the 1960s, 1970s, and early 1980s, the rate of decline slowed from the late 1980s onwards. Third, I identify a fatherhood penalty emerging since the 1980s, particularly pronounced among men in more gender-egalitarian households (proxied by the father's share of parental leave) and among fathers who have sons relative to daughters.

Keywords: Parenthood, child penalties, gender earnings gap
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1 Introduction

In most industrialized countries, women have entered the labor market at almost the same rate as men and have even surpassed men in educational attainment, often referred to as a gender revolution (Goldin, 2006; England, 2010). However, there are still persistent gender gaps in wages, hours worked, and the representation of women in manager positions (Olivetti and Petrongolo, 2016). Moreover, women's earnings drop sharply relative to men's after entering parenthood (Angelov, Johansson and Lindahl, 2016; Kleven, Landais and Søgaard, 2019).[1] The differential impact of parenthood on women relative to men is the main driver of the persistent gender gap in labor market outcomes across industrialized countries (Kleven, Landais and Søgaard, 2019; Bertrand, 2020; Kleven, 2023; Cortés and Pan, 2023).

This study focuses on the impact of parenthood on labor market outcomes in Sweden. Sweden provides an interesting setting for a study on child penalties since it is often seen as a forerunner in gender-egalitarian norms and the main proponent of the dual-earner/dual-carer model (Ferrarini and Duvander, 2010). Many European countries have followed Sweden's lead, with the EU increasingly emphasizing the role of fathers as family carers.[2] Sweden's historical and contemporary setting therefore provides an important context to study, particularly for countries seeking to implement comparable policies aimed at challenging the male breadwinner norm and promoting gender equality in the labor market.

In this essay, I first document the contemporary child penalties for both men and women across a number of labor market outcomes in Sweden. Second, I show that while the motherhood penalty in earnings declined significantly during the 1960s, 1970s, and early 1980s, the rate of decline slowed substantially from the late 1980s onwards. Third, I identify a fatherhood penalty emerging since the 1980s, particularly pronounced among men in more gender-egalitarian households (proxied by the father's use of paternity leave) and among fathers of sons compared to daughters.

Over the 10 years following first childbirth, women in Sweden having their first child between 1995 and 2011 experience a child penalty in earnings of 37 percent. The penalty 10 years after the first childbirth is 25 percent. Compared to other high-income countries, this is a relatively low long-run motherhood penalty (Kleven et al., 2019). The 10-year motherhood penalty in employment is 6 percent, which is substantially lower than most other OECD countries (Kleven, Landais and Leite-Mariante, 2023) and is reflecting the fact that few women leave the labor market altogether after family formation in Sweden. The 10-year penalty in hours worked and wages (both conditional on employment) are 14 percent, respectively. Therefore, the long-run penalty in earnings primarily stems from lower wages and an increase in part-time employment.

[1] See also Korenman and Neumark (1992), Waldfogel (1997), Budig and England (2001), and Anderson, Binder and Krause (2003) for early evidence on motherhood penalties in wages.

[2] See e.g., EU Directive 2019/1158 on work-life balance for parents and carers, which also mandates that member states must offer a minimum of 10 days of paternity leave.

The fatherhood penalty is essentially constant across the number of children while the motherhood penalty increases with each additional child. Therefore, the gender gap in child penalties over the 10 years following first childbirth increases from 18 percentage points for one child to 30 percentage points for two children, 37 percentage points for three children, and 47 percentage points for four children. Both men and women have higher child penalties in more densely populated regions.

The motherhood penalty in earnings over the 10 years following childbirth decreased from 63 percent for first childbirths in the early 1960s to 43 percent for childbirths in the early 1980s and to 34 percent for childbirths in the early 2010s. The significant reduction in child penalties between the 1960s and 1980s coincides with a substantial entry of women into the labor force and Sweden's implementation of several major family policy reforms to enable and incentivize women with children to work. The slowdown in the reduction in the size of the child penalty is aligned with the broader narrative that gender equality in economic outcomes made significant progress in the 20$^{\text{th}}$ century but has slowed in recent decades (England, 2010; Blau and Kahn, 2006, 2017; Kleven, 2023). It also corresponds with the trend observed in the few other countries that have studied the evolution of motherhood penalties. Generally, these countries experienced significant reductions in the motherhood penalties up to the 1990s, but progress slowed after that.[3]

Although often overlooked in the literature, this essay also focuses on the labor market outcomes of men following parenthood. Despite substantial changes for women in the labor market in the 20$^{\text{th}}$ century (Goldin, 2006), the impact of children on the labor market outcomes of men has been non-existent (or even positive) across countries (Kleven, Landais and Leite-Mariante, 2023). However, I show that within the comparatively gender-egalitarian Swedish context, there is a fatherhood penalty in earnings for men having children. The fatherhood penalty has increased from non-existent to a child penalty in earnings of 7 percent following the 10 years after first childbirth and a 10-year penalty of 4 percent. The short-run penalty is primarily driven by reduced labor supply in the first years after the child is born due to paternity leave. The long-run penalty is driven by lower wages and, to some extent, fewer hours worked.

Recent literature suggests that gender norms are important for the size of the motherhood penalty (Boelmann, Raute and Schönberg, 2021; Kleven, Landais and Søgaard, 2021; Andresen and Nix, 2022*b*; Kleven, 2023). In this essay, I also show the importance of gender norms for the size of the fatherhood penalty. I proxy gender norms by the father's share of parental leave. Previous research has shown a positive relationship between the use of paternity leave and gender-egalitarian norms within the household (Duvander, 2014; Aldén, Boschini and Tallås Ahlzén, 2023).[4] As the number of days of paternity leave has increased substantially during the studied period, I use an individual's

[3]For the evolution of motherhood penalties from the 1970s, see Kleven (2023) for the US, Andresen and Nix (2022*a*) for Norway, and Huttunen and Troccoli (2023) for Finland.

[4]Father's share of parental leave is also an indicator of gender equality that is frequently used by government authorities in Sweden (Swedish Social Insurance Agency, 2018; Haandrikman, Webster and Duvander, 2021).

placement in the distribution of father's share of parental leave in a given year of childbirth as a proxy for gender norms. This implies that the institutional framework remains constant—focusing on Sweden during a specific year of childbirth—while varying gender norms across individual households.

Men in more gender-egalitarian households (proxied by the relative use of paternity leave) also have a higher long-run fatherhood penalty. This comparison of men highlights a large variation in the observed long-run fatherhood penalties, ranging from non-existent for men in the lowest deciles to a penalty of 10 percent for men in the highest decile. The suggested explanation is that men in more gender-egalitarian households make career decisions that translate better to family care relative to market work, much in the same way that women do (Bertrand, Goldin and Katz, 2010; Bertrand, 2020). This explanation is supported by previous research showing that men using more paternity leave also tend to have a higher engagement in child rearing as the child gets older (Haas and Hwang, 2008; Almqvist and Duvander, 2014).[5]

Research in economics has also identified variations in labor market outcomes based on the gender of children. In both the US and Germany, studies indicate that men tend to experience an increase in their hourly wage rates and annual hours worked when they have a son compared to having a daughter (Lundberg and Rose, 2002; Choi, Joesch and Lundberg, 2008; Pollmann-Schult, 2017). Additionally, studies have revealed differences in parental behavior influenced by the child's gender, including at what age they engage their children in activities such as reading, singing songs, and teaching letters and words (Lundberg, McLanahan and Rose, 2007; Bertrand and Pan, 2013; Baker and Milligan, 2016). Studies have also shown that fathers spend more time interacting with their children when they have sons. In contrast, mothers' earnings and time allocation remain relatively unaffected by the child's gender (Lundberg, 2005; Raley and Bianchi, 2006; Mammen, 2011).

In this paper, I show that the motherhood penalty is unaffected by the child's gender, but the fatherhood penalty is relatively larger for men with a first-born son than a first-born daughter, and the gender of the first child accounts for 7 percent of the long-run fatherhood penalty. This result, therefore, contrasts previous findings from the US and Germany (Lundberg and Rose, 2002; Choi, Joesch and Lundberg, 2008; Dahl and Moretti, 2008). While the higher earnings of men with sons are often discussed in the literature in terms of a role model effect (Raley and Bianchi, 2006), this effect may only be present in the context of stronger breadwinner norms, but not in a more gender-egalitarian environment such as Sweden.

The rest of the paper is organized as follows. In Section 2, I present the institutional setting for the study and discuss the relevant policies introduced in Sweden over the last decades. Section 3 presents the empirical strategy using two empirical specifications and the necessary identifying assumptions. In Section 4, I present the data and the sample

[5] An alternative explanation is that higher use of paternity leave signals less career ambition to the employers for men but not for women and that men using more paternity leave are "punished" for doing so (Albrecht et al., 1999).

restrictions. In Section 5, I show the child penalties across different labor market outcomes and regions in Sweden, the development of child penalties in earnings over time, and variation in child penalties across households depending on gender norms and child gender. The paper ends with concluding remarks in Section 6.

2 Background

Sweden consistently ranks high in gender equality indices with gender egalitarian views on women in the labor force and the highest maternal employment rate in the OECD (OECD, 2016).[6] Individual income taxation, expansion of publicly subsidized childcare, and extensive parental leave are all policies implemented in Sweden to increase the incentives for women with children to work.

In 1971, Sweden abandoned joint taxation for households to increase the labor market participation rate of married women. The impact was the strongest for women with children married to high-income earners, where the marginal gain of female labor force participation increased the most (Selin, 2014). Three years later, Sweden was the first country in the world to introduce an earnings-based, job-protected, and gender-neutral parental leave scheme. This reform meant that men and women had the right to economic compensation for being at home with their children. Men and women could transfer these days without any restrictions within the household. In 1974, the paid leave was six months, but it incrementally increased up to 15 months in 1989. The parental leave system was also reformed with "earmarked" parental leave for each parent. In 1995, one month of the total 15 months of paid leave could not be transferred to the other parent. In 2002, it was extended to two months (with an increase in total paid leave from 15 to 16 months), and in 2016 to three months. Parental leave benefits are earnings-based and amount to around 80 percent of earnings up to a capped maximum amount for high earners. In addition to the 480 days of parental leave following a child's birth, parents are entitled to government-paid temporary parental leave to care for sick children. There are no restrictions on the division of temporary parental leave between the parents.

Together with short or non-existent parental leave, expensive childcare is often discussed as one of the main obstacles to women's participation in the labor market (Olivetti and Petrongolo, 2017). However, Sweden was also the first country to introduce public and heavily subsidized universal childcare at a very low cost to families (Lundin, Mörk and Öckert, 2008). Families are guaranteed access to childcare from the age of 1, but can

[6]Examples of gender equality rankings are the World Economic Forum's Global Gender Gap Index (GGI) and the Gender Inequality Index (GII) in the Human Development Report by the United Nations Development Program (UNDP). Sweden ranks 4th behind Iceland, Finland, and Norway (GGI, 2020) and 6th with Belgium behind Switzerland, Norway, Finland, Netherlands, and Denmark (GII, 2019). During the period studied in the main analysis of this paper (1990–2021), Sweden's female labor force participation rate has ranged between 86 percent and 90 percent of the male labor force participation rate. Swedes were the most likely to disagree with the statement that when jobs are scarce, men should have more right to a job than women (Inglehart et al., 2014). Sweden also has the third lowest gender gap in time spent on unpaid/care work relative to paid work in the OECD (OECD, 2016).

access childcare before that. In 2021, 50 percent of one-year olds, 91 percent of two-year-olds and 95 percent of children aged three to five attended preschool (Swedish National Agency for Education, 2022).

