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The Motherhood Training Penalty*

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Abstract

Women experience slower wage growth than men over their lifetimes, a gap often attributed to the "motherhood wage penalty," as childbearing reduces earnings. This paper links this penalty to differences in human capital using a pseudo-event study of first childbirth in Europe to document a "motherhood training penalty." Before parenthood, full-time male and female workers exhibit similar on-the-job training trends, but their trajectories diverge afterward. In the first 1–3 years of parenthood, women are 17%–21% less likely to train, compared to a 1%–5% decline for men. Additional evidence suggests this gap reflects employers' lower willingness to finance training for mothers, and that it is larger in countries with higher childcare costs and weaker government support for training.

Keywords: On-the-Job Training, Human Capital Accumulation, Lifecycle Wage Growth, Gender Gaps

JEL Codes: J24, J16, M53

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1 Introduction

A well-documented feature of labor markets worldwide is that women earn significantly less per hour on average than men and experience slower wage growth over their lifetimes (Altonji and Blank (1999); Blau and Kahn (2017)). Extensive research has explored the causes of this disparity, with several studies identifying childbearing as a key driver of the lifecycle gender wage gap — often referred to as the "motherhood wage penalty" (Waldfogel (1998); Lundberg and Rose (2000); Budig and England (2001); Anderson et al. (2002); Bertrand et al. (2010); Goldin (2014); Adda et al. (2017); Kleven et al. (2019); Kleven (2022b); Gallen (2023); Adams et al. (2025a)). Various explanations have been proposed for this motherhood penalty,[1] but direct empirical evidence remains limited, particularly for one widely-cited factor: differences in human capital accumulation between mothers and non-mothers.

In this paper, we provide direct evidence linking the motherhood wage penalty to on-the-job human capital formation by focusing on on-the-job training, a key input to workers' human capital. Estimating motherhood effects is often challenging, especially for outcomes such as on-the-job training, because standard approaches require long-term panel data with repeated observations and consistent measurement of labor market, demographic, and fertility variables. We address these limitations by drawing on rich cross-sectional data covering more than 40 million individuals across all European Union (EU) countries and by adopting the pseudo-event study approach of Kleven (2022a), which uses matching techniques to recover motherhood penalties from cross-sectional data. Our analysis reveals a "motherhood training penalty": although men and women exhibit similar on-the-job training trends before parenthood, their trajectories diverge sharply afterward. Given the well-documented link between on-the-job training and wage growth (see Heckman et al., 1999; Kluve, 2010; McKenzie, 2017; Card et al., 2018; What Works - Centre for Local Economic Growth, 2016, for reviews), our findings suggest that this training gap is an important mechanism contributing to the motherhood wage penalty over the lifecycle.

We begin by describing our data and our definition of on-the-job training, which captures job-related learning activities occurring outside the formal education system, and includes key sources of human capital acquisition for workers, such as participation in courses, seminars, or conferences. We also describe our main sample of interest, which focuses on full-time workers. This restriction allows us to control for both extensive and intensive labor market adjustments following motherhood, particularly since full-time workers are more likely to

[1] These explanations include human capital losses during career breaks, self-selection into lower-paying occupations, reduced work effort, employer discrimination, differences in job search behavior, and selection into motherhood itself (see Gough and Noonan (2013); Cukrowska-Torzewska and Matysiak (2020) for reviews).

be eligible for on-the-job training (Maximiano and Oosterbeek, 2007).[2] Nevertheless, we also estimate the motherhood training penalty without restricting the sample to full-time employees to capture its magnitude in the overall workforce.

Next, we outline the pseudo-event study methodology of Kleven (2022a) for studying motherhood penalties using cross-sectional data and describe how it applies to our setting. This methodology uses matching techniques to construct a pseudo-panel of men and women by matching parents to non-parents based on relevant observable characteristics, creating surrogate observations that approximate parents' counterfactual outcomes at different event times relative to the birth of their first child. The event study is then implemented on this pseudo-panel and includes age, education, year, and country fixed effects to account for lifecycle patterns, time trends, and country-specific factors.[3]

Using this pseudo-event study approach, we document a sizeable "motherhood training penalty": while men and women exhibit similar on-the-job training trends before parenthood, women are 17% to 21% less likely to engage in training in the 1 to 3 years following childbirth, whereas men are only 1% to 5% less likely to do so. This gap narrows substantially 4 years after birth. A back-of-the-envelope calculation suggests that, given the wage returns to on-the-job training (estimated at around 5% for typical training programs (Frazis and Loewenstein, 2005; Ma et al., 2024)), the motherhood training penalty implies a cumulative loss of 1.24 percentage points in wage growth over the first three years of motherhood. This represents 29.3% of the overall motherhood wage penalty, which has been estimated to be about 4% in various settings (Cukrowska-Torzewska and Matysiak, 2020).

We then conduct two additional analyses to further shed light on our findings and assess their robustness. First, when we broaden the sample beyond full-time workers to include all individuals, the motherhood training penalty becomes larger and more persistent, reflecting the fact that many women reduce their work hours or exit the labor force after becoming mothers, thereby limiting their exposure to on-the-job training. Second, we document meaningful heterogeneity by number of children, as training penalties are larger and more persistent for higher-fertility mothers. Importantly, penalties remain sizeable even among mothers with only one child and for several years after childbirth, suggesting that the results are unlikely to be explained by the incapacitation effects of parental leave associated with subsequent births (Adams et al., 2024).

[2]For instance, training subsidies are often limited to full-time positions. More broadly, the returns to training, and thus the incentives to participate, tend to be higher for full-time compared to part-time workers.

[3]We validate our approach by showing that it yields parallel trends in employment and hours worked for men and women prior to childbirth, and produces motherhood penalties in these outcomes that closely match those documented in prior work.

We then provide suggestive evidence on the mechanisms underlying the motherhood training penalty using additional EU data containing detailed information on workers' willingness to train, the types of training undertaken, and the sources of training financing. These data allow us to assess whether the penalty reflects mothers' choices, the nature of available training opportunities, or constraints imposed by employers. Four key findings emerge. First, although prior research has shown that women often switch into more flexible occupations after motherhood, it is unlikely that this channel explains the patterns we document: the motherhood training penalty remains largely unchanged when occupation fixed effects are included in the pseudo–event study, suggesting that the results primarily reflect within-occupation differences in training. Second, mothers are consistently more likely than fathers to express a desire to train, both among training participants and non-participants, indicating that the penalty does not reflect diminished motivation or weaker preferences for career advancement. Third, among those who do train, mothers engage in similar types of training as fathers, including relatively inflexible formats such as courses and seminars, suggesting that differences in the flexibility of training modalities are not driving the results. Fourth, and most importantly, financing patterns reveal a marked asymmetry: mothers are significantly more likely to self-finance their training, while employers are substantially less likely to fund training for mothers than for fathers.

Taken together, these findings suggest that the motherhood training penalty is not driven by mothers' occupational choices, preferences, or by the incompatibility of available training formats with motherhood. Instead, it likely reflects employers' decisions about whom to invest in. This interpretation aligns with the hold-up problem emphasized in the training literature (Acemoglu, 1997; Acemoglu and Pischke, 1998; Moen and Rosén, 2004): firms underinvest in workers they perceive as more likely to separate, a concern that is particularly salient for mothers given the large and persistent declines in employment following childbirth (Kleven et al., 2019; Kleven, 2022b; Kleven et al., 2024a). Through this mechanism, motherhood employment penalties spill over into reduced training investments, suppressing human capital accumulation even among mothers who remain continuously employed. The hold-up problem also helps explain why the motherhood training penalty gradually fades after several years: once mothers demonstrate sustained labor market attachment, employers' concerns diminish and training investments resume.

The central role of employer behavior and the hold-up problem points to clear policy implications. In particular, because the hold-up problem leads firms to underinvest in mothers' training, and this distortion is exacerbated in environments where women are more likely to exit the labor force upon motherhood, policies that reduce mothers' exit rates or subsidize

job-related training for mothers may help attenuate the training penalty. We provide suggestive evidence on this in our setting by estimating the motherhood training penalty across countries with (1) above- versus below-median childcare costs, which have been shown to affect mothers' labor force attachment (Gelbach, 2002; Baker et al., 2008; Andresen and Havnes, 2019; Kleven et al., 2024b), and (2) above- versus below-median levels of public support for on-the-job training.

We find that the motherhood training penalty is 9–13 percentage points larger in the 1 to 3 years following childbirth in countries with above-median childcare fees than in those with below-median fees, and 1–2 percentage points larger in countries with lower public support for training than in those with higher support. These results further underscore the role of employer incentives and the hold-up problem in driving the training penalty. At the same time, they suggest that childcare policies and public co-financing or subsidies for job-related training targeted at mothers could help offset firms' reluctance to invest in training, directly addressing the underlying mechanism and mitigating the long-run consequences for women's wage growth.

Our paper combines insights from three different bodies of literature. First, we build on the extensive literature on gender inequality in the labor market, particularly studies examining the role of parenthood in explaining gender wage growth gaps. This includes work by Waldfogel (1998), Lundberg and Rose (2000), Budig and England (2001), Anderson et al. (2002), Bertrand et al. (2010), Wilde et al. (2010), Fernandez-Kranz et al. (2013), Goldin (2014), Angelov et al. (2016), Erosa et al. (2016), Adda et al. (2017), Kleven et al. (2019), Kleven (2022b), Gallen (2023), Adams et al. (2025a), and Okuyama et al. (2025) among others, across a variety of contexts and settings. Our paper is especially connected to research that emphasizes the role of human capital in driving the gender wage growth gap (see Gough and Noonan (2013) and Cukrowska-Torzewska and Matysiak (2020) for a review). While much of this literature focuses on the loss of mothers' human capital during child-related career breaks, we focus on the loss of human capital that occurs even when mothers remain in the labor force, driven by reductions in on-the-job training opportunities. Relatedly, given the documented link between job-related training and productivity (see Ma et al. (2024) for a review), the motherhood training penalty may also help explain the recent findings of Gallen (2023), who reports a sizable productivity gap between mothers and other workers, as well as the evidence from Okuyama et al. (2025), who show that childbirth leads to reduced hours, worse performance evaluations, and fewer promotion opportunities for mothers in a Japanese manufacturing firm.