3 Empirical framework

I use two empirical specifications to estimate child penalties. In my first specification, I follow Kleven, Landais and Søgaard (2019) and run the following regression:

$$Y_{it} = \boldsymbol{\beta}' \boldsymbol{D}_{it}^{\text{Event}} + \boldsymbol{\gamma}' \boldsymbol{D}_{it}^{\text{Age}} + \boldsymbol{\lambda}' \boldsymbol{D}_{it}^{\text{Year}} + \varepsilon_{it}, \tag{1a}$$

where Y_{it} is the labor market outcome of interest for individual i in event time t. In all empirical specifications, boldface is used to denote vectors. $\boldsymbol{D}$ refers to vectors of a full set of dummies for event time, age, and calendar year. Individuals are included from 5 years before first childbirth to 10 years after, meaning that the event time dummies are indexed from -5 to 10, where $t = 0$ is the year of first childbirth. Event time $t = -1$ is omitted to provide the baseline. Therefore, the event time coefficient $\beta_t \in \boldsymbol{\beta}$ is the impact of children relative to one year before the first childbirth. I do not restrict the number of children, so this estimation should be viewed as the impact of family formation rather than the impact of a child. I also follow Kleven, Landais and Søgaard (2019) and convert the coefficients to percentage effects using the following equation:

$$P_{it} \equiv \hat{\beta}_t / \boldsymbol{E}[\tilde{Y}_{it} \mid t], \tag{1b}$$

where $\tilde{Y}_{it}$ is the predicted counterfactual outcome of having children.[7]

All individuals in the regressions have a child at some point in time. As follows, identification comes from comparing individuals born in the same calendar year, who have their first child at different ages. I am interested in the heterogeneity in the impact of children across childbirth cohorts, the number of children, location choices and characteristics such as parental leave take-up. Therefore, I run Equation 1a separately for each group, which allows for group-specific age and calendar year effects. In the main analysis, I exclude observations where the individuals are students, so that the estimated changes in labor market outcomes are not an artefact of labor market entry.[8]

The key assumption in the event study method is that the decision to have children is not determined by the labor market outcome studied. This assumption is strong for the long-run outcomes since one cannot rely on the smoothness assumption when extrapolating earnings profiles. If unobserved earnings potential is correlated with the timing of the first childbirth, the estimated long-run child penalties will be biased. In Norway,

[7] Note that Kleven, Landais and Søgaard (2019) defines the child penalty as the the outcome for women relative to the outcome for men: $P_{it} \equiv (\hat{\beta}_t^w - \hat{\beta}_t^m)/\boldsymbol{E}[\tilde{Y}_{it}^w \mid t]$. In this study, I define the child penalty as the effect of parenthood as a percentage of the counterfactual outcome of not having children for men and women, respectively.

[8] See Figure C2 for a comparison when including and excluding students from the population.

Bensnes, Huitfeldt and Leuven (2023) use IVF treatments to show that women tend to time their fertility as their earnings profile flattens, which leads to an overestimation of the motherhood penalty using the standard framework. This bias is due to an overestimation of the counterfactual earnings for the women who had children at an early age. However, Melentyeva and Riedel (2023) shows that bias can also arise if there is heterogeneity in the effects of motherhood on earnings by maternal age at first childbirth. In Germany, this heterogeneity leads to an underestimation of the long-run child penalty in the standard framework. Given the potential challenges associated with the conventional event study framework and its applicability to long-run outcomes, I mainly focus on the average outcome in the 10 years following the first childbirth.

The event study method handles decisions taken close to entering parenthood well. For example, if individuals change to a lower-paying job with more work flexibility in a period close to having their first child, this would be detectable as a pre-trend and violate the identifying assumption. Thus, the method is well suited to estimate child penalties related to decisions or outcomes that occur close to entry into parenthood. However, the method cannot incorporate the effect of anticipating becoming a parent on early career investments. For example, individuals could self-select into specific occupations that enable a job with better family-oriented work flexibility but lower earnings potential in anticipation of parenthood (Kahn and Ginther, 2018; Bertrand, 2020). This self-selection is also a potential channel for child penalties that are not accounted for in the event study method, given that it only includes individuals who have children at some point and normalizes outcomes to a pre-child level. From this perspective, the estimated child penalties should be seen as a lower bound on the actual child penalties (Kleven, Landais and Søgaard, 2019).

In the second empirical specification, I modify Equation 1a to estimate the effect of having sons relative to daughters on labor market outcomes to study the impact of child gender:

$$Y_{it} = \boldsymbol{\phi}' \boldsymbol{D}_{it}^{\text{Event}} + \boldsymbol{\beta}' \left(\boldsymbol{D}_{it}^{\text{Event}} \times D_i^{\text{Son}} \right) + \boldsymbol{\delta}' \boldsymbol{D}_{it}^{\text{Children}} + \boldsymbol{\gamma}' \boldsymbol{D}_{it}^{\text{Age}} + \boldsymbol{\lambda}' \boldsymbol{D}_{it}^{\text{Year}} + \varepsilon_{it} \qquad (2)$$

where I include an interaction term with the event time dummies and a dummy for having sons along with a full set of dummies for the number of children. Conditioning on the number of children means that the impact of sons is distinguished from the effect of additional children. The coefficient of interest $\beta_t \in \boldsymbol{\beta}$ is the effect of having sons relative to having daughters. In this model, I use the randomness of the gender of the first child to estimate the impact of the child's gender on earnings. Therefore, this model relies on a weaker assumption than Equation 1a.[9]

I run Equation 2 in two versions. First, I only focus on the gender of the first-born child. This specification has the benefit of relying on the arguably weak assumption that

[9]Table A3 shows the statistics for the main sample of analysis, one year before the birth of the first child, divided by the gender of the parent and the gender of the first child. All the descriptive statistics are very similar with respect to the gender of the child, which supports the identifying assumption that the gender of the first-born child is random.

the gender of the first child is random. The downside is that instead of estimating the effect of having sons relative to daughters, it estimates the impact of having a first-born son relative to a first-born daughter. It should, therefore, be seen as a lower bound as individuals in the control group (individuals with a first-born daughter) are potentially treated later in the post-period (higher order child being a son).

Second, to estimate the impact of having sons relative to daughters, I run the model only for time periods in which the individuals have no children (pre-period) or one or more children of the same gender (post-period). This restriction means that individuals are censored if they have children of opposite genders. The benefit of this restriction is that it estimates the impact of sons relative to daughters, assuming the identifying assumption holds. The downside is that the model relies on a stronger assumption: individuals cannot be following a fertility-stopping rule based on the gender of the children.[10]

In addition, I run Equation 2, including indicator variables for whether the individual is living (i) with their partner, (ii) in a single household with children, or (iii) in a single household without children to control for relationship status. The reason for these control variables is to rule out that the impact of child gender on earnings goes through the relationship status of the parents.

4 Data

I use longitudinal population-wide administrative data on individuals in Sweden. The data links multiple registers through unique identifiers and covers all individuals residing in Sweden between the ages of 16 and 74. It includes annual information on earnings, social benefits, education, and place of living, combined with multigenerational data on parent-child relationships. Relationship status between individuals is identified through marriage or having a joint child.

I restrict the main analysis to a fully balanced panel of individuals, from five years before to ten years after the first child's birth. I have population-wide data on all variables needed for the main analysis from 1990 to 2021. Consequently, I focus on individuals with their first child born between 1995 and 2011. This sample restriction means that only individuals known, alive, and residing in Sweden for the full sequence of years are included. I do not impose any restrictions on the marital or cohabitation status of the parents, nor that it must be the first child for both parents (only that it must be the first child for the individual). I do not impose any restrictions on employment or positive earnings.

The main outcome is annual earnings from the Swedish Tax Agency, defined as labor

[10] As seen in Table B3, if a man has a first-born son, the likelihood of having at least two children increases by 0.29% (0.57% for women). This result is aligned with previous research in the Swedish context (Andersson et al., 2006) and more recent data on the US (Blau et al., 2020) but contrasts earlier research from the US (Dahl and Moretti, 2008). Given that there is a tendency for both men and women to have more children when their first child is a son, a fertility-stopping rule might be in place. Although the effect sizes are small, interpretations of the estimates should be made with this in mind.

income before taxes, excluding paid parental leave, tax deductions, and social benefits. Earnings are winsorized at the 99.5 percent level. Parental benefits are delivered by the Swedish Social Insurance Agency and include job-protected paid leave for parents to care for infants and paid temporary leave for parents to care for sick children. It is registered in spells and total amounts.

For the analysis on parental leave, I use the number of net days of benefits paid out in the first two years from first childbirth.[11] The parental leave days taken by men have increased substantially during the main study period (Figure C1). The median share of men's relative leave-taking has increased from 5 percent in 1995 to 12 percent in 2011 for my main analysis sample.

In addition, the data are merged with matched employer-employee data. These data include a large and representative sample of individuals with information on monthly wages and contracted work hours (full-time equivalent).[12] The information is complete for individuals employed in the public sector. The data on workers in private firms include a representative sample with around 50 percent coverage. This data is used to study monthly wages, contracted work hours, and the probability of becoming a manager. The analysis of these outcomes is therefore conducted on a smaller sample of individuals than the other analyses. These outcomes are also conditional on having employment. Given that it is unusual for individuals to be included in this data set uninterrupted for all 16 periods around child birth, these outcomes are analyzed using an unbalanced panel. Managers are identified using the Swedish Standard for Classification of Occupations (SSYK), based on the International Standard for Classification of Occupations (ISCO). Table 1 shows the descriptive statistics for the main sample.

For the spatial analysis, I use data on the region in which someone lived one year prior to having their first child. The region is defined as a "local labor market," as defined by Statistics Sweden, with the aim to have regions that are "relatively independent from the outside world in terms of labor supply and demand" (Statistics Sweden, 2023). There are small variations over time in how these are defined, but they are relatively constant over time. I use the definition in the year 2018, which includes 69 regions in Sweden.

The multigenerational data goes back to individuals born from 1932 onwards who have been registered in Sweden at some point from 1961. The data from the Pension Authority on pensionable income goes back to 1960 for individuals born in 1938 onwards. In the historical analysis, I use an unbalanced panel in order to include as many years and

[11] Most leave is taken within two years, and leave-taking during the first two years is more important for the father's continued participation in childcare as the child gets older (Duvander and Johansson, 2019; Aldén, Boschini and Tallås Ahlzén, 2023).

[12] The contracted work hours are stipulated in the work contract and state whether the individual is scheduled to work full-time (40 hours per week) or a percentage of full-time. If an individual's actual working hours exceed or fall short of the contracted work hours, this will not show in the data. Common examples of when this could happen are, for instance, that an individual's actual working hours exceed the limit of 40 hours per week (working overtime) or that an individual is on parental leave or leave for sickness. Monthly wages are the wages stipulated in the work contract and may also diverge from the actual earnings for the same reasons as contracted work hours.

Table 1: Descriptive statistics—Main sample

	Men	Women
Child birth year	2003.4	2003.4
	(4.881)	(4.885)
Age at first childbirth	31.00	29.11
	(4.734)	(4.501)
Years of education	12.43	12.93
	(2.098)	(2.070)
Annual earnings (1000 SEK)	282.1	223.7
	(167.1)	(133.9)
Employment	0.929	0.940
	(0.257)	(0.238)
Monthly wage (1000 SEK)*	27.90	23.86
	(9.451)	(6.934)
Hours worked in % of full-time*	0.756	0.796
	(0.416)	(0.348)
Manager position*	0.0606	0.0240
	(0.239)	(0.153)
Observations	561344	559547

Notes: The table shows descriptive statistics for the main sample (first childbirths between 1995 and 2011). Standard deviation in parenthesis. All variables are measured one year prior to the birth of the first child, except age which is the age in the same year as first childbirth. *These variables are based on a sample as described in Section 4.

observations as possible. Hence, I will look at men and women born from 1938 who had their firstborn child from 1961. See Tables A1 and A2 for descriptive statistics on income and age at first birth for cohorts using these data.