Second, our paper relates to the labor literature examining the impacts of on-the-job learning opportunities on workers' earnings and employment. Numerous studies have documented the effects of on-the-job training, particularly firm-sponsored training, on worker outcomes across various contexts (see Heckman et al. (1999), Kluve (2010), Card et al. (2018), McKenzie (2017), and What Works - Centre for Local Economic Growth (2016) for general reviews on the impacts of on-the-job training, and Haelermans and Borghans (2012) and Bassanini et al. (2007) for reviews on firm-sponsored training specifically). These studies consistently show that job-related, in-firm training has large and significant effects on the human capital acquisition and wages of both men and women. These findings suggest that the motherhood training penalty we document in this paper may help explain the broader motherhood wage penalty.

Finally, our paper relates to the literature on gender gaps in training across different countries and contexts (Gronau (1988), Altonji and Spletzer (1991), Royalty (1996), Altonji and Blank (1999), Barron et al. (1993), Hamil-Luker (2005), Blau and Kahn (2017), Blundell et al. (2021)). While some studies find that women receive less training than men, the evidence is mixed (Appendix A provides a comprehensive summary of this literature). A few studies suggest that the training gap may contribute to the gender wage gap by limiting women's career advancement opportunities, and that these gaps may be partly driven by motherhood. For instance, Blau and Kahn (2017) argue that women's access to training may be limited by the time they take off for childcare. Likewise, Booth (1991) and Booth (1993) show that childbearing reduced women's likelihood of receiving training in the 1980s. However, this evidence is primarily correlational and based on older data, reflecting a time when the work landscape for women was quite different. In contrast, we provide direct evidence using modern data and identification methods that the gender training gap is specifically driven by motherhood and reflects employer decisions rather than mothers' choices.

The paper is organized as follows. Section 2 introduces our data and sample of interest, and provides a precise harmonized definition of on-the-job training. Section 3 outlines the pseudo-event study methodology and explains how it is implemented in our setting. Section 4 presents the results of our analyses. Finally, Section 5 concludes.

2 Data, sample, and definition of on-the-job training

In this section, we describe our data and sample of interest, and provide a precise definition of on-the-job training as it pertains to our study.

2.1 Data description

Our main data comes from the EU Labor Force Survey (EU-LFS), a large-scale household survey that provides information on labor force participation, job characteristics, socioeconomic traits, family structure, training, and more, for individuals aged 15 and above in Europe. The survey is conducted quarterly in all EU member countries, as well as in Norway, Iceland, and Switzerland, covering millions of people across all industries and occupations in each wave. While data collection began in 1983 or 1992 for most countries, our analysis uses data from 2006 to 2021 due to data availability and harmonization constraints. Further details on this data and the variables used in the analysis are provided in Appendix B.1. We present summary statistics of this data by gender and parenthood status in Table B.1. Table B.2 lists the years of data availability and the number of observations for each country.

A secondary data source used in our analysis is the EU Adult Education Survey (EU-AES), which collects detailed information on participation in, desirability of, types of, and financing of education and training activities, including job-related training. The survey covers approximately 666,000 adults aged 25–64 and was conducted in 2007, 2011, and 2016 across 26, 27, and 28 EU member states, respectively. We focus on the 2011 and 2016 waves, as the 2007 wave was a pilot and employed substantially different training definitions. Further details on this data and the variables used in the analysis are provided in Appendix B.2. Summary statistics are presented in Table B.3.

2.2 Definition of on-the-job training

We define on-the-job training following the International Standard Classification of Education (ISCED) guidelines, which provide a common framework for comparing education and training systems across countries. Specifically, we use the ISCED definition of "Non-formal Education and Training," which encompasses training activities that are separate from the active workplace and exhibit a high degree of organization by a trainer or institution, including classroom instruction, seminars, workshops, and similar formats.

Our definition of training has three main features. First, training activities must be work-related and aimed at improving job performance, which excludes activities such as art history or pottery courses that some workers may take for recreational purposes. Second, training is distinct from formal schooling, so programs like MBAs, which may contribute to human capital for some workers, are not included. Third, training activities must be organized and structured, which distinguishes them from learning-by-doing and other informal channels of

skill acquisition such as job rotation, reading journals, visiting museums, or unstructured learning through media.

Under this definition, on-the-job training encompasses all organized and structured work-related learning outside the formal education system, and thus captures several important sources of workers' human capital acquisition, including participation in seminars and workshops, as well as more task-specific instruction delivered by coworkers.

In our main EU-LFS data, training refers to participation in certain activities, such as courses, seminars, workshops, or private lessons outside the regular education system, within the last 4 weeks. The EU-AES training definition is similar, encompassing participation in courses, seminars, workshops, guided training, or private lessons over the past 12 months. For more details on the definitions of training in each data source, please refer to Appendix B.1 and Appendix B.2.

2.3 Sample of interest

Given our focus on the impact of parenthood, we first restrict our sample of parents to individuals whose age at first birth falls between 25 and 45. We then consider three samples. First, in our main specification, we limit the analysis to full-time workers, excluding those who work fewer than 35 hours per week, which corresponds to the standard definition of full-time employment in Europe. This restriction helps control for extensive and intensive labor market adjustments following parenthood and allows us to examine training outcomes among men and women who remain employed full-time and are therefore more likely to be eligible for on-the-job training (Maximiano and Oosterbeek, 2007). To the extent that this restriction induces sample selection, it likely operates in a conservative direction: full-time workers are precisely those most exposed to employer-provided training, implying that any decline in training we document is unlikely to be driven by sample composition. If anything, focusing on this margin likely understates the overall reduction in training opportunities associated with motherhood. To capture the magnitude of the motherhood training penalty more broadly, we also consider two additional samples: (1) all employed individuals, regardless of hours worked, and (2) all individuals.

3 Pseudo-event study methodology

Motherhood penalties have traditionally been estimated using event studies that rely on high-frequency, long-running panel data. However, since such data are relatively rare and

typically do not include information on on-the-job training, we follow the pseudo-event study methodology developed by Kleven (2022b) and further detailed in Kleven et al. (2024a).[4] This approach allows motherhood penalties to be estimated using cross-sectional data by employing matching techniques. In this section, we first describe how the event-time pseudo-panel is constructed, and then explain how it is used to estimate the event study and quantify motherhood penalties.

3.1 Construction of pseudo-panel

The pseudo-panel approach converts cross-sectional data into a pseudo-panel of men and women to study outcomes around the birth of their first child, indexed at event time $\tau = 0$. Specifically, individuals are assigned to event times τ relative to the birth of their first child, where

$$\tau = \{-T^-, -T^- + 1, \ldots, -1, 0, 1, \ldots, T^+ - 1, T^+\},$$

spanning T^- periods before and T^+ periods after this birth. For parents, event time τ is weakly positive ($\tau \geq 0$) and can be calculated using the age of their oldest child. Because we cannot directly assign negative event times ($\tau < 0$) to childless individuals since we do not observe when or whether they will have children, this method constructs surrogate observations for negative event times by matching individuals on observable characteristics.

To fix ideas, and following the example given by Kleven et al. (2024a), consider a parent i of age a and with demographic characteristics X_i observed at event time $\tau \geq 0$ in calendar year t. To generate a matching observation at event time $-n$, parent i is matched to a childless individual j observed in year $t - \tau - n$, with age $a - \tau - n$ and the same demographic characteristics X_i.[5] This process is repeated for every parent at each $\tau \in \{0, \ldots, T^+\}$ and for every $-n \in \{-T^-, \ldots, -1\}$, yielding a pseudo-panel that captures T^- years of pre-child event times.

The set of demographic variables used in the matching procedure comprises those employed by Kleven et al. (2024a), namely gender, education, marital status, urban/rural status, and country. Further details on our matching variables are provided in Appendix B.1.2.

To illustrate the matching procedure, Table 1 presents summary statistics for men and women in our main sample matched at event times $\tau = 0$ and $\tau = -1$ in the pseudo-panel.

[4] For example, the German Socioeconomic Panel (G-SOEP) does not include on-the-job training data, while the US Panel Study of Income Dynamics (PSID) contains training information only for 1968–1972.

[5] Similar to Kleven et al. (2024a), since a parent can have multiple matches at each negative event time, we create an average of all matches to use as the matched observation.

By construction, the matched observations are identical in education, marital status, and urban/rural status. Moreover, observations at $\tau = -1$ are exactly one year younger than those at $\tau = 0$, and because we restrict the main sample to full-time workers, both groups consist of individuals working 35 or more hours per week. However, the two groups differ in their labor market outcomes, particularly on-the-job training participation. Some of these differences reflect the effect of parenthood, which is the object of interest, while others arise because $\tau = -1$ observations are drawn from an earlier calendar year and correspond to younger individuals. In the specification below, we isolate the motherhood penalty from these other factors by including age, year, education, and country fixed effects.

Table 1: Descriptive statistics in the pseudo-panel

	Matched Men			Matched Women		
	$\tau = 0$	$\tau = -1$	**Difference**	$\tau = 0$	$\tau = -1$	**Difference**
Fraction engaging in on-the-job training	0.08	0.09	-0.01	0.09	0.14	-0.05
Fraction employed	1.00	1.00	0.00	1.00	1.00	0.00
Mean hours per week usually worked in main job	42.41	42.14	0.26	40.14	40.50	-0.35
Mean hours actually worked in main job in reference week	42.84	42.58	0.26	40.47	40.92	-0.46
Mean age	33.16	32.16	1.00	32.49	31.49	1.00
Fraction married	0.92	0.92	0.00	0.93	0.93	0.00
Fraction urban	0.73	0.73	0.00	0.76	0.76	0.00
Fraction w/ less than primary education	0.00	0.00	0.00	0.00	0.00	0.00
Fraction w/ primary education	0.02	0.02	0.00	0.01	0.01	0.00
Fraction w/ lower-secondary education	0.15	0.15	0.00	0.10	0.10	0.00
Fraction w/ upper-secondary education	0.49	0.49	0.00	0.34	0.34	0.00
Fraction w/ post-secondary education	0.35	0.35	0.00	0.55	0.55	0.00
Number of Observations	50,570	50,570	10,328	10,328		

We further illustrate the pseudo-panel approach in our setting by replicating the analysis of Kleven et al. (2024a) and estimating motherhood penalties in employment and hours worked. The results, shown in Figure C.1, reveal parallel pre-childbirth trends for men and women in both variables and reproduce the large and persistent employment penalties for mothers documented in Kleven et al. (2024a). In their European sample, these employment penalties range from roughly 20% to 30%, closely matching the magnitudes we observe.