In 1974, work-related transfers (e.g., unemployment insurance and parental benefits) became taxable and hence part of pensionable income. I therefore use the Income and Taxation Register (IoT), which is available for years 1968 to 2021, to identify these work-related transfers and remove them from the pensionable income. Moreover, income from the Pension Authority is capped at both ends of the distribution. Income below one price base amount is counted as zero income, and income above 7.5 price base amounts are capped at that level. For child births from 1976 onwards, I therefore use the Income and Taxation Register (IoT). Income from the IoT is winsorized at the 99.5 percent level. All nominal variables are adjusted for inflation using the consumer price index for 2018.[13]

5 Results

Figure 1 shows the contemporary child penalties along a number of labor market outcomes. Immediately after the birth of the first child, women and men diverge in terms of all labor market outcomes studied. The initial differential impact is starkest in earnings, where there is a 52 percentage point gap between men and women one year after the birth of the first child.[14] Some of this initial gender gap is compensated for with parental benefits, where the gap is 30 percentage points when adding parental benefits to earnings.[15]

10 years after family formation, the gender gap in child penalties is 21 percentage points in earnings and 18 percentage points when adding parental benefits to earnings. This result aligns well with the fact that parental leave is mainly taken in the first two years after a child is born. The slightly higher penalty in earnings without added parental benefits in the longer horizon is due to the fact that men and women might also be on parental leave for subsequent children (including temporary leave to care for sick children) and the fact that parental benefits do not account for 100 percent of the earnings.[16]

The fatherhood penalty one year after the birth of the first child is reduced by 9 percentage points when adding parental benefits, showing the importance of parental leave when estimating the impact of children also on male earnings. Consequently, in Sweden, also male labor market outcomes are negatively affected by parenthood, and the main

[13] See Figure C8 for a comparison of estimations using the two respective databases and when including and excluding transfers.

[14] Note that since the outcomes are measured at the annual level, the impact in the year of childbirth is mitigated by the fact that earnings in the months before the birth of the child is included.

[15] Parental benefits include both job-protected parental leave to care for infants and temporary leave to care for sick children.

[16] Notably, the inclusion of parental benefits also makes the outcome for Swedish women very similar to the outcomes for Danish (Kleven et al., 2019) and Norwegian (Andresen and Nix, 2022*b*) women, both in the short and the long run. Given that parental benefits are included in the earnings measurement in both Danish and Norwegian register data, the pattern is, therefore, very similar for women across the Scandinavian countries.

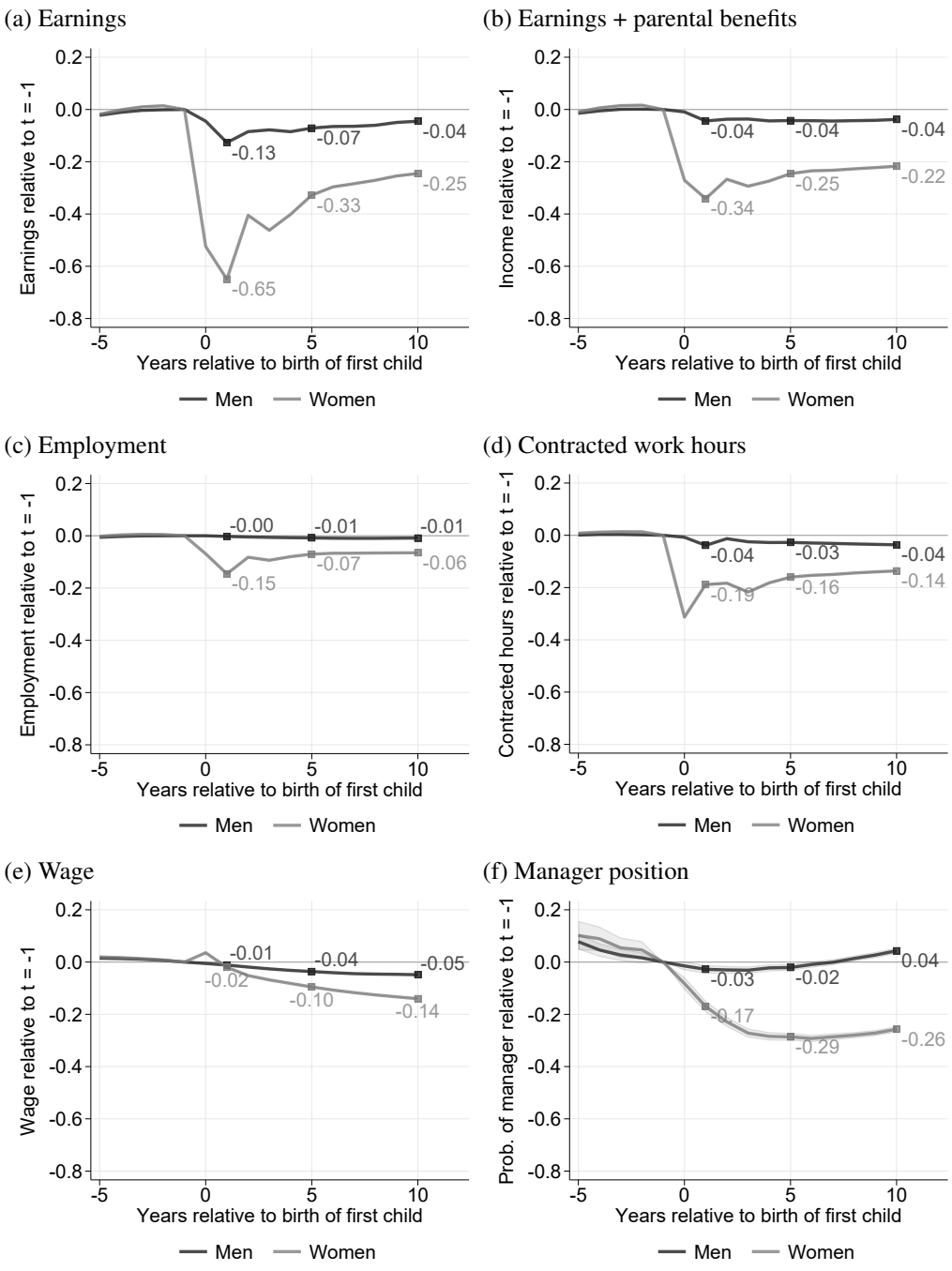


Figure 1: Impact of children on labor market outcomes. The outcomes are relative to one year before the first childbirth and are converted to relative effects by dividing them with the predicted counterfactual outcome for individual i in period t. See Figure C3 for the raw earnings gap and Figure C4 for predicted counterfactual earnings and the impact of children on earnings in SEK. The empirical specifications are shown in Equations 1a and 1b in Section 3. Earnings, income, and employment are unconditional on labor market participation, while hours and wages are conditional on participation. Employment is an indicator variable for having earnings above the first quintile in the earnings distribution. Analysis includes first childbirths between 1995–2011. 95 percent confidence intervals in shaded gray (only visible for manager position).

driver of the fatherhood penalty is the use of parental leave. However, even when adding parental benefits, there is a fatherhood penalty of 4 percent over the 10 years following first childbirth.

The gender gap in child penalties in employment is 7 percentage points over the 10 years following first childbirth, which corresponds to less than a fourth of the gap in earnings. Contracted hours has a more pronounced initial dip for women and a gender gap at 15 percentage points over the 10 years following first childbirth. Hence, few men and women tend to leave the labor market completely due to children, and the impact along the intensive margin (part-time work) is relatively more important in understanding the gender gap in earnings. Both men and women have a worse wage trajectory after having children. The gender gap in wages is 5 percentage points over the 10 years following first childbirth and increases over time to 9 percentage points after 10 years. Consequently, both wage and contracted hours are important partial explanations for the earnings penalty.[17] Women are also less likely to become managers following parenthood. There is a substantial 24 percentage point gender gap in the likelihood of becoming a manager over the 10 years following first childbirth.[18]

The number of children is important for the size of the motherhood penalty (Figure 2).[19] The fatherhood penalty is essentially constant across the number of children. Therefore, the gender gap in child penalties over the 10 years following first childbirth increases from 18 percentage points for one child to 30 percentage points for two children, 37 percentage points for three children, and 47 percentage points for four children. It is also clear that the smaller second drop occurring for women three years after the first childbirth in terms of earnings, employment, and hours worked in Figure 1 is driven by the impact of a second child.

Figure 3 shows that there is a positive correlation between population density and the size of both the motherhood and fatherhood penalties, where the penalty is higher in more urban regions. The correlation is stronger between population density and the size of the fatherhood relative to the motherhood penalty. For some rural areas, there is still a fatherhood premium, while the penalty is highest in the most densely populated regions. The range in the size of the fatherhood penalty is substantial, going from a fatherhood premium in some rural areas to a fatherhood penalty of 8 percent in the most urban areas.

[17] While earnings are measured on all men and women, the wage and hours are conditional on labor market participation. Moreover, contracted work hours and wage rates require a change in the employment contract; reduced work hours not included in the employment contract are not covered (e.g., working less overtime or being on leave). The drop in hours worked could be different than the drop in contracted hours.

[18] A bit of caution is warranted when interpreting the point estimates for men and women separately, given the pre-trends. The negative pre-trend is given by men and women having children earlier are less likely to be managers.

[19] An important note is that we cannot rule out endogeneity in the number of children. Men and women with one or four children have lower earnings and education levels than men and women with two or three children at the age of their first child (Table A4).

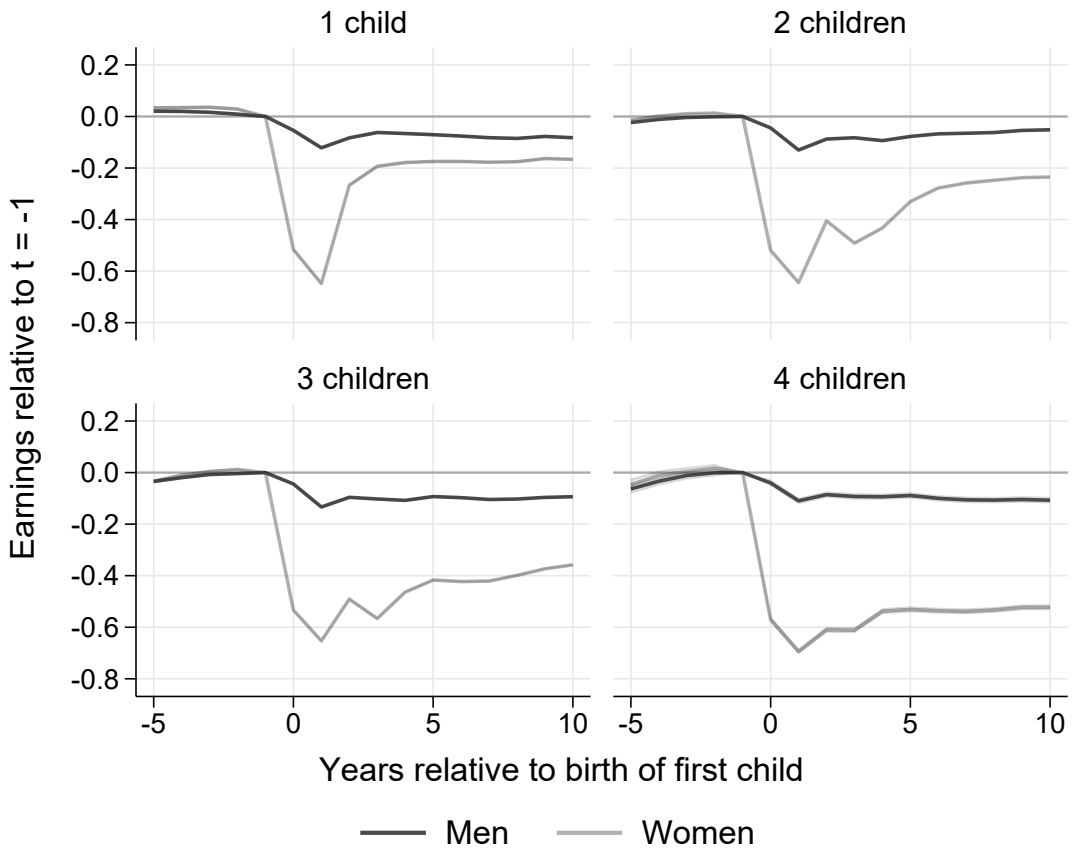


Figure 2: Child penalties in earnings by the number of children. The figure plots the estimates from child penalties in earnings. The legend shows the number of children ten years after the birth of the first child. The outcomes are relative to one year before the first childbirth and are converted to relative effects by dividing them with the predicted counterfactual outcome for individual i in period t. The empirical specifications are shown in Equations 1a and 1b in Section 3. Analysis includes first childbirths between 1995 and 2011. The shaded regions are 95 percent confidence intervals (only visible for 4 children).