3.2 Pseudo event-study specification

Using the pseudo-panel data, we estimate the following specification separately for men and women

$$Y_{it}^{g} = \sum_{\tau=-T^{-}}^{T^{+}} \alpha_{\tau}^{g} D_{it,\tau}^{Event} + \beta_{a_{it}}^{g} + \gamma_{t}^{g} + \psi_{educ_{it}}^{g} + \phi_{country_{it}}^{g} + \upsilon_{it}^{g}, \tag{1}$$

where Y_{it}^{g} is the outcome variable (on-the-job training in our case) for individual i of gender $g = w, m$ in year t. The set of dummies for each event time τ is captured by $D_{it,\tau}^{Event}$,

where $\tau = \{-T^-, -T^- + 1, \ldots, -1, 0, 1, \ldots, T^+ - 1, T^+\}$. To focus on the period around the first child's birth and given lifecycle patterns in on-the-job training (Ma et al., 2025), we set $T^- = 3$ and $T^+ = 5$. The base event time corresponds to the year before childbirth ($\tau = -1$), and the coefficients α_τ^g measure the effect of event time τ relative to that base year. The terms $\beta_{a_{it}}^g$, γ_t^g, $\psi_{educ_{it}}^g$, and $\phi_{country_{it}}^g$ capture age, year, education, and country fixed effects, respectively.

The estimated level effects are then converted into percentage effects by calculating

$$P_\tau^g = \frac{\hat{\alpha}_\tau^g}{\mathbb{E}\left[\tilde{Y}_{it}^g | \tau\right]}, \tag{2}$$

where P_τ^g captures the percentage parenthood penalty effect at event time τ, $\hat{\alpha}_\tau^g$ is the estimated coefficient α_τ^g from the regression above, and $\mathbb{E}\left[\tilde{Y}_{it}^g | \tau\right]$ represents the predicted outcome from Equation (1) absent the event-time parenthood effects.

Before turning to the results, it is useful to clarify two aspects of the implementation and interpretation of the event-study specification. First, we do not include occupation fixed effects in the baseline specification. Occupational shifts may occur after childbirth and constitute one of the mechanisms we examine, as mothers may sort into occupations with fewer training opportunities. Second, we center the event study on the birth of the first child, consistent with our focus on the effect of motherhood, the structure of the pseudo-panel, and the difficulty of defining appropriate comparison groups for higher-order births (Kleven et al., 2019). Moreover, because the analysis relies on cross-sectional data, we cannot condition on completed fertility. As a result, the estimated motherhood penalties, P_τ^w and P_τ^m, capture the cumulative impact of all births occurring within the event window. In additional analyses, we examine how these penalties vary with subsequent fertility by estimating Equation (1) separately by number of children at each event time.

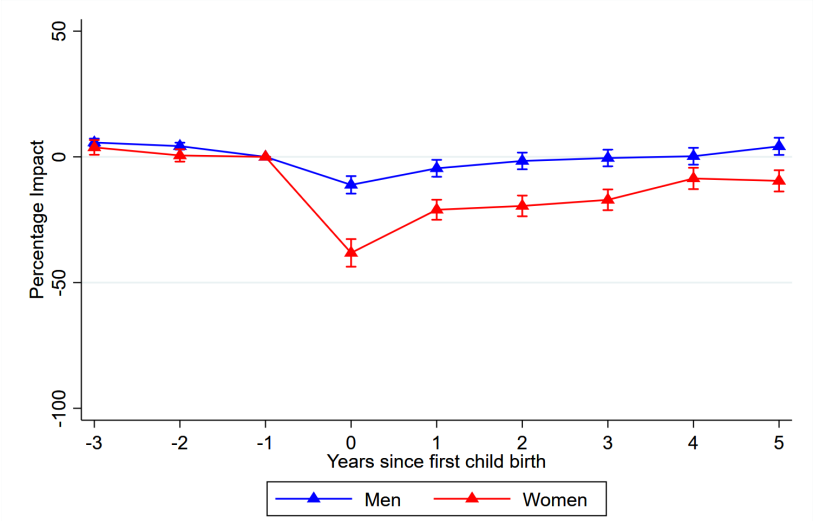
4 Results

We now turn to the results. We begin by documenting the existence of a motherhood training penalty using the pseudo-event study design applied to the EU-LFS data. We then use these data, along with the EU-AES, to investigate the mechanisms underlying this penalty and examine how it varies across policy environments.

4.1 Documenting the motherhood training penalty

We present the results of our pseudo-event study estimating the impact of first childbirth on men's and women's participation in on-the-job training in Europe in Figure 1. The figure shows that men and women exhibit similar training trends before parenthood, but diverge significantly in the years following childbirth, revealing a "motherhood training penalty."

Figure 1: Impact of first child birth on the participation of men and women on on-the-job training activities (EU-LFS)



Notes: This figure presents pseudo-event studies of the impact of first childbirth on men's and women's participation in on-the-job training activities using pooled data from all EU-LFS countries, following the sample refinements that restrict the analysis to full-time employed individuals described in Section 2.3, and applying the specification in Equation (1). The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

Unsurprisingly, the largest effect for both men and women, as well as the largest gap between them, occurs at event time 0, the year the first child is born. This likely reflects post-natal parental leave, which keeps parents, and especially breastfeeding mothers, away from the workplace and unable to participate in on-the-job training.[6] However, although parenthood continues to reduce both men's and women's participation in training in the years following the birth of their first child, the decline remains much more pronounced for women. Specifically, women are 17%–21% less likely to engage in on-the-job training during the 1–3 years after becoming mothers, while men are only 1%–5% less likely to do so, with their decline heavily concentrated in the first two years after childbirth.[7]

[6] In other words, even though we focus on full time employees, the large drop at event time 0 may be partially mechanical, reflecting the incapacitation effects of parental leave rather than actual changes in on-the-job training (Adams et al., 2024). We therefore focus on the effects in subsequent years.

[7] The fact that the decline for fathers is concentrated more narrowly around birth is consistent with relatively generous paternity leave policies in many European countries and is also supported by the findings of Cools

The motherhood training penalty narrows substantially four years after the first birth and is therefore much shorter-lived than employment penalties, which are highly persistent (Kleven et al., 2024a). This pattern is consistent with the hold-up mechanism: firms may initially be reluctant to invest in training for new mothers due to uncertainty about their labor market attachment, but as mothers remain employed over time, this uncertainty diminishes and training investments resume.

Given the sizable wage returns to on-the-job training documented in various settings, the motherhood training penalty we document may help account for part of the broader motherhood wage penalty. To illustrate this, we conduct a back-of-the-envelope calculation to assess the implied impact of the motherhood training penalty on wages. For this exercise, we draw on Ma et al. (2024), who review the literature on job-related training and document average wage gains of about 5% from typical programs across several settings. Our results suggest that women are, on average, 19% less likely to engage in on-the-job training in the 1–3 years following motherhood. Meanwhile, roughly 40% of childless workers undertake such training each year, as shown in Table B.3 and consistent with the statistic that 8% trained in the last four weeks in Table 1. Using these figures, we estimate annual wage growth losses of about 0.4 percentage points for mothers during this period, which amount to a cumulative loss of 1.24 percentage points in wage growth over three years. This implies that the motherhood training penalty can account for roughly 29.3 of the overall motherhood wage penalty, which has been estimated at around 4% on average (Cukrowska-Torzewska and Matysiak, 2020).

4.1.1 Additional analyses and robustness

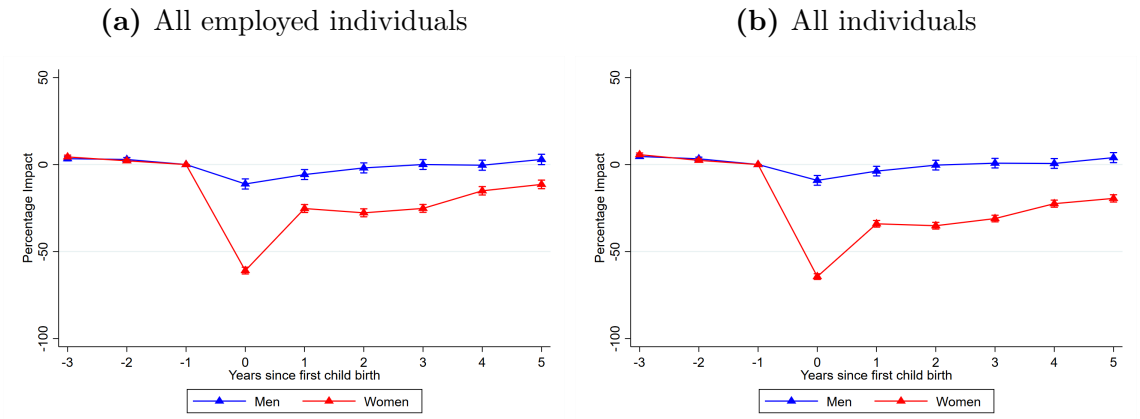
We conduct two additional analyses to assess the robustness of our results.

First, we extend the analysis to include all employed individuals regardless of hours worked, and, separately, all individuals, rather than restricting the sample to full-time workers as in the baseline specification. This allows us to capture the motherhood training penalty more broadly by incorporating both intensive and extensive labor market adjustments following childbirth. As shown in Figure 2, the motherhood training penalty is larger and more persistent in both expanded samples, and especially so when considering all individuals rather than only the employed, relative to the baseline. This reflects the fact that many women reduce their work hours or leave the labor force after becoming mothers, which reduces their exposure to training. This pattern indicates that, because the baseline focuses on full-

et al. (2015), who show that a paternal leave reform in Norway substantially increased fathers' leave take-up, temporarily removing them from the workplace.

time employed women—the most relevant group for measuring human capital accumulation through training—it provides a lower bound on the overall decline in mothers' training participation.