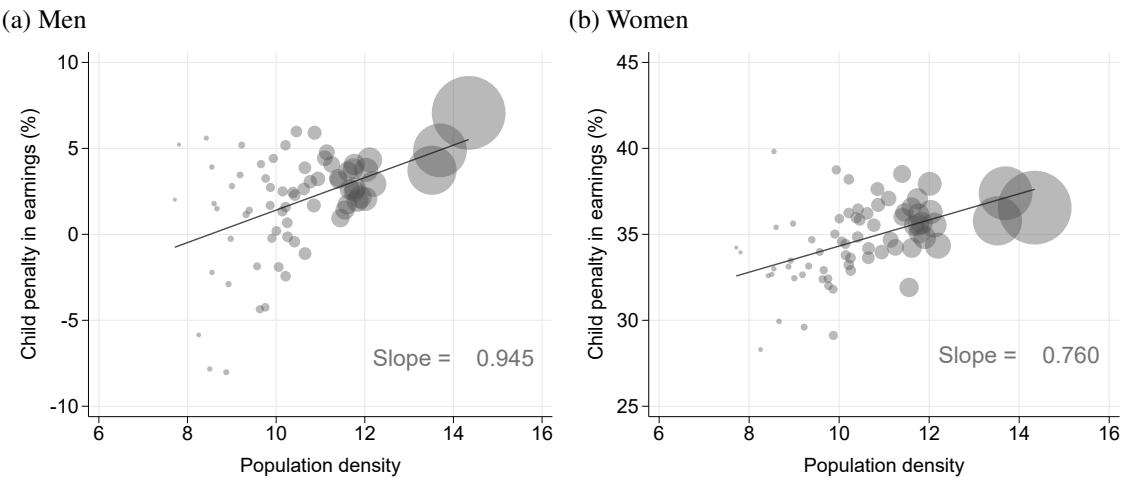


Figure 3: Child penalties across regions in Sweden. The penalty is the average penalty in earnings for the 10 years following first childbirth. Analysis includes firstborn children between 1995 and 2011. Regions are defined as local labor markets according to Statistics Sweden. Population density is defined as the natural logarithm of the number of people living in a region. The size of the circles is the relative size of the population within a region. See Figure C5 for regions. Analysis includes first childbirths between 1995 and 2011.

5.1 Child penalties over time

Figure 4 shows the child penalties for men and women having their first child between 1961 and 2015. Most strikingly, the motherhood penalty in earnings has been significantly reduced during the 1960s, 1970s, and early 1980s, going from 63 percent for childbirth cohorts in the early 1960s to 43 percent for childbirth cohorts in the early 1980s. Hence, the child penalty in earnings was reduced by 20 percentage points over these two decades. From the late 1980s onwards, the motherhood penalty has been declining at a much slower rate, where the motherhood penalty in the early 2010s is at 34 percent, a reduction by 9 percentage points.

The magnitude of the fatherhood penalties is much smaller, with relatively little variation in the impact of children on men's earnings over the last six decades. Notable, however, is the fact that Sweden has a fatherhood penalty since the 1980s. The relatively small magnitude of the average fatherhood penalty means that the changes in the gender gap in earnings stemming from children is mainly driven by the reduction in the motherhood penalty during the early decades. The main reduction in motherhood penalties is driven by women born in the late 1930s to early 1950s, while the fatherhood penalty appears for men born in the late 1950s and is increasing for each generation of men having children (Figure C7).

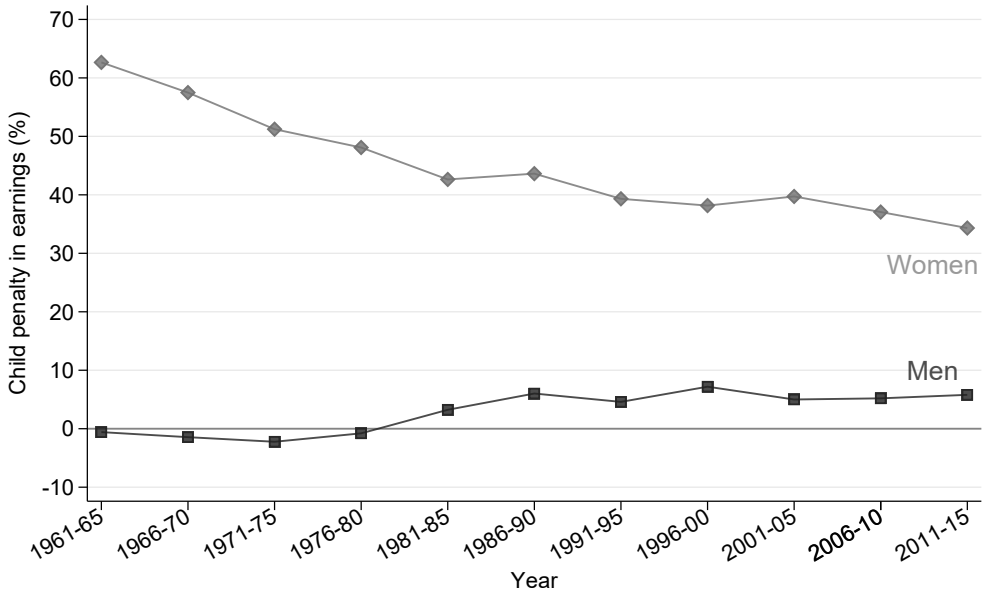


Figure 4: Child penalties for men and women having their first child between 1961 and 2015. Men and women are divided into childbirth cohorts of 5 years based on when their first child was born. The child penalties are defined as the average annual penalty in the 10 years following the first childbirth. See Figure C6 for underlying event study graphs.

5.2 Child penalties and gender norms

Figure 5 displays child penalties depending on how gender-egalitarian a household is. Gender norms are proxied by father's share of parental leave relative to other fathers' share of parental leave within the same year of first childbirth. The correlations in panel (a) are partly mechanical, as parental leave inevitably reduces earnings in the short run. In this case, both the motherhood penalty and the fatherhood penalty correlates with the relative use of paternity leave within the household. The gradient in the long run disappears for women but there is still a substantial gradient for men in panel (b). Hence, men in more gender-egalitarian households have a larger fatherhood penalty, while the motherhood penalty is essentially constant across households (except for the highest decile). The long-run fatherhood penalty ranges from non-existent for men using no paternity leave to above 10 percent for men in the highest decile. This finding is corroborated by dividing households by the distribution of days of maternity and paternity leave, respectively, instead of looking at the relative use within the household (Figure C9). The result also holds when adding parental benefits to earnings, which means that the long-run impact is not driven by the impact of parental leave for subsequent children (Figure C10).

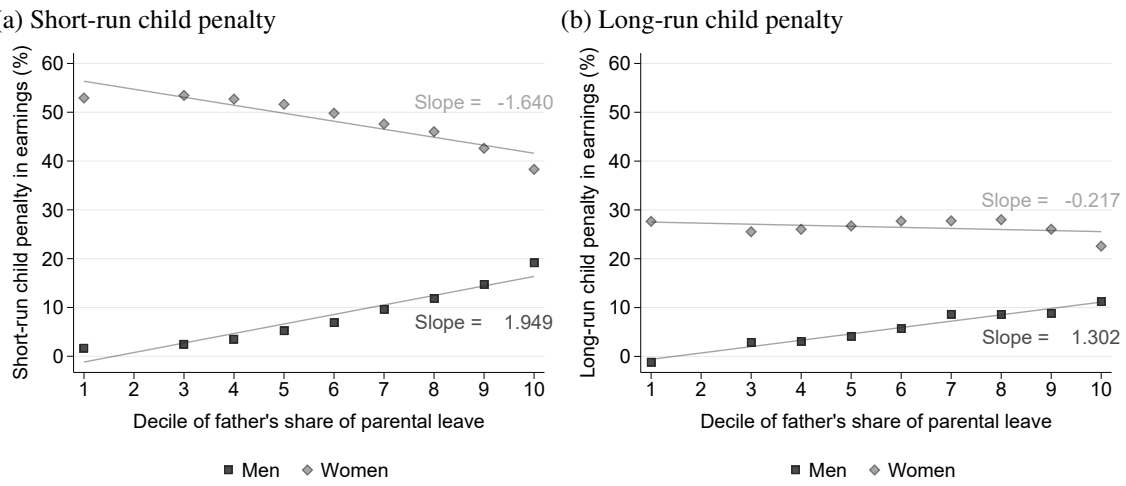


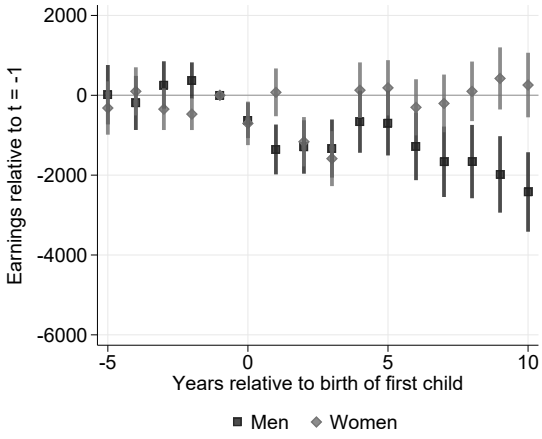
Figure 5: Short-run and long-run child penalties in earnings depending on the father's share of total parental leave within the household. The short-run penalty is the average annual penalty 0 to 4 years after first childbirth. The long-run penalty is the average annual penalty 5 to 10 years after first childbirth. Analysis includes first childbirths between 1995 and 2011. Deciles are based on father's share of parental leave within the household within the first two years of a given year of first childbirth. Deciles 1 and 2 are not separable as these are men using no leave for parts of the period. For underlying event study graphs, see Figure C11. For underlying distribution of father's share of parental leave, see Figure C1.

5.3 Child penalties and child gender

The fatherhood penalty is also higher for men with sons than for men with daughters, while the motherhood penalty is unaffected by the gender of the children. Using the randomness of the gender of the first child, panel (a) in Figure 6 shows the negative earnings effect for men having a firstborn son relative to a firstborn daughter. The figure shows an additional average annual negative impact of 1,688 SEK in the long run (5 to 10 years after first childbirth). Panel (b) shows the negative earnings effect for men in terms of the overall gender composition of the children. This figure only includes observations where the individual has same-gender children, establishing an average annual negative impact of 2,707 SEK from having sons relative to daughters in the long run.[20] Thus, the results are qualitatively similar, but the effect sizes are mitigated in panel (a) because some of the individuals in the control group (whose firstborn child is a daughter) are treated later in the post-period (higher-order child is a son). The long-run son penalty accounts

[20] As shown in Tables B1 and B2, sons are 9.4 percent (6.7 percent focusing on the gender of the first child only) more likely to live with their fathers than daughters, conditional on being a single household. This result is also aligned with previous findings (Dahl and Moretti, 2008; Blau et al., 2020). Including controls for the relationship status when estimating child penalties does, however, not alter the conclusion that fathers to sons have higher child penalties than fathers of daughters (Figure C12). Therefore, the additional penalty having sons is not driven by single household fathers being more common with sons than daughters.

(a) Firstborn child is a son



(b) All children are sons

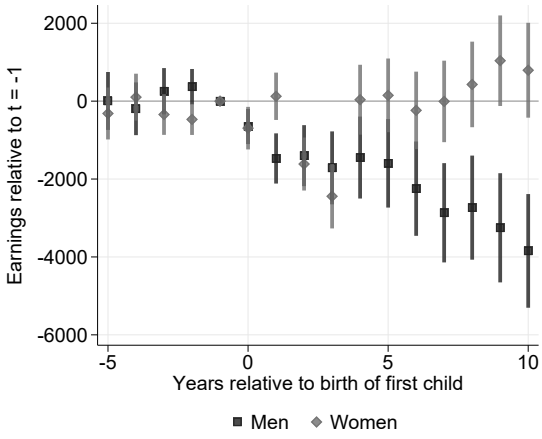


Figure 6: Child penalties from sons relative to daughters. The figures plot the estimates from additional child penalties in earnings from having sons. Analysis includes first childbirths between 1995 and 2011. The left figure shows the impact of having a firstborn son relative to a firstborn daughter. The right figure shows the impact of having sons relative to the same number of daughters. The empirical specification follows Equation 2. The bars are 95% confidence intervals.

for 11 percent (7 percent for the firstborn child) of the long-run fatherhood penalty. For women, the corresponding numbers are less than 0.3 percent. In conclusion, there is a notable difference in the size of the child penalties among fathers depending on the gender composition of the children but not among mothers.[21] The gradual increase in the "son penalty" indicates that the child's gender becomes more important as the child ages.[22] This finding highlights that it is when the child approaches school age and the age of leisure activities that the child's gender makes a difference in terms of earnings.

6 Conclusions

This paper contributes to the literature on gender inequality in the labor market by focusing on men's and women's labor market outcomes in an environment with less traditional gender norms. First, it shows that there is a considerable motherhood penalty and a small but existing fatherhood penalty in Sweden. Second, it shows that the motherhood penalty has been substantially reduced over time, from 63 percent in the early 1960s to a penalty of 34 percent in the early 2010s. This decline occurred primarily during the 1960s, 1970s,

[21] Notably, Tables B1 and B2 show that fathers of sons also take slightly more parental leave than fathers of daughters (1.2 percent for only sons relative to only daughters and 0.7 percent for a firstborn son relative to a firstborn daughter). The corresponding numbers for temporary leave to care for sick children are 5.8 percent and 3.3 percent, respectively. However, adding parental benefits (including also temporary leave to care for sick children) does not alter the result that there is an additional penalty from having sons relative to daughters (Figure C13).

[22] This is aligned with previous research on the importance of child gender for fathers' participation in activities with their child (Morgan, Lye and Condran, 1988; Baker and Milligan, 2016).

and early 1980s while being while being only modestly reduced from the 1980s up until today. The reduction in the motherhood penalty therefore coincides with a substantial entry of women into the labor market and major family policy reforms in the early 1970s. The observed trends thus contributes to the broader narrative of a transformative change in women's labor market outcomes in Sweden between the 1960s and 1980s.

For men having their firstborn child from the 1980s onwards, there is a fatherhood penalty in earnings. This penalty in earnings is primarily driven by reduced labor supply in the first years after the child is born (partly due to the use of paternity leave) but also persists in the longer horizon. The penalty in the long run is driven by reduced hours worked and lower wages but is small in magnitude. While the long-run motherhood penalty is relatively unaffected by the use of parental leave and the distribution of parental leave within the household, there is a linear increase in the long-run fatherhood penalty for men using more paternity leave. This result indicates that differential gender norms across households matter for variations in the size of the fatherhood penalty.

Finally, the fatherhood penalty is higher for men who have sons compared to daughters. The gender composition of the children corresponds to 11 percent of the fatherhood penalty, and the gender of the firstborn child corresponds to 7 percent. The fact that fathers of sons have lower earnings than fathers of daughters contrasts with studies from the US and Germany. One potential explanation for this discrepancy is that gender norms in Sweden are different from those in the US and Germany. While the higher earnings of men with sons is often discussed in the literature in terms of a role model effect, this effect may only be present in a context with a stronger breadwinner norm, but not in a more gender-egalitarian environment such as Sweden.

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Appendix A: Descriptive statistics

Table A1: Descriptive statistics for birth cohorts of children

	Men										
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10	2011-15
Age	22.80	24.79	26.16	27.46	28.36	28.66	29.35	30.40	31.22	31.46	31.49
	(2.185)	(3.024)	(3.629)	(4.310)	(4.806)	(5.064)	(5.243)	(5.364)	(5.404)	(5.665)	(5.784)
Income	130468.5	166942.4	185748.8	181347.3	174975.5	175736.4	184832.4	202608.6	255880.5	267100.0	280920.9
	(50148.1)	(64900.2)	(68506.4)	(406775.1)	(741085.4)	(209591.0)	(148050.4)	(159984.0)	(205673.2)	(204760.6)	(207245.8)
Observations	81746	174767	230022	196545	187187	227055	223148	187257	214276	239264	238482

	Women										
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10	2011-15
Age	21.91	23.39	24.12	25.08	25.82	26.18	26.96	27.98	28.82	28.97	29.02
	(2.312)	(3.132)	(3.839)	(4.385)	(4.575)	(4.563)	(4.712)	(4.850)	(4.915)	(5.096)	(5.044)
Income	92630.3	121561.4	145712.5	140423.3	138322.3	129439.0	141546.3	149677.7	191973.6	201293.6	214545.0
	(31256.8)	(47294.5)	(55083.2)	(328227.4)	(662514.6)	(367572.1)	(89982.4)	(114309.7)	(141645.6)	(152192.2)	(157962.1)
Observations	98302	176554	232150	196720	187285	228428	222827	185471	213254	240158	238662

Notes: The table shows descriptive statistics in terms of age at first child birth and earnings (2018 SEK) one year prior to the year of first childbirth. Standard deviation in parenthesis.

Table A2: Descriptive statistics for birth cohorts of parents

	Men								
	1938-42	1943-47	1948-52	1953-57	1958-62	1963-67	1968-72	1973-77	1978-82
Age	27.80	27.26	27.68	28.82	29.59	29.84	30.75	31.28	30.84
	(4.931)	(5.305)	(5.659)	(5.904)	(5.851)	(6.014)	(5.947)	(5.333)	(4.727)
Income	181453.8	183485.6	169993.9	177178.5	189883.3	207948.7	239191.7	265976.4	277140.2
	(71239.3)	(73901.6)	(532779.3)	(243546.0)	(468079.5)	(177770.7)	(203132.5)	(206891.3)	(210622.4)
Observations	178169	261483	249863	231714	227582	263690	244017	234137	216367

	Women								
	1938-42	1943-47	1948-52	1953-57	1958-62	1963-67	1968-72	1973-77	1978-82
Age	26.10	25.09	25.08	25.54	26.53	27.07	27.95	28.94	28.99
	(4.149)	(4.499)	(4.713)	(5.229)	(5.181)	(5.191)	(5.547)	(5.254)	(4.879)
Income	127697.5	136487.9	131778.1	131806.8	138423.7	149847.9	171366.7	196069.8	211618.0
	(57113.8)	(60459.9)	(501833.5)	(455650.3)	(172141.1)	(325854.0)	(132556.1)	(152648.7)	(159742.5)
Observations	128878	223284	233258	232553	229396	262996	249309	238261	225273

Notes: The table shows descriptive statistics in terms of age at first child birth and pensionable income (2018 SEK) one year prior to the year of first childbirth. Standard deviation in parenthesis.

Table A3: Descriptive statistics—Gender of the child

	Men		Women	
	Son	Daughter	Son	Daughter
Child birth year	2003.4	2003.4	2003.4	2003.4
	(4.885)	(4.877)	(4.890)	(4.880)
Age	31.00	31.01	29.11	29.11
	(4.734)	(4.735)	(4.502)	(4.501)
Years of education	12.43	12.43	12.92	12.93
	(2.098)	(2.097)	(2.070)	(2.069)
Annual earnings (1000 SEK)	281.8	282.4	223.5	223.9
	(167.1)	(167.1)	(134.0)	(133.8)
Monthly wage (1000 SEK)*	27.88	27.92	23.86	23.86
	(9.428)	(9.473)	(6.926)	(6.942)
Contracted work hours*	0.756	0.757	0.797	0.795
	(0.417)	(0.416)	(0.347)	(0.348)
Observations	272,025	289,319	271,575	287,972

Notes: The table is separated by the gender of the individual and the gender of the individual's first-born child. All variables are one year before the birth of the first child (except age which is the age at the year of birth of the first child). Annual earnings (2018 SEK) are taken from tax registers and adjusted to the consumer price index in 2018. Annual earnings (percentile) are the placement in the income distribution of that given year. Employment is an indicator variable for earning more than the 1st quintile of the earnings distribution in a given year. Contracted work hours are the percentage of full-time work (40 hours per week). Observations are individuals.

*These variables are based on a sample as described in Section 4.

Table A4: Descriptive statistics—Number of children

	Men				Women			
	1	2	3	4	1	2	3	4
Child birth year	2003.1	2003.4	2003.4	2003.4	2003.4	2003.5	2003.4	2003.3
	(4.941)	(4.873)	(4.818)	(4.818)	(4.956)	(4.856)	(4.801)	(4.798)
Age	32.88	30.97	29.66	28.69	31.85	29.13	27.59	26.30
	(5.485)	(4.427)	(4.172)	(4.327)	(5.454)	(4.064)	(3.715)	(3.656)
Years of education	11.90	12.54	12.70	12.20	12.46	13.08	13.18	12.56
	(1.994)	(2.083)	(2.158)	(2.143)	(2.105)	(2.037)	(2.084)	(2.147)
Annual earnings (1000 SEK)	263.0	293.6	278.1	238.3	213.9	236.4	216.3	174.2
	(168.5)	(165.0)	(169.8)	(164.5)	(143.9)	(131.9)	(132.2)	(127.3)
Monthly wage (1000 SEK)*	27.48	28.21	27.77	26.21	24.25	24.09	23.65	22.46
	(9.331)	(9.497)	(9.566)	(8.773)	(7.460)	(7.024)	(6.617)	(6.141)
Hours in % full-time*	0.753	0.761	0.752	0.726	0.787	0.808	0.790	0.736
	(0.418)	(0.415)	(0.418)	(0.428)	(0.355)	(0.344)	(0.348)	(0.363)
Observations	108227	323378	107822	15269	92348	319245	103380	13990

Notes: The table is separated by the total number of children ten years after the individual's first child. All variables are one year before the birth of the first child (except age which is the age at the year of birth of the first child). Observations are individuals.

*These variables are based on a sample as described in Section 4.

Appendix B: Child gender and related outcomes

To estimate the importance of child gender on relationship status and parental leave take-up, I use the following specification and focus only on the post-child periods:

$$Y_{it} = \alpha + \beta D_i^{\text{Son}} + \boldsymbol{\phi}' \boldsymbol{D}_{it}^{\text{Event}} + \boldsymbol{\delta}' \boldsymbol{D}_{it}^{\text{Children}} + \boldsymbol{\gamma}' \boldsymbol{D}_{it}^{\text{Age}} + \boldsymbol{\lambda}' \boldsymbol{D}_{it}^{\text{Year}} + \varepsilon_{it} \tag{3a}$$

where D^{Son} is a dummy variable equal to one if the first child is a son and zero if it is a daughter. The bold $\boldsymbol{D}$ refers to vectors of a full set of dummies for event time, number of children, age, and calendar year, respectively. Individuals are included from the year of the birth of their first child up to ten years later. The coefficient of interest is β, which is the effect of having either a first-born son relative to a first-born daughter or the impact of having only sons relative to only daughters. To estimate the percentage effects, I again convert the coefficient β using the following transformation:

$$P_i \equiv \frac{\hat{\beta}}{\boldsymbol{E}[\tilde{Y}_i]}, \tag{3b}$$

where $\tilde{Y}_i$ is the predicted counterfactual outcome to having a son or only sons (i.e., having a daughter or only daughters). To estimate the effect of gender of the first child on fertility, I modify Specification 3a accordingly:

$$Y_i = \alpha + \beta D_i^{\text{Son}} + \boldsymbol{\gamma}' \boldsymbol{D}_i^{\text{Age}} + \boldsymbol{\lambda}' \boldsymbol{D}_i^{\text{Year}} + \varepsilon_i \tag{4}$$

where I look only at the number of children ten years after the birth of the first child. I follow Dahl and Moretti (2008) and estimate the impact of the gender of the first child on the number of children and the likelihood of having at least two, three, and four children, respectively. To estimate the percentage effects, I again convert the coefficient β using the following transformation:

$$P_i \equiv \frac{\hat{\beta}}{\boldsymbol{E}[\tilde{Y}_i]}, \tag{4b}$$

where $\tilde{Y}_i$ is the predicted counterfactual outcome to having a first-born son.