Figure 2: Impact of first child birth on the participation of men and women on on-the-job training activities, without restricting to full-time workers (EU-LFS)



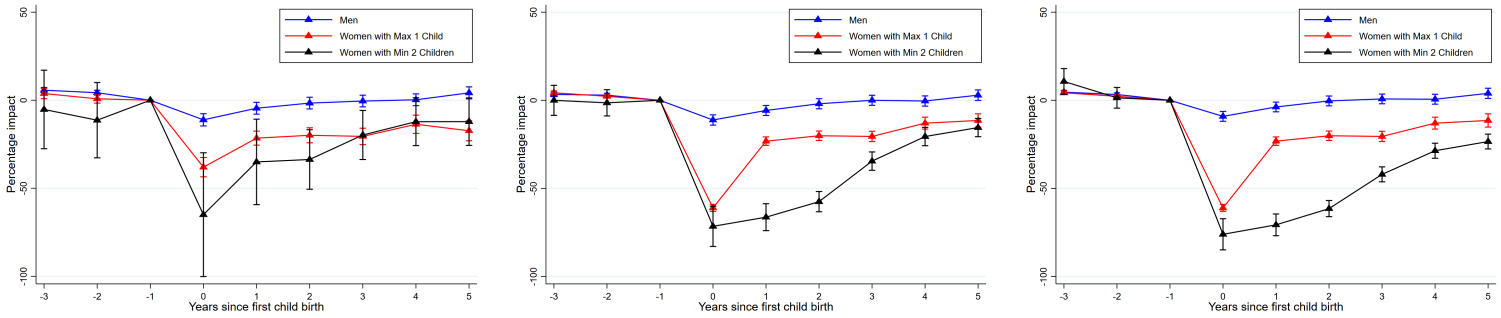
Notes: These figures present pseudo-event studies of the impact of first childbirth on men's and women's participation in on-the-job training using pooled data from all EU-LFS countries, following the sample refinements that restrict the analysis to all employed individuals, and all individuals, respectively, described in Section 2.3, and applying the specification in Equation (1). The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

Second, we examine how the motherhood training penalty varies with subsequent births by estimating Equation (1) separately for mothers with one child and mothers with two or more children. Panel (a) of Figure 3 shows that, among women who remain full-time employed, training penalties are larger for mothers with two or more children—particularly in the first three years after childbirth—than for mothers with one child, though the estimates are noisier due to smaller samples. This difference becomes more pronounced when we broaden the sample to include all employed individuals and all individuals in panels (b) and (c), which show larger and more persistent training penalties for higher-fertility mothers, although the estimates still converge after four to five years. This pattern is consistent with the hold-up mechanism: firms face greater uncertainty about the labor market attachment of women with closely spaced or multiple births, but this uncertainty diminishes as these women remain continuously employed.

However, it is noteworthy that the motherhood training penalty remains sizeable across all samples even among women with only one child. This indicates that the results are not driven by parental leave following subsequent births (Adams et al., 2024). Even three to five years after having their only child, women continue to receive less on-the-job training relative to fathers.

Figure 3: Impact of first child birth on the participation of men and women on on-the-job training activities, conditioning on number of children (EU-LFS)

(a) Baseline sample (full-time employed individuals) **(b)** All employed individuals **(c)** All individuals



Notes: These figures present pseudo-event studies of the impact of first childbirth on men's and women's participation in on-the-job training using pooled data from all EU-LFS countries, following the sample refinements that restrict the analysis to full-time employed individuals, all employed individuals, and all individuals, respectively, described in Section 2.3, and applying the specification in Equation (1). The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

4.2 Drivers of the motherhood training penalty

We now investigate the mechanisms underlying the motherhood training penalty, focusing on four potential drivers: occupational change after childbirth, mothers' willingness to participate in training, the compatibility of different training types with motherhood, and the sources of training financing.

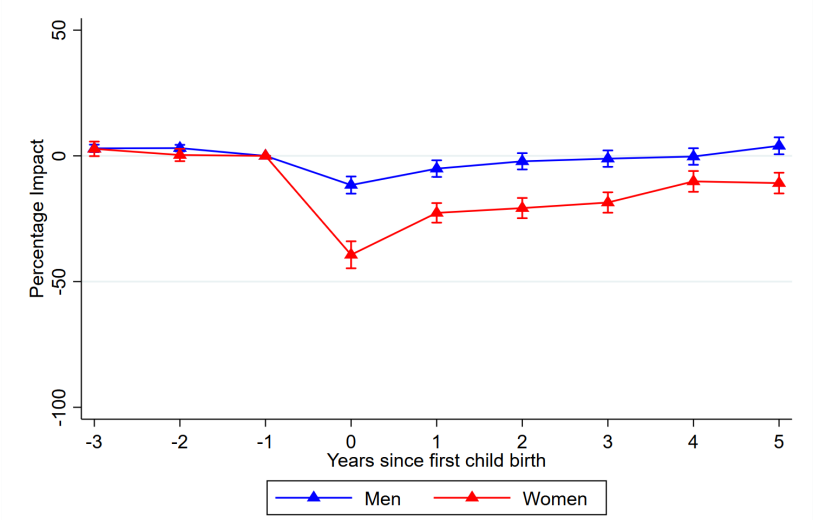
4.2.1 Occupational change after childbirth

Previous research shows that motherhood affects occupational choices, as mothers often switch into occupations that provide greater flexibility or proximity to home (Goldin, 2014; Adda et al., 2017; Berniell et al., 2023; Adams et al., 2025b), and which may also offer fewer training opportunities. To assess the role of occupation in driving our results, we re-estimate the pseudo-event specification in Equation (1) including occupation fixed effects. If occupational switching were driving the motherhood training penalty, the post-parenthood gap in training between men and women should substantially attenuate once we condition on occupation.

Figure 4 presents the results. Relative to the baseline specification, the estimated training responses for both women and men after parenthood, as well as the resulting gender gap, are largely unchanged when occupation fixed effects are included, differing by at most 1 percentage point in years 1–3 after parenthood. This suggests that the motherhood training

penalty primarily reflects within-occupation differences in training rather than occupational reallocation around childbirth.

Figure 4: Impact of first child birth on the participation of men and women on on-the-job training activities (EU-LFS), with occupation fixed effects



Notes: This figure presents pseudo-event studies of the impact of first childbirth on men's and women's participation in on-the-job training activities using pooled data from all EU-LFS countries, following the sample refinements that restrict the analysis to full-time employed individuals described in Section 2.3, and applying the specification in Equation (1), with the addition of occupation fixed effects at the 3-digit level. The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

4.2.2 Training desirability, training types, and sources of financing

To provide further suggestive evidence on the channels behind the motherhood training penalty, we leverage data from the EU-AES, which provides rich information on workers' desire to participate in training, the types of training they undertake, and the sources of financing. This allows us to assess whether mothers actively choose to engage in less training or whether other factors, such as employer decisions or the compatibility of available training opportunities with the demands of motherhood, drive the observed motherhood training penalty.

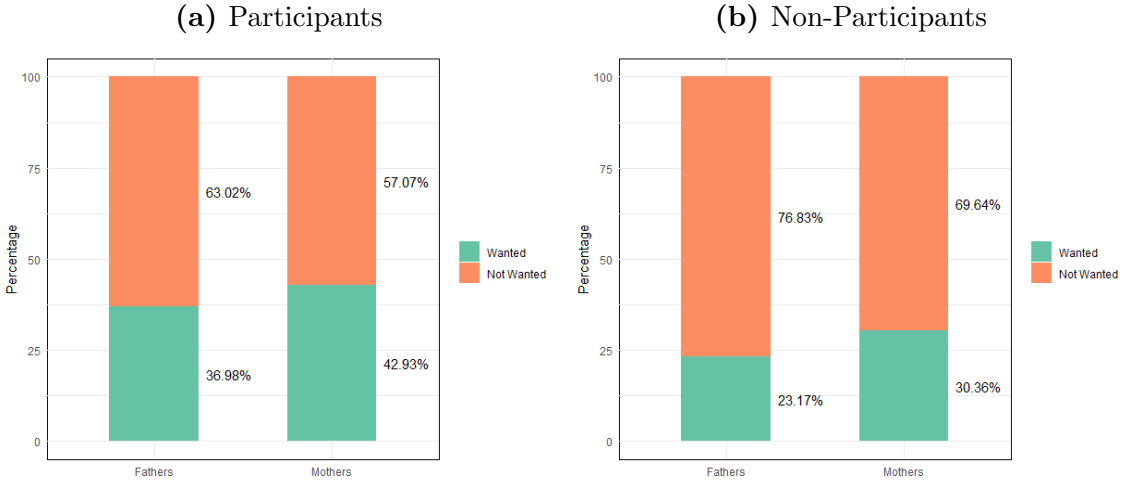
Training desirability

First, to assess whether the motherhood training penalty reflects mothers' preferences—for instance, if mothers opt out of training because they are less interested in career advancement or anticipate reducing their future labor supply—we use EU-AES information on the desirability of training among both participants and non-participants. For participants, the

survey records whether they wanted more of the training they received; for non-participants, it asks whether they would have liked to participate in training over the past 12 months.

Figure 5 plots the share of mothers and fathers who report wanting training, separately for participants and non-participants. In both groups, mothers are more likely than fathers to express a desire for training, with especially large gaps among non-participants. These differences are statistically significant, with p-values below 0.01 for the differences between mothers and fathers in the share reporting a desire to participate among both participants and non-participants.

Figure 5: Training desirability among mothers and fathers (EU-AES)



Notes: This figure presents the share of mothers and fathers who did or did not want to participate in training, distinguishing between those who engaged in on-the-job training in the past 12 months and those who did not. Data comes from the EU-AES 2011 and 2016 surveys, and focuses on employed individuals. The results are weighted using the personal weights provided in the survey.

These patterns indicate that mothers are not opting out of training because of lower willingness or motivation. If anything, mothers consistently express greater interest in participating in training than fathers.

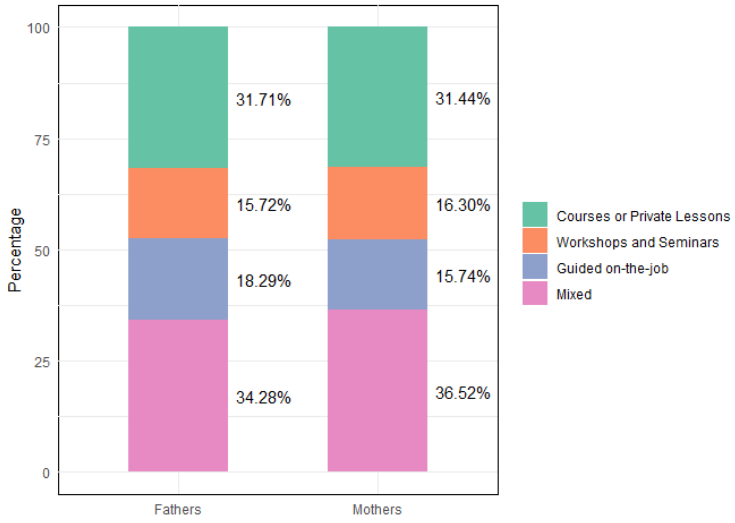
Training types

We next examine whether the motherhood training penalty arises from the incompatibility of certain training formats with the demands of motherhood, as some types of training, such as week-long off-site courses or evening classes, may be particularly difficult for mothers to attend. The EU-AES allows us to assess this by distinguishing among four training types that vary in flexibility: courses or private lessons and workshops or seminars (both potentially inflexible if they require travel or extended hours), guided on-the-job training (more flexible, as it occurs at the workplace), and mixed formats.

Figure 6 plots the composition of training types among mothers and fathers who participated in training in the past 12 months. The distributions are remarkably similar across the two groups and statistically indistinguishable, suggesting that mothers participate in both relatively inflexible formats (such as courses and seminars) and more flexible ones (such as guided on-the-job training) at rates comparable to fathers. If certain formats were incompatible with motherhood, we would expect mothers to disproportionately select into more flexible training types, which we do not observe.

These patterns indicate that differences in the flexibility of available training formats are unlikely to be driving the motherhood training penalty. Among those who participate in training, mothers engage in similar types of training as fathers.

Figure 6: Training types for mothers and fathers (EU-AES)



Notes: This figure presents the share of mothers and fathers engaging in different types of on-the-job training among those who participated in training in the past 12 months. Data comes from the EU-AES 2011 and 2016, and focuses on employed individuals. The results are weighted using the personal weights provided in the survey.

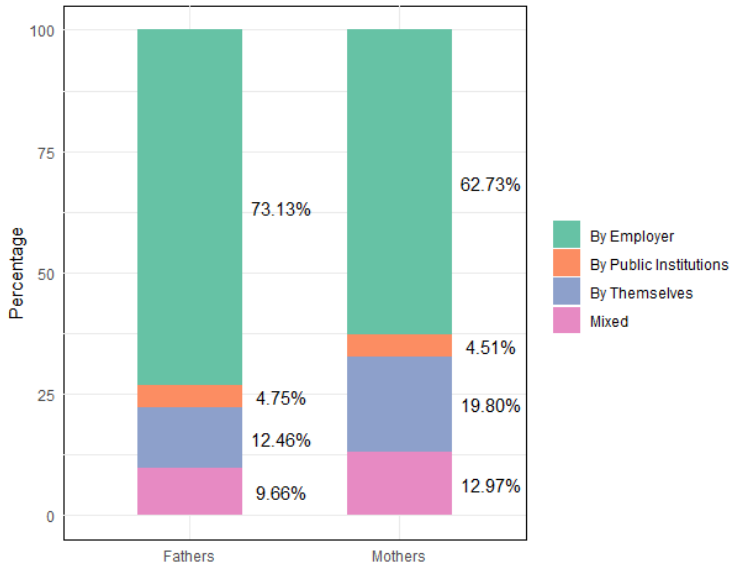
Training financing

Finally, we examine whether the motherhood training penalty may be driven by employers being less willing to fund training opportunities for mothers. To do this, we use EU-AES information on training financing, which records whether training undertaken in the past 12 months was financed fully or partly by the employer, by public institutions, by the worker, or through a mix of these sources.

Figure 7 plots the distribution of financing modalities for mothers and fathers who participated in training in the past 12 months. The figure reveals that mothers are significantly

more likely than fathers to fully self-finance their training (p-value < 0.01), while employers are significantly less likely to cover training costs for mothers (p-value < 0.01).[8] Public institutions support mothers and fathers at similar rates.

Figure 7: Training financing for mothers and fathers (EU-AES)



Notes: This figure presents the share of mothers and fathers with different financing sources for on-the-job training among those who participated in training in the past 12 months. Data comes from the EU-AES 2011 and 2016, and focuses on employed individuals. The results are weighted using the personal weights provided in the survey.

These patterns indicate that the motherhood training penalty could be driven, at least in part, by employer behavior: mothers are less likely to receive employer-funded training and more likely to bear the cost themselves. This finding aligns with the hold-up problem highlighted in the training literature (Acemoglu, 1997; Acemoglu and Pischke, 1998; Moen and Rosén, 2004), in which firms underinvest in training when they anticipate a higher probability of worker separation. This concern is especially salient for mothers, given the substantial and persistent motherhood penalties in employment (Kleven et al., 2019; Kleven, 2022b; Kleven et al., 2024a). Through this channel, penalties in employment reinforce penalties in training, suppressing wage growth even for mothers who remain employed. The hold-up mechanism also helps explain why the motherhood training penalty diminishes over time: as mothers remain continuously employed, employers' uncertainty about future separation declines.

[8]This gap in employer-financed training between mothers and fathers is also confirmed when we control for industry, occupation, and firm size (Table D.1), suggesting that it is likely not driven by differences in job or employer characteristics.

4.3 Role of policy

We now investigate the role of policy in mitigating the motherhood training penalty. Given the central role of employers in financing and determining training investments, and thus in driving the motherhood training penalty as shown above, we focus on policies that may alleviate employers' reluctance to invest in mothers' training by either reducing mothers' likelihood of exiting the labor force upon motherhood (thereby lowering the perceived risk of separation) or subsidizing job-related training. Our analysis in this section is necessarily suggestive, as it relies on cross-country variation in policy environments rather than within-country policy changes, given that the timing and granularity of our data limits our ability to exploit policy reforms over time.

First, to assess the role of mothers' exit rates, we exploit cross-country variation in childcare costs, motivated by a large literature documenting the key role of childcare availability and affordability in shaping mothers' labor supply (Gelbach, 2002; Baker et al., 2008; Andresen and Havnes, 2019; Kleven et al., 2024b).[9] Specifically, we compare the motherhood training penalty in countries with above- versus below-median childcare costs, as measured by the OECD Family Database (2024).[10] Second, to assess the role of training subsidies, we similarly examine how the motherhood training penalty varies across countries with above- versus below-median levels of government support for on-the-job training, as measured in the EU-AES in 2016.

Table 2 reports summary statistics for childcare costs and public support for training, and lists the countries in each subsample. The median childcare cost among EU-LFS countries is 13% of average earnings, and the median share of workers receiving public support for training is 6%.

We present estimates of the motherhood training penalty by childcare costs and public support for training in Figure 8. The motherhood training penalty in the 1 to 3 years following childbirth is 9–13 percentage points larger in countries with above-median childcare fees than in those with below-median fees, and 1–2 percentage points larger in countries with lower public support for training than in those with higher support. These patterns further underscore the role of employer incentives and the hold-up problem in shaping training investments. Lower childcare costs reduce the likelihood that women exit the labor force following childbirth, as documented in the literature, thereby lowering employers' perceived

[9] We do not use the observed motherhood employment penalty or female labor supply directly here, since these outcomes are likely endogenous to the training penalty itself.

[10] Our main results use gross childcare costs. Results based on net childcare costs incorporating childcare-related benefits are similar, as shown in Figure C.2.

Table 2: Summary statistics for childcare costs and public support for training

	All countries	Below median	Above median
Childcare costs (% of average earnings)			
Median childcare cost	13%	9%	27%
Mean childcare cost	21.7%	8.1%	31.6%
Countries	All in EU-LFS	Austria, Czech Republic, Estonia, Germany, Hungary, Iceland, Latvia, Lithuania, Norway, Romania, Slovak Republic, Spain, Sweden	Belgium, Bulgaria, Croatia, Cyprus, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovenia, Switzerland, United Kingdom
Public support for training (% of workers reporting)			
Median public support	6%	3%	10%
Mean public support	8%	3%	12%
Countries	All in EU-LFS, except Iceland	Belgium, Czech Republic, Germany, Hungary, Ireland, Italy, Netherlands, Norway, Romania, Slovak Republic, Sweden, Switzerland, United Kingdom	Austria, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Greece, Latvia, Lithuania, Luxembourg, Malta, Poland, Slovenia, Spain