Table B1: Impact of sons relative to daughters—First-born child is a son

	Men				
	Marriage	Single household	Single household with child	Parental leave	Temporary parental leave
Son	-0.0008	0.0010	0.0142***	69.22***	126.60***
	(0.0011)	(0.0006)	(0.0020)	(19.94)	(8.91)
Year	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Event time	Yes	Yes	Yes	Yes	Yes
No. children	Yes	Yes	Yes	Yes	Yes
Baseline	0.47	0.13	0.21	10197	3805
Percent effect	-0.2%	0.8%	6.7%	0.7%	3.3%
Observations	6019489	6019489	748942	6019489	6019489
	Women				
	Marriage	Single household	Single household with child	Parental leave	Temporary parental leave
Son	-0.0005	0.0011*	-0.0079***	-26.79	73.43***
	(0.0011)	(0.0006)	(0.0018)	(27.86)	(9.83)
Year	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Event time	Yes	Yes	Yes	Yes	Yes
No. children	Yes	Yes	Yes	Yes	Yes
Baseline	0.48	0.13	0.84	29728	3743
Percent effect	-0.1%	0.8%	-0.9%	-0.1%	2.0%
Observations	5699117	5699117	727557	5699117	5699117

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The table shows the impact of having a first-born son relative to a first-born daughter on a range of outcomes for men and women respectively. The baseline is the average predicted outcome when having a first-born daughter. The percent effect is the percentage increase in the relevant outcome when the first child is a son relative to a daughter. Model specifications are shown in Equations 3a and 3b.

Table B2: Impact of sons relative to daughters—All children are sons

	Men				
	Marriage	Single household	Single household with child	Parental leave	Temporary parental leave
Son	-0.0020	0.0020**	0.0177***	109.46***	197.50***
	(0.0012)	(0.0008)	(0.0022)	(21.45)	(9.63)
Year	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Event time	Yes	Yes	Yes	Yes	Yes
No. children	Yes	Yes	Yes	Yes	Yes
Baseline	0.43	0.16	0.19	9136	3433
Percent effect	-0.5%	1.3%	9.4%	1.2%	5.8%
Observations	4109206	4109206	591357	4109206	4109206
	Women				
	Marriage	Single household	Single household with child	Parental leave	Temporary parental leave
Son	-0.0018	0.0022***	-0.0114***	29.44	122.93***
	(0.0013)	(0.0008)	(0.0020)	(29.94)	(10.98)
Year	Yes	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes	Yes
Event time	Yes	Yes	Yes	Yes	Yes
No. children	Yes	Yes	Yes	Yes	Yes
Baseline	0.44	0.15	0.85	29426	3305
Percent effect	-0.4%	1.5%	-1.3%	0.1%	3.7%
Observations	3849434	3849434	570947	3849434	3849434

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The table shows the impact of having two first-born sons relative to two first-born daughters on a range of outcomes for men and women respectively. The baseline is the average predicted outcome when having two first-born daughters. The percent effect is the percentage increase in the relevant outcome when the first child is a son relative to a daughter. Model specifications are shown in Equations 3a and 3b.

Table B3: First child's gender and fertility

	Men			
		Breakdown by number of children		
	Total number of children	Two or more children	Three or more children	Four or more children
Son	0.0129***	0.0030***	0.0090***	0.0007
	(0.0019)	(0.0010)	(0.0011)	(0.0004)
Year	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes
Baseline	2.04	0.80	0.21	0.03
Percent effect	0.63%	0.38%	4.25%	2.43%
Observations	569117	569117	569117	569117
	Women			
		Breakdown by number of children		
	Total number of children	Two or more children	Three or more children	Four or more children
Son	0.0177***	0.0051***	0.0114***	0.0012***
	(0.0018)	(0.0009)	(0.0011)	(0.0004)
Year	Yes	Yes	Yes	Yes
Age	Yes	Yes	Yes	Yes
Baseline	2.07	0.82	0.21	0.03
Percent effect	0.86%	0.62%	5.31%	4.48%
Observations	567790	567790	567790	567790

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Notes: The table shows the impact of having a first-born son relative to a first-born daughter on fertility for men and women respectively. The baseline is the average predicted outcome when having a first-born daughter. The percent effect is the percentage increase in fertility when the first child is a son relative to a daughter. Model specifications are shown in Equations 4 and 4b.

Appendix C: Additional figures and tables

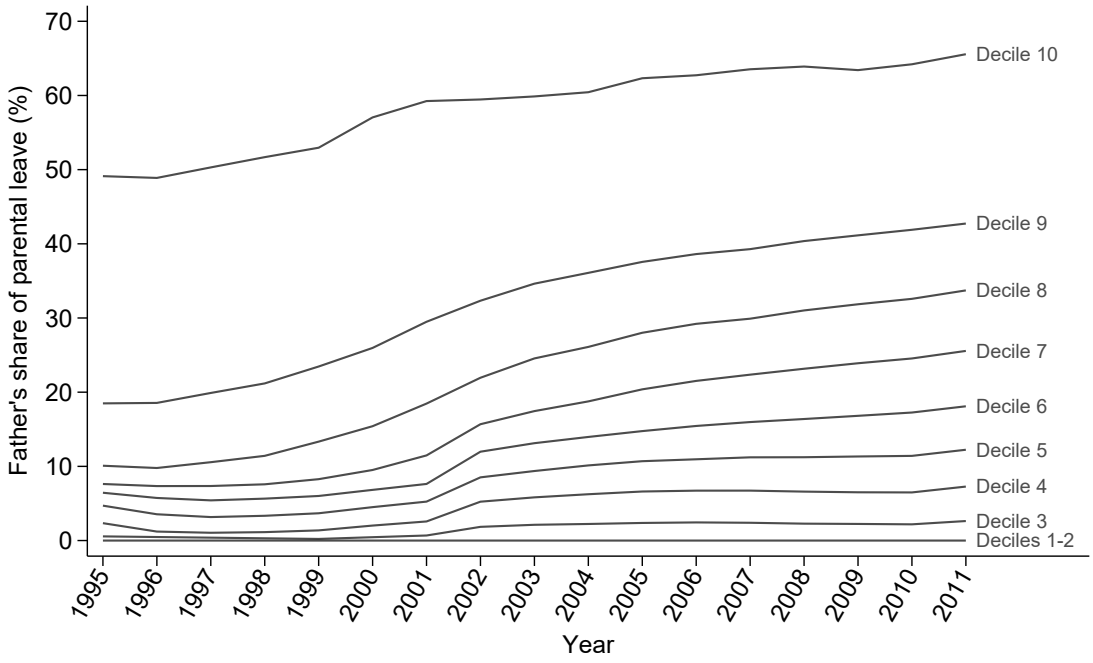
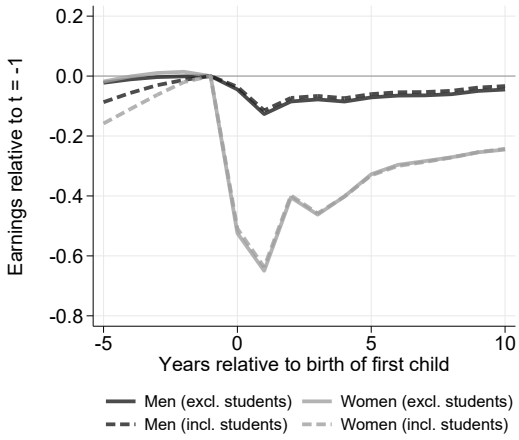


Figure C1: Distribution of father's share of parental leave over first childbirth years for the main analysis sample. Parental leave is the net days of paid parental leave within the first two years from a given year of first childbirth. The first two deciles are combined as they are not separable for the early childbirth cohorts (men taking no leave).

(a) Child penalties in %



(b) Counterfactual earnings

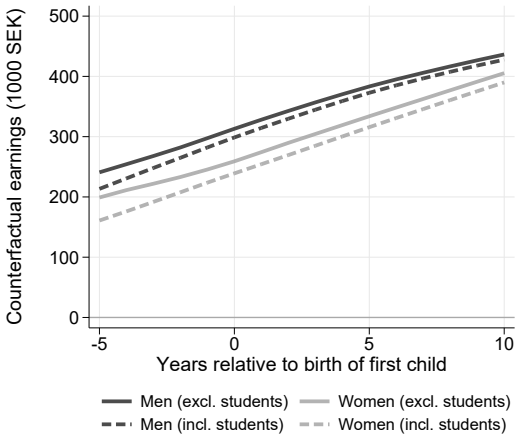


Figure C2: Student restriction. The figures plot the estimated child penalties and counterfactual earnings when including and excluding students. Earnings are adjusted to the consumer price index in 2018. The empirical specifications are shown in Equations 1a and 1b in Section 3. The shaded regions are 95% confidence intervals.

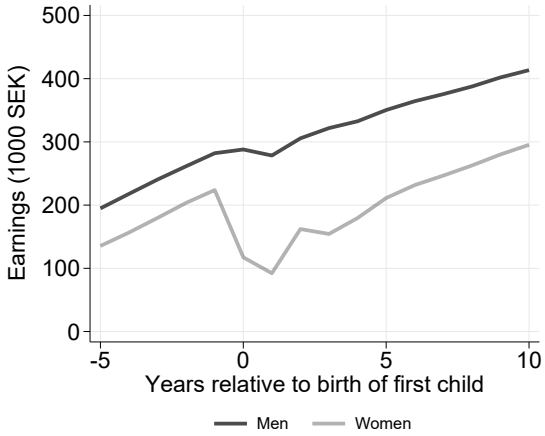


Figure C3: Raw earnings gap from parenthood for men and women having their first child between 1995 and 2011. Earnings are adjusted to the consumer price index in 2018.

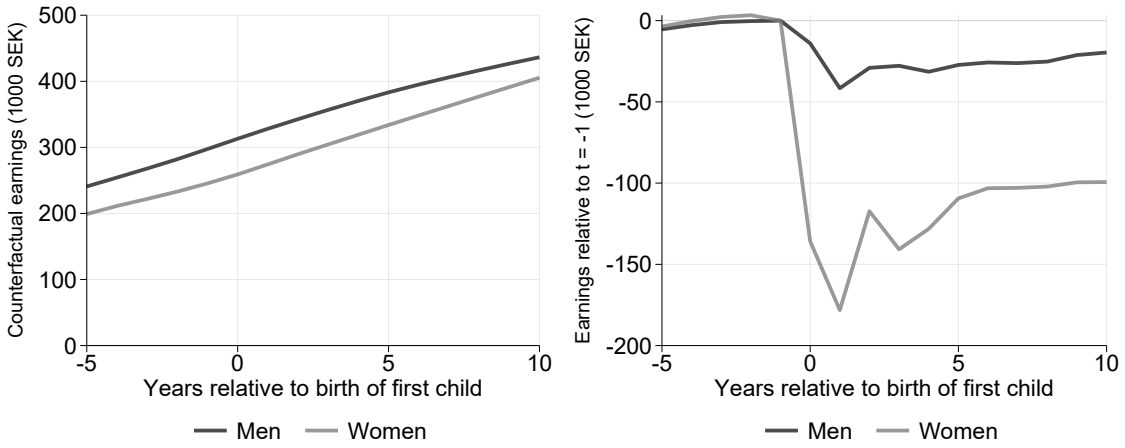


Figure C4: Counterfactual earnings and child penalties in SEK for men and women having their first child between 1995 and 2011. Earnings are adjusted to the consumer price index in 2018. The empirical specifications are shown in Equations 1a and 1b in Section 3.