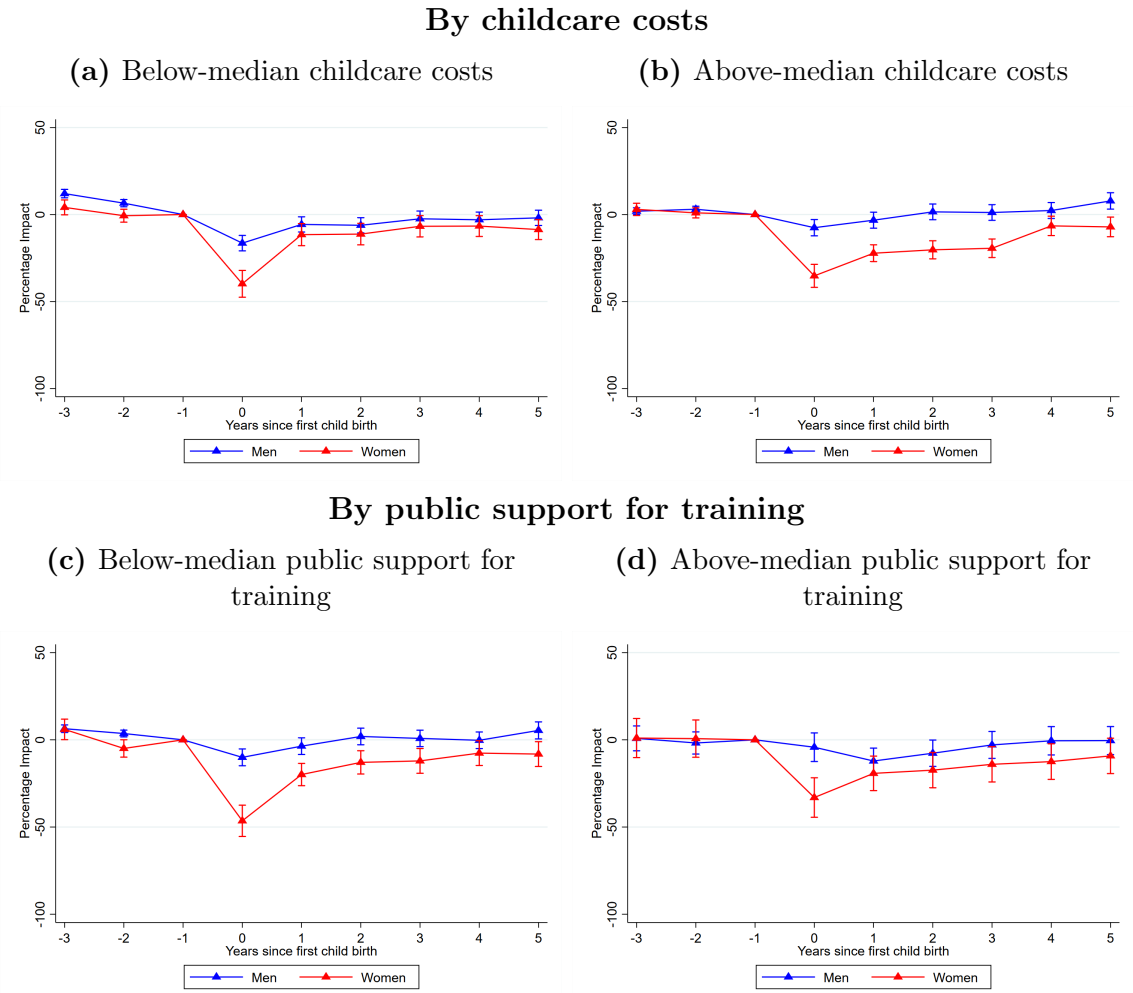
Notes: Childcare costs are measured as gross out-of-pocket fees for full-time formal childcare, expressed as a percentage of average earnings, for a two-earner, two-child (ages 2 and 3) household in which one parent earns 100% and the other 67% of average earnings, following the OECD Family Database (2024). Public support for on-the-job training is measured as the share of workers reporting training financed by public institutions in the EU-AES. Subsamples are defined based on whether a country's policy measure lies above or below the median in the full sample.

risk associated with training mothers. Similarly, greater public support for training reduces employers' exposure by shifting part of the training cost away from firms. However, the effects of childcare costs are larger because they affect whether mothers remain employed at all, directly reducing employers' perceived separation risk when costs fall, whereas training subsidies only reduce the cost of training conditional on the employer having already decided to invest.

Interestingly, and in contrast to mothers, the training penalty for fathers is larger in countries with higher public support for training, further pointing to the importance of the hold-up problem. In low-support settings, training is closely tied to employers' perceptions of workers' long-term attachment, a margin that tends to favor fathers (Goldin, 2014). In high-support settings, this channel is weakened because government support allows firms to reallocate training toward workers perceived as riskier investments, making the post-childbirth decline in training more pronounced for fathers. This asymmetric response is difficult to reconcile with alternative explanations such as taste-based discrimination against

mothers or differences in time constraints for mothers and fathers, both of which would predict monotone effects of public support across both groups.

Figure 8: Impact of first child birth on the participation of men and women on on-the-job training activities, by childcare costs and training subsidies (EU-LFS)



Notes: These figures present pseudo-event studies of the impact of first childbirth on men's and women's participation in on-the-job training using pooled data from all EU-LFS countries, following the sample refinements that restrict the analysis to full-time employed individuals described in Section 2.3, and applying the specification in Equation (1). The sample is divided into subsamples based on (i) whether countries have above- or below-median gross childcare costs, measured as a percentage of average earnings, for a two-earner, two-child (ages 2 and 3) household in which one parent earns 100% and the other 67% of average earnings, following the OECD Family Database (2024); and (ii) whether countries have above- or below-median public support for on-the-job training, measured as the share of workers reporting training financed by public institutions in the EU-AES. The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

More broadly, these results point to scope for policy intervention. Childcare policies and public support for training may help reduce firms' reluctance to invest in mothers during the period when training incentives are weakest. However, as shown in Figure 7, public institutions finance training at similar rates for mothers and fathers, suggesting a potential role for more targeted public support to alleviate firms' incentives to underinvest in mothers

during the post-childbirth period.

5 Conclusions

This paper provides empirical evidence linking the motherhood wage penalty to on-the-job human capital formation by documenting a "motherhood training penalty." Using rich European cross-sectional worker-level data and a pseudo-event study of first childbirth, we find that full-time employed men and women follow similar on-the-job training trends before parenthood, but diverge significantly in the years following. Specifically, women are 17%–21% less likely to engage in on-the-job training during the 1–3 years after becoming mothers, while men are only 1%–5% less likely to do so. By examining workers' desire to participate in on-the-job training and how it is financed, we provide suggestive evidence that this gap is not driven by mothers opting out of training, or the incompatibility of available training formats with motherhood, but rather by employers providing less training to mothers. We further show that the motherhood training penalty is larger in countries with higher childcare costs and weaker public support for on-the-job training, consistent with policies that reduce mothers' labor market exit or subsidize training playing a mitigating role.

Our findings underscore the importance of training dynamics in understanding the motherhood wage penalty and, by extension, the gender wage gap. By showing that the motherhood training penalty is larger in countries with higher childcare costs and weaker public support for on-the-job training, the results highlight how policies affecting mothers' labor market attachment and the financing of training shape post-birth human capital accumulation. More broadly, given the central role of firms in providing training, an important direction for future research is to better understand how policy interventions alter employers' incentives and shape gender disparities in training and other forms of career advancement. In particular, policies that generate variation in mothers' labor market attachment may provide valuable opportunities to study how such changes affect firms' beliefs and training investment decisions.

References

Acemoglu, D. (1997). Training and Innovation in an Imperfect Labour Market. The Review of Economic Studies, 64(3):445. ISBN: 00346527.

Acemoglu, D. and Pischke, J.-S. (1998). Why Do Firms Train? The Quarterly Journal of Economics, 113(1):79–119.

Adams, A., Hara, K., Milland, K., and Callison-Burch, C. (2025a). The gender wage gap in an online labor market: The cost of interruptions. Review of Economics and Statistics, 107(1):55–64.

Adams, A., Jensen, M. F., and Petrongolo, B. (2024). Birth timing and spacing: Implications for parental leave dynamics and child penalties, volume 3. JSTOR.

Adams, A., Jensen, M. F., and Petrongolo, B. (2025b). The contribution of employee-led and employer-led work flexibility to the motherhood wage gap. In AEA Papers and Proceedings, volume 115, pages 243–247. American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203.

Adda, J., Dustmann, C., and Stevens, K. (2017). The Career Costs of Children. Journal of Political Economy, 125(2):293–337.

Albert, C., García-Serrano, C., and Hernanz, V. (2010). On-the-job training in Europe: Determinants and wage returns. International Labour Review, 149(3):315–341.

Almeida, R. K. and Faria, M. (2014). The wage returns to on-the-job training: evidence from matched employer-employee data. IZA Journal of Labor and Development, 3(19).

Altonji, J. G. and Blank, R. M. (1999). Chapter 48 Race and gender in the labor market. In Handbook of Labor Economics, volume 3, pages 3143–3259. Elsevier.

Altonji, J. G. and Spletzer, J. R. (1991). Worker Characteristics, Job Characteristics, and the Receipt of On-the-Job Training. Industrial and Labor Relations Review, 45(1):58.

Anderson, D. J., Binder, M., and Krause, K. (2002). The Motherhood Wage Penalty: Which Mothers Pay It and Why? The American Economic Review, 92(2,):354 –358.

Andresen, M. E. and Havnes, T. (2019). Child care, parental labor supply and tax revenue. Labour Economics, 61:101762.

Angelov, N., Johansson, P., and Lindahl, E. (2016). Parenthood and the Gender Gap in Pay. Journal of Labor Economics, 34(3):545–579.

Baker, M., Gruber, J., and Milligan, K. (2008). Universal Child Care, Maternal Labor Supply, and Family Well-Being. Journal of Political Economy.

Barron, J. M., Black, D. A., and Loewenstein, M. A. (1993). Gender Differences in Training, Capital, and Wages. The Journal of Human Resources, 28(2):343.

Bassanini, A., Booth, A., Brunello, G., De Paola, M., and Leuven, E. (2007). Workplace Training in Europe. In Brunello, G., Garibaldi, P., and Wasmer, E., editors, Education and Training in Europe. Oxford Scholarship Online.

Berniell, I., Berniell, L., de la Mata, D., Edo, M., and Marchionni, M. (2023). Motherhood and flexible jobs: Evidence from Latin American countries. World Development, 167.

Bertrand, M., Goldin, C., and Katz, L. F. (2010). Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors. American Economic Journal: Applied Economics, 2(3):228–255.

Biesebroeck, J. V. (2007). Wage and Productivity Premiums in Sub-Saharan Africa. NBER Working Paper Series.

Bishop, J. H. (1994). The Impact of Previous Training on Producitivity and Wages. In Lynch, L. M., editor, Training and the Private Sector, pages 161–200. University of Chicago Press, Chicago.

Blau, F. D. and Kahn, L. M. (2017). The Gender Wage Gap: Extent, Trends, and Explanations. Journal of Economic Literature, 55(3):789–865.

Blundell, R., Costa-Dias, M., Goll, D., and Meghir, C. (2021). Wages, Experience, and Training of Women over the Life Cycle. Journal of Labor Economics, 39(S1):S275–S315.

Booth, A. L. (1991). Job-Related Formal Training: Who Receives It and What Is It Worth? Oxford Bulletin of Economics and Statistics, 53(3):281–294.

Booth, A. L. (1993). Private sector training and graduate earnings. Review of Economics & Statistics, 75(1):164–170.

Budig, M. J. and England, P. (2001). The Wage Penalty for Motherhood. American Sociological Review, 66(2):204.

Card, D., Kluve, J., and Weber, A. (2018). What works? A meta analysis of recent active labor market program evaluations. Journal of the European Economic Association, 16(3):894–931.

Cools, S., Fiva, J. H., and Kirkebøen, L. J. (2015). Causal Effects of Paternity Leave on Children and Parents. The Scandinavian Journal of Economics, 117(3):801–828.

Cukrowska-Torzewska, E. and Matysiak, A. (2020). The motherhood wage penalty: A meta-analysis. Social Science Research, 88-89.

Dieckhoff, M. and Steiber, N. (2009). In search of gender differences in access to continuing training: Is there a gender training gap and if yes, why?

Duncan, G. J. and Hoffman, S. (1979). On-The-Job Training and Earnings Differences by Race and Sex. The Review of Economics and Statistics, 61(4):594.

Erosa, A., Fuster, L., and Restuccia, D. (2016). A quantitative theory of the gender gap in wages. European Economic Review, 85:165–187.

Fernandez-Kranz, D., Lacuesta, A., and Rodriguez-Planas, N. (2013). The Motherhood Earnings Dip: Evidence from Administrative Records. The Journal of Human Resources, 48(1):169–197.

Frazis, H. and Loewenstein, M. A. (2005). Reexamining the returns to training: Functional form, magnitude, and interpretation. Journal of Human Resources, 40(2):453–476.

Gallen, Y. (2023). Motherhood and the Gender Productivity Gap.

Gelbach, J. B. (2002). Public Schooling for Young Children and Maternal Labor Supply. The American Economic Review, 92(1):307–322.

Gibson, J. (2003). Do Lower Expected Wage Benefits Explain Ethnic Gaps in Job-related Training? Evidence from New Zealand. Motu Working Paper Series.

Goldin, C. (2014). A Grand Gender Convergence: Its Last Chapter. American Economic Review, 104(4):1091–1119.

Gough, M. and Noonan, M. (2013). A Review of the Motherhood Wage Penalty in the United States: Motherhood Wage Penalty. Sociology Compass, 7(4):328–342.

Goux, D. and Maurin, E. (2000). Returns to firm-provided training: Evidence from French worker-firm matched data. Labour Economics, 7(1):1–19. ISBN: 3314117604.

Gronau, R. (1988). Sex-Related Wage Differentials and Women's Interrupted Labor Careers-the Chicken or the Egg. Journal of Labor Economics, 6(3):277–301.

Haelermans, C. and Borghans, L. (2012). Wage effects of on-the-job training; a meta-analysis. British Journal of Industrial Relations, 50(3):502–528.

Hamil-Luker, J. (2005). Women's wages: Cohort differences in returns to education and training over time. Social Science Quarterly, 86(SPEC. ISS.):1261–1278.

Heckman, J. J., Lalonde, R. J., and Smith, J. A. (1999). The economics and econometrics of active labor market programs. Handbook of Labor Economics, 3(1):1865–2097.

Kleven, H. (2022a). The Geography of Child Penalties and Gender Norms: A Pseudo-Event Study Approach. NBER Working Paper.

Kleven, H. (2022b). The Geography of Child Penalties and Gender Norms: Evidence from the United States. NBER Working Paper.

Kleven, H., Landais, C., and Leite-Mariante, G. (2024a). The Child Penalty Atlas. NBER Working Paper.

Kleven, H., Landais, C., Posch, J., Steinhauer, A., and Zweimüller, J. (2024b). Do Family Policies Reduce Gender Inequality? Evidence from 60 Years of Policy Experimentation. American Economic Journal: Economic Policy, 16(2):110–149.

Kleven, H., Landais, C., and Søgaard, J. E. (2019). Children and Gender Inequality: Evidence from Denmark. American Economic Journal: Applied Economics, 11(4):181–209.

Kluve, J. (2010). The effectiveness of European active labor market programs. Labour Economics, 17(6):904–918.

Lillard, L. A. and Tan, H. W. (1986). Private Sector Training Who Gets It and What Are Its Effects. Technical report. Publication Title: Rand Corporation.

Lundberg, S. and Rose, E. (2000). Parenthood and the earnings of married men and women. Labour Economics, 7(6):689–710.

Lynch, L. M. (1992). Private-Sector Training and the Earnings of Young Workers. The American Economic Review, 82(1):299–312. ISBN: 0002-8282.

Ma, X., Nakab, A., and Vidart, D. (2024). Human Capital Investment and Development: The Role of On-the-job Training. Journal of Political Economy Macroeconomics, 2(1):107–148.

Ma, X., Nakab, A., and Vidart, D. (2025). How do Workers Learn? Theory and Evidence on the Roots of Lifecycle Human Capital Accumulation. Working Paper.

Maximiano, S. and Oosterbeek, H. (2007). On the determinants of workers' and firms' willingness to train. Conference paper, European Association of Labour Economists.

McKenzie, D. (2017). How effective are active labor market policies in developing countries? A critical review of recent evidence. World Bank Research Observer, 32(2):127–154.

Moen, E. R. and Rosén, (2004). Does poaching distort training? Review of Economic Studies, 71(4):1143–1162.

OECD Family Database (2024). Childcare cost database.

Okuyama, Y., Murooka, T., and Yamaguchi, S. (2025). Unpacking the Child Penalty Using Personnel Data: How Promotion Practices Widen the Gender Pay Gap. IZA Discussion Paper Series.

Pischke, J.-S. (2001). Continuous Training in Germany. Journal of Population Economics, 14:523–548.

Royalty, A. B. (1996). The Effects of Job Turnover on the Training of Men and Women. Industrial and Labor Relations Review, 49(3):506–521.

Salas-Velasco, M. (2009). Beyond lectures and tutorials: Formal on-the-job training received by young European university graduates. Research in Economics, 63(3):200–211.

Veum, J. R. (1995). Sources of Training and Their Impact on Wages. Industrial and Labor Relations Review, 48(4):812.

Waldfogel, J. (1998). Understanding the 'Family Gap' in Pay for Women with Children. Journal of Economic Perspectives, 12(1):137–156.

What Works - Centre for Local Economic Growth (2016). Evidence Review 1: Employment Training. Technical report, London School of Economics.

Wilde, E. T., Batchelder, L., and Ellwood, D. (2010). The Mommy Track Divides: The Impact of Childbearing on Wages of Women of Differing Skill Levels. Technical Report w16582, National Bureau of Economic Research, Cambridge, MA.

Online Appendix

A Literature Review on Gender Training Gap

This section provides a comprehensive review of the literature on the relationship between on-the-job training and gender. Our main focus is the evolution of the gender training gap over time, while also highlighting both similarities and differences across countries.

Table A.1 summarizes this literature. We focus on worker-level outcomes, which typically rely on worker-level data. Our primary interest is in studies that address the training gender gap in some capacity, even if it is not the main focus of the paper.[11] The table organizes the studies by country, reporting results separately for studies that examine the training gender gap across multiple countries. The literature we review covers a wide range of contexts and time periods, although fewer studies analyze the gender training gap in developing countries compared to developed ones.

Several studies from the 1970s and 1980s highlight the existence of a gender gap in training, with women receiving systematically less training than men. This disparity was documented in developed countries such as the United States (Duncan and Hoffman (1979), Lillard and Tan (1986), Gronau (1988), Lynch (1992), Bishop (1994), Veum (1995)), the United Kingdom (Booth (1991), Booth (1993)), France (Goux and Maurin (2000)), and Germany (Pischke (2001)).[12] Booth (1991) and Booth (1993) further find evidence that having children had different effects on the probability of receiving training for women and men in the 1980s. Specifically, they examine the incidence of formal on-the-job training for full-time employed individuals in the United Kingdom, and find that having children drastically reduced the probability of receiving training for women, while the effect for men was positive, though small and not statistically significant.

The evidence on the gender training gap has become sparser and less clear since the 1990s, with studies analyzing European countries producing mixed results. For instance, Bassanini et al. (2007) show that prime-age women in Europe had more opportunities to receive on-the-job training than men in the 1990s. Similarly, Salas-Velasco (2009) finds that among recent college graduates in Europe, women had a higher chance of receiving training than

[11] For instance, we include studies that examine the returns to training by gender and perform a training incidence regression as a first step, as long as a gender dummy is included in the analysis.

[12] It is important to note that all of these studies use some form of econometric identification that produced statistically significant coefficients. The exceptions were Duncan and Hoffman (1979), Lillard and Tan (1986), and Gronau (1988), who reported the gender gap based on descriptive averages.

men. However, Dieckhoff and Steiber (2009) finds the opposite result: in 2005, a sample of prime-age workers with partners had a lower likelihood of receiving course training if they were female.

These mixed results persist even when comparing studies with similar settings and data. For instance, Bassanini et al. (2007) and Albert et al. (2010) use the same time span and dataset to examine training across several European countries but report different findings. The former focuses on the incidence of on-the-job training, while the latter looks at vocational training. These studies find opposing effects in countries like France, Portugal, and Spain, although these effects are not statistically significant. Moreover, the results vary widely across countries. For example, both studies find that prime-age women receive less training than men in Italy, but the opposite is true in the United Kingdom.