(a) Men

(b) Women

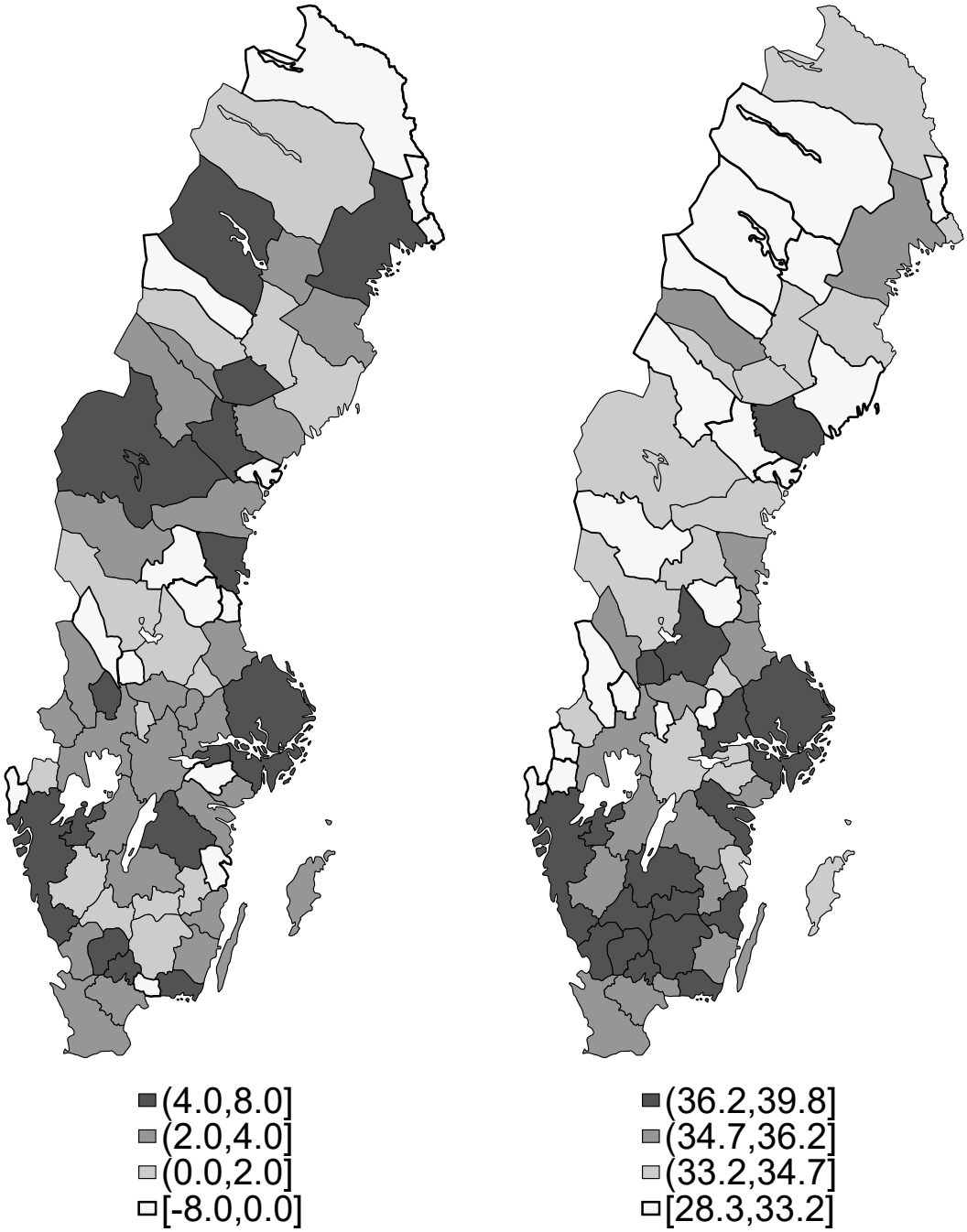


Figure C5: Child penalties for men and women across regions in Sweden. Darker regions have a higher penalty. The penalty is the child penalty in earnings (percent) for the 10 years following first childbirth. The empirical specifications are shown in Equations 1a and 1b in Section 3.

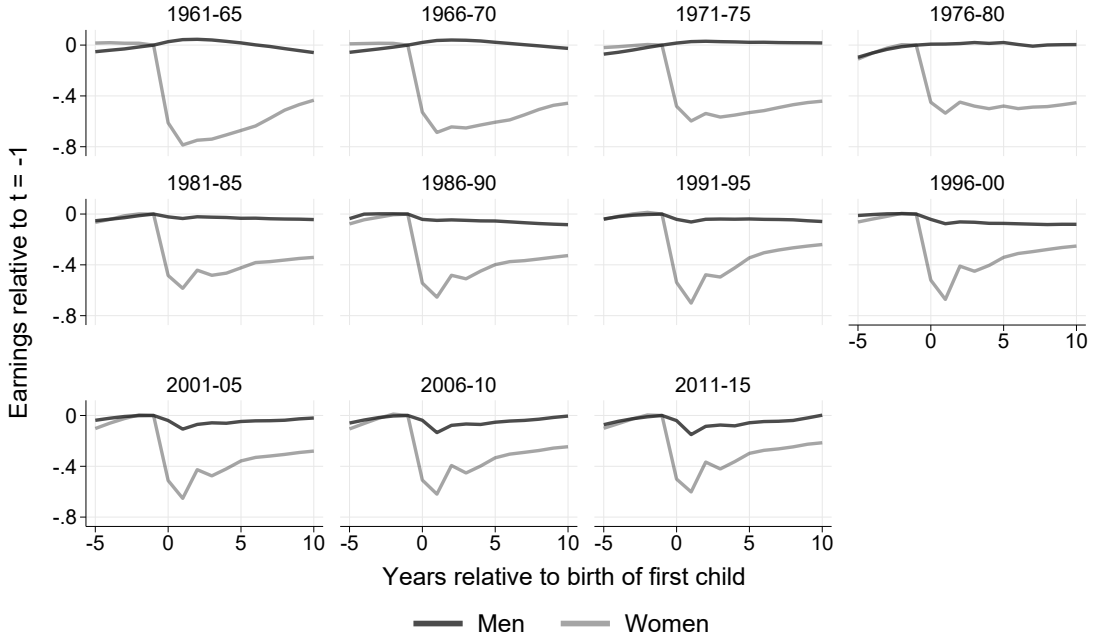


Figure C6: Child penalties for men and women having their first child between 1961 and 2015. Men and women are divided into childbirth cohorts of 5 years based on when their first child was born. The outcomes are relative to one year before the first childbirth and are converted to relative effects by dividing them with the predicted counterfactual outcome for individual i in period t. The empirical specifications are shown in Equations 1a and 1b in Section 3. The shaded regions are 95 percent confidence intervals.

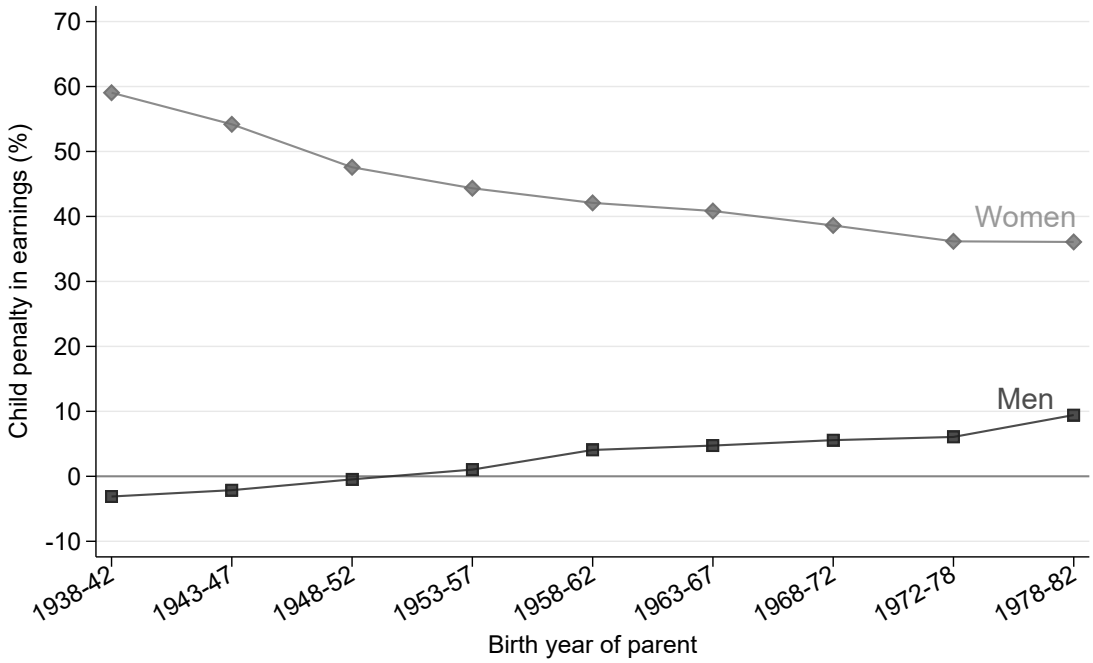


Figure C7: Child penalties for men and women born between 1938 and 1982. The child penalty is defined as the child penalty for the 10 years following the first childbirth. Men and women are divided into birth cohorts of 5 years based on when they were born. The empirical specifications are shown in Equations 1a and 1b in Section 3.

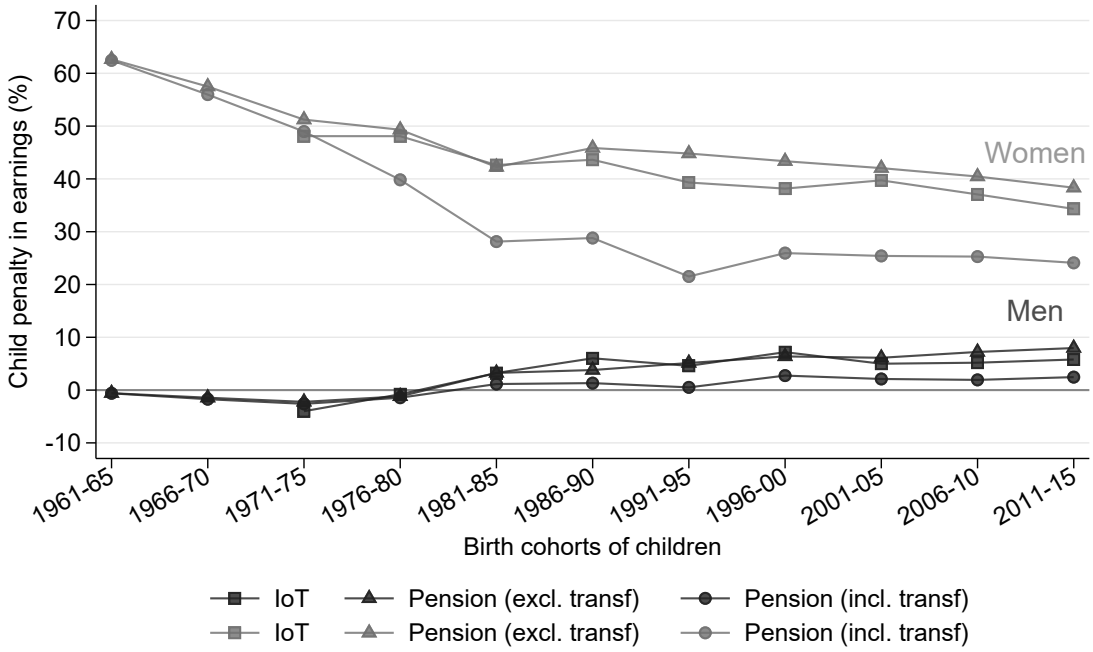


Figure C8: Child penalties for men and women having their first child between 1961 and 2015 using different data sources and when including and excluding transfers (such as parental benefits). The child penalty is defined as the child penalty for the 10 years following the first childbirth. Men and women are divided into birth cohorts of 5 years based on when they had their first child. The empirical specifications are shown in Equations 1a and 1b in Section 3.

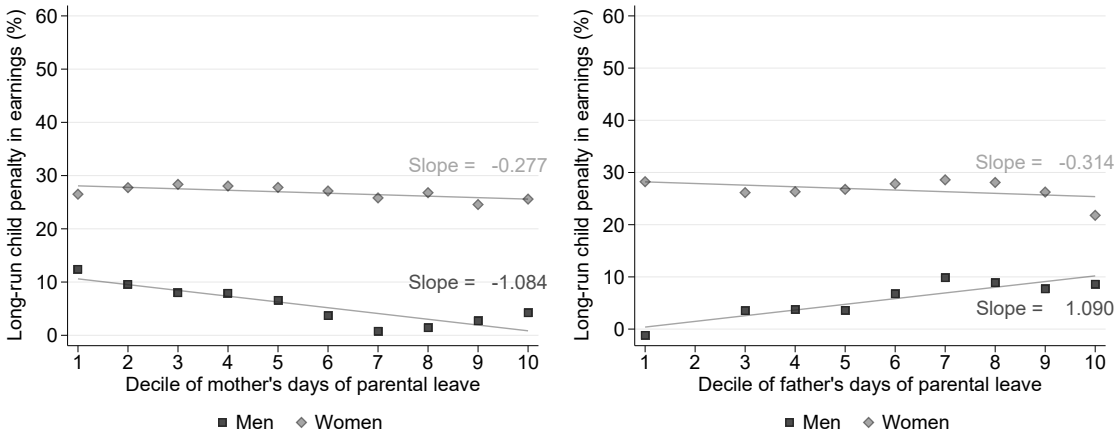


Figure C9: Long-run child penalties in earnings depending on the mother's and father's use of parental leave, respectively. Long-run penalty is defined as the child penalty 6 to 10 years after first childbirth. The empirical specifications are shown in Equations 1a and 1b in Section 3. Deciles are based on the net days of paid parental leave within the first two years from a given year of first childbirth. Deciles 1 and 2 are not separable in the right panel as these are men using no leave for parts of the period.

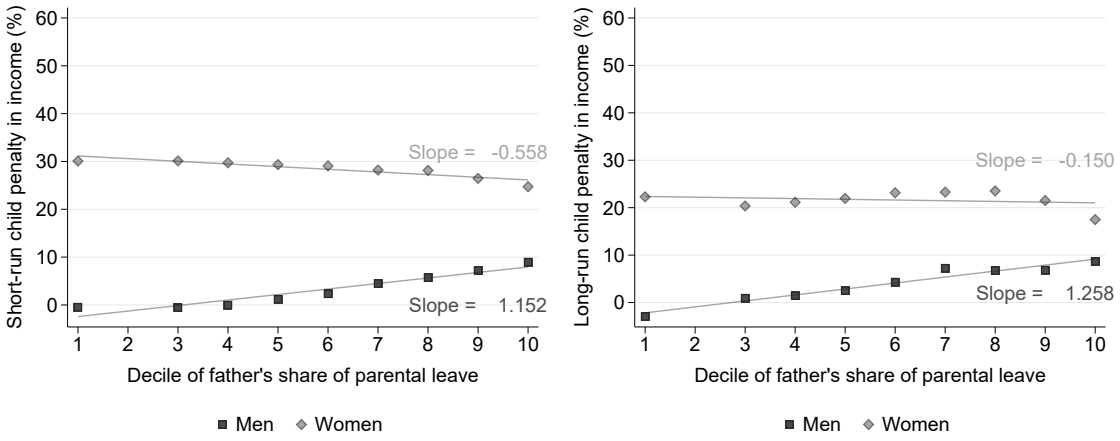


Figure C10: Short-run and long-run child penalties in income (earnings + parental benefits) depending on the father's share of total parental leave within the household. Short-run penalty is defined as the child penalty 0 to 5 years after first childbirth. Long-run penalty is defined as the child penalty 6 to 10 years after first childbirth. The empirical specifications are shown in Equations 1a and 1b in Section 3. Deciles are based on father's share of parental leave within the household within a given year of first childbirth. Deciles 1 and 2 are not separable as these are men using no leave for parts of the period.

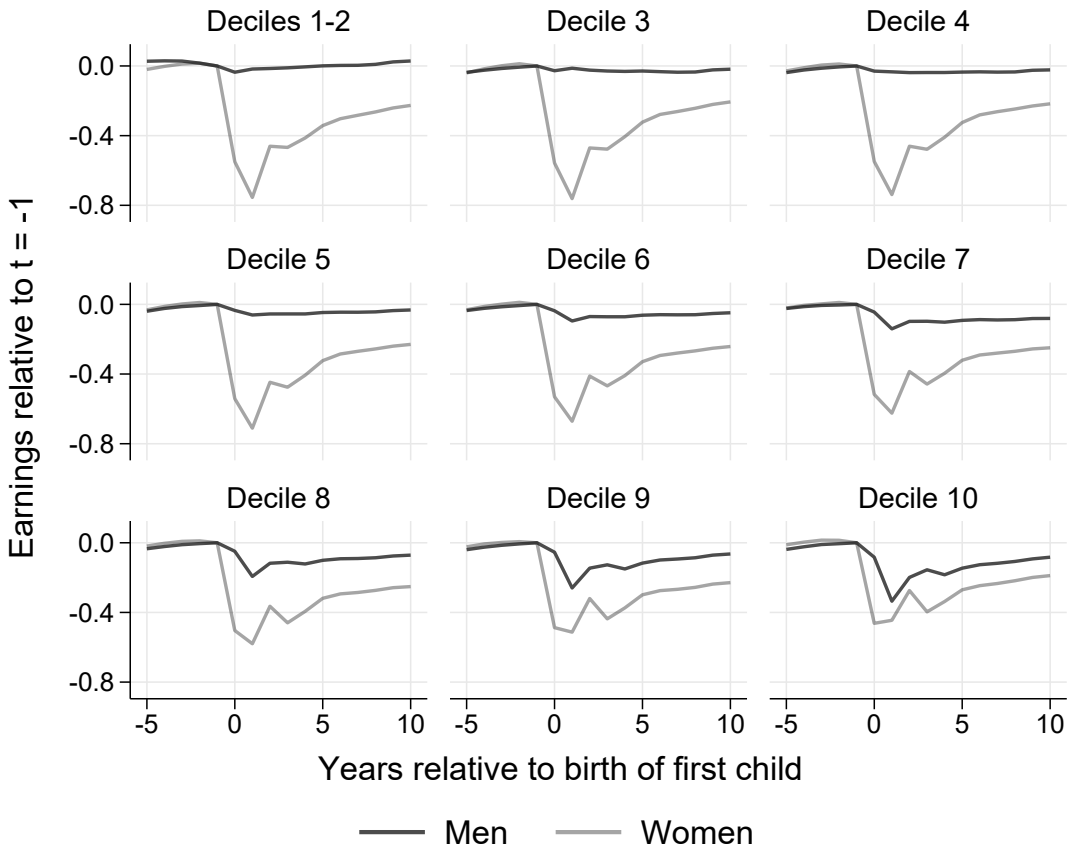
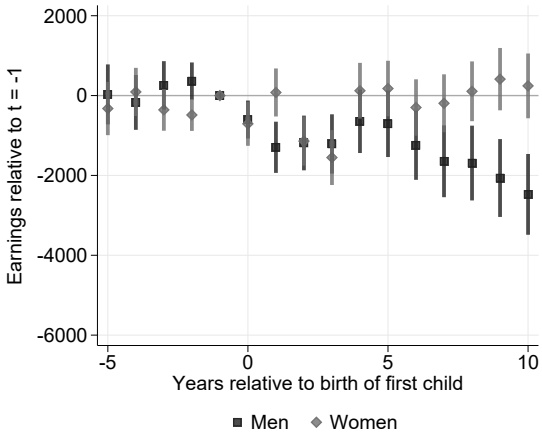


Figure C11: Child penalty in earnings depending on the father's share of parental leave within the household. Deciles are based on father's share of parental leave within the household within a given year of first childbirth. Deciles 1 and 2 are not separable as these are men using no leave for parts of the period. The empirical specifications are shown in Equations 1a and 1b in Section 3.

(a) First-born child is a son



(b) All children are sons

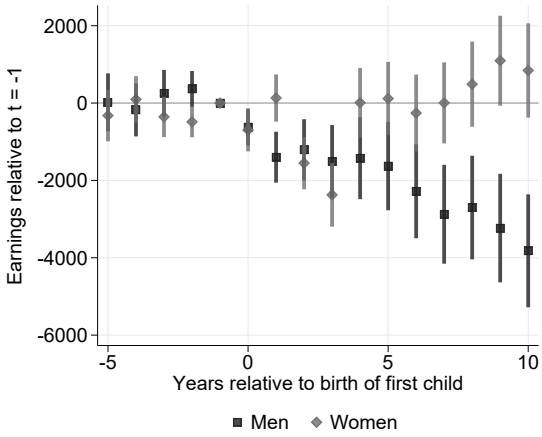
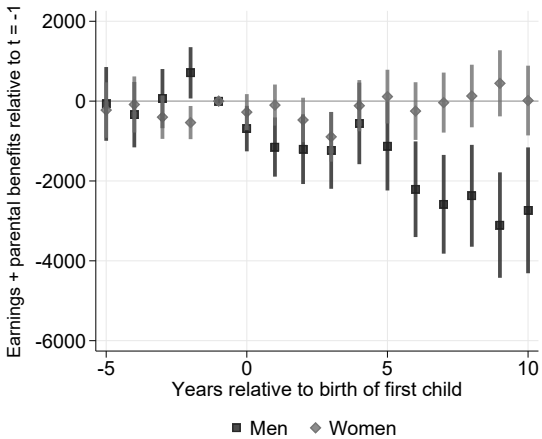


Figure C12: Child penalties from sons relative to daughters (with controls for relationship status). The figures plot the estimates from additional child penalties in earnings from having sons. The left figure shows the impact of having a first-born son relative to a first-born daughter. The right figure shows the impact of having sons relative to the same number of daughters. Event time is relative to the birth of the first child and the outcomes are relative to one year before the first childbirth. The empirical specifications are shown in Equation 2 in Section 3. The regressions include indicator variables for whether the individual is living (i) with their partner, (ii) in a single household with children, or (iii) in a single household without children. The bars are 95% confidence intervals.

(a) First-born child is a son



(b) All children are sons

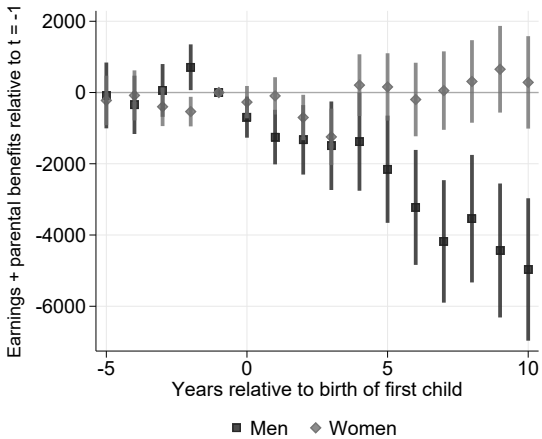


Figure C13: Child penalties from sons relative to daughters with parental benefits added to earnings. The figures plot the estimates from additional child penalties from having sons. The left figure shows the impact of having a first-born son relative to a first-born daughter. The right figure shows the impact of having sons relative to the same number of daughters. Event time is relative to the birth of the first child and the outcomes are relative to one year before the first childbirth. The empirical specifications are shown in Equation 2 in Section 3. The bars are 95% confidence intervals.