Results from other countries, including more recent studies from the developing world, also show mixed outcomes. For instance, Gibson (2003) finds evidence that white women in New Zealand receive more training than white men, while the opposite is true for non-white women. Additionally, studies on manufacturing workers in Tanzania (Biesebroeck (2007)) and Thailand (Almeida and Faria (2014)) reveal that women receive less training than men.

Table A.1: Studies examining training incidence by gender

Study	Period	Dataset	Sample	Training Definition	Training Incidence	Estimation Method
Austria						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: -0.017	Probit
Belgium						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: -0.013	Probit
Denmark						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.012	Probit
Europe						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.006**	Probit
Dieckhoff (2009)	2004-2005	ESS2e03	Prime-age workers with partner	Incidence of Course Training	F: -0.20*	Logit
Salas-Velasco (2009)	1999	CHEERS	Recent European college graduates	Incidence of OJT	M: -0.2805** M: -0.1674**	Logit Probit
Finland						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.016	Probit
France						
Goux and Maurin (2000)	1988-1993	FQP	Prime-age	Incidence of employer-provided OJT	F: -0.081**	Probit
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.002	Probit
Albert et al. (2010)	1995-2001	ECHP	Prime-age	Vocational Training	M: 0.194	Probit
Germany						
Pischke (2001)	1986-1989	GSOEP	Prime-age	Incidence of any training Incidence of employed sponsored training	F: -0.067*** F: -0.061***	OLS OLS
Albert et al. (2010)	1995-2001	ECHP	Prime-age	Vocational Training	M: 0.046	Probit
Burgard and Gorlit (2014)	2000, 2004, 2008	SOEP	Prime-age	Career oriented courses	M: 0.35 F: 0.32 dif=0.04**	T-test
Tamm (2018)	2007-2010	WeLL	Manufacturing or service workers	Incidence of OJT Security or health Technical training Training on computer Administrative training Communication or soft skills	M: -0.0399*** M: -0.0826*** M: 0.0903*** M: -0.0152* M: -0.0288*** M: -0.0244***	OLS
Greece						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: -0.008**	Probit
Ireland						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.026***	Probit
Italy						
Albert et al. (2010)	1995-2001	ECHP	Prime-age	Vocational Training	M: 0.264***	Probit
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: -0.001	Probit
Kenya						
Rosholm et al. (2007)	1995	RPED	Manufacturing workers	Incidence of OJT	M: -0.053	Probit
Malaysia						
Almeida and Faria (2014)	2002	WBES	Manufacturing and service workers	OJT	F: - 0.071	Probit
Netherlands						
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: -0.006	Probit
New Zealand						
Gibson (2003)	1996	ETS	Prime-age whites Prime-age non-whites	Incidence of employer-provided OJT	M whites: -1.00 M non-whites: 1.48	Probit
Portugal						
Budria and Telhado Pereira (2007)	1998-2000	PLFS	Men and Women	Incidence of OJT	F: 0.452 M: 0.548	Averages
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.006**	Probit
Albert et al. (2010)	1995-2001	ECHP	Prime-age	Vocational Training	M: 0.162	Probit

Study	Period	Dataset	Sample	Training Definition	Training Incidence	Estimation Method
Spain						
Albert et al. (2010)	1995-2001	ECHP	Prime-age	Vocational Training	M: 0.082	Probit
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.001	Probit
Sweden						
Evertsson (2004)	1994-1998	SSLC	Prime-age	Incidence of OJT	F: -0.22***	Logit
Schøne (2004)	1989-1993	NSOE	Prime-age	Incidence of OJT	F: 0.013	IV first stage
Tanzania						
Biesebroeck (2007)	1991-1993	WBRED	Manufacturing workers	Incidence of OJT	M: 0.055**	OLS
Thailand						
Almeida and Faria (2014)	2004	WBES	Manufacturing workers	Incidence of OJT	F: - 0.072*	Probit
United Kingdom						
Booth (1991)	1987	BSAS	Full-time employed men Full-time employed women	Incidence of Formal OJT	Private Sector (M): -0.587** Children (M): 0.056 Private Sector (F): -0.204 Children (F): -0.733**	OLS
Booth (1993)	1980-1987	BHPS	College-Graduate men College-Graduate women	Incidence of Training	Children (M): 0.037 Children (F): -0.360**	Logit
Bassanini et al. (2007)	1995-2001	ECHP	Prime-age	Incidence of OJT	F: 0.030***	Probit
Albert et al. (2010)	1995-2001	ECHP	Prime-age	Vocational Training	M: - 0.139**	Probit
United States						
Duncan and Hoffman (1979)	1975	PSID	White men Black men White women Black women	Incidence of Training	WM: 0.258 BM: 0.091 WF: 0.141 BF: 0.088	Weighted averages
Lillard and Tan (1986)	1983	CPS	Men and women	Training to get currentor last job Training to improve skills	M: 0.555 F: 0.550 M: 0.38 F: 0.367	Averages
Gronau (1988)	1977-1979	PSID	Women Men	Incidence of OJT	M: 0.741 F: 0.675	Averages
Lynch (1992)	1980-1983	NLSY79	Young non-college graduates	Incidence of off-job training Incidence of OJT Incidence of Apprenticeship	M: -0.17*** M: 0.28*** M: 0.48***	Probit
Bishop (1994)	1982-1987	EOPP-NCRVE and NFIBS	New hires	Log training time	F: -0.105* F: -0.083 F: -139*** F (married): 0.109* M (married): -0.053	OLS-EOPP OLS-NFIB OLS-Augmented NFIB
Veum (1995)	1986-1990	NLSY79	Young	Incidence of company training Incidence of Apprenticeship Incidence of off-job training	M: -0.0208 M: 0.7043*** M: -0.0542	Probit
Krueger and Rouse (1998)	1991-1995	Records for manufacturing co. Records for service co.	Production workers All workers	Incidence of OJT	F: 0.122*** F: 0.057	Probit
Zambia						
Rosholm et al. (2007)	1995	RPED	Manufacturing workers	Incidence of OJT	M: -0.106	Probit

B Data sources

B.1 European Union Labor Force Survey (EU-LFS)

The European Union Labor Force Survey (EU-LFS) is a household survey conducted by the European Union to gather data on employment and labor market activities of individuals aged 15 years and above who live in the EU member states, as well as Norway, Switzerland, and Iceland. The survey is conducted on a quarterly basis and collects information on various aspects of employment, such as hours worked, type of job, employment status, occupation, sector of activity, and training participation. The EU-LFS also collects data on educational attainment, gender, age, family structure, nationality, and other demographic information to provide a comprehensive understanding of the EU labor market.

The survey is conducted using a common methodology across all participating countries, allowing for cross-country comparisons and analysis of trends in the labor market over time. While data collection began in 1983 or 1992 for most countries, our analysis uses data from 2006 to 2021 due to data constraints. In particular, information on the age of respondents' children, which is needed to construct event times for parents, only started being collected in 2006.

B.1.1 Training definition

- On-the-job training: Participation in non-formal education and training in the last 4 weeks. This variable covers learning activities organized with the intention to improve workers' knowledge, skills and competences, and encompasses participation in courses (classroom instruction, lecture, distance learning), seminars, workshops, or private lessons.

B.1.2 Matching variables

The set of variables used in the matching procedure comprises gender, education, marital status, urban/rural status, and country. We describe the education, marital status, and urban/rural status variables variables below.

- Education: Less than primary, primary, lower-secondary, upper-secondary, post-secondary.
- Marital status categories: married and not married.[13]

[13] Since we do not have a proper "marital status" variable available, we identified married individuals as those adults over 25 years old who live together in the same household and whose age difference is the smallest among all the people in that household.

Table B.1: Summary statistics in EU-LFS

	Men			Women		
	Child	No Child	**Difference**	Child	No Child	**Difference**
Mean age	34.74	37.93	-3.19	33.96	39.53	-5.57
Fraction married	0.63	0.39	0.24	0.57	0.45	0.13
Fraction urban	0.70	0.74	-0.03	0.72	0.75	-0.03
Fraction w/ less than primary education	0.01	0.00	0.00	0.01	0.00	0.00
Fraction w/ primary education	0.07	0.03	0.04	0.06	0.03	0.03
Fraction w/ lower-secondary education	0.31	0.20	0.11	0.29	0.18	0.12
Fraction w/ upper-secondary education	0.48	0.58	-0.10	0.47	0.56	-0.09
Fraction w/ post-secondary education	0.14	0.19	-0.05	0.17	0.24	-0.06
Fraction on parental leave	0.00	0.00	0.00	0.01	0.00	0.01
Fraction employed	0.72	0.75	-0.03	0.55	0.68	-0.13
Fraction engaging in on-the-job training	0.07	0.08	-0.01	0.08	0.10	-0.02
Number of Observations	9,879,261	12,662,648		10,748,353	11,574,763	

Notes: These results are weighted using the personal weights provided in the survey.

Table B.2: Data availability and number of observations in EU-LFS by country

Country	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Austria	87576	88840	85060	80433	78036	76366	75758	75033	99316	96938	99325	100495	97329	96611	96799	77557
Belgium	44876	43632	40726	39452	38325	35227	34477	33942	57842	54753	55051	81060	79281	82144	79198	69681
Bulgaria	58925	56119	56733	57341	54541	50877	49339	51063	65154	63609	65688	63357	65320	63475	55203	57209
Switzerland	0	0	0	0	51051	54020	53793	50344	86253	87347	83974	84150	83466	80422	82265	89501
Cyprus	13728	13927	14740	15085	15775	15327	15013	14618	22228	22004	22358	22421	21680	20810	20628	18230
Czechia	136243	133639	125185	118917	115630	111082	106458	101222	120642	117191	115417	113247	109502	106889	101193	99807
Germany	202850	195243	191455	190300	188092	174670	170929	167431	236616	237444	254884	260120	255418	253928	54242	151692
Denmark	20298	40821	35888	37339	42510	46430	46881	45866	66903	66005	54524	54604	56475	55084	54242	45067
Estonia	9398	10942	10126	8784	8694	9151	9890	9561	13961	13491	13482	15527	15329	15278	16423	14483
Greece	112499	107429	104397	105947	107056	94464	82229	81938	107612	104262	111604	107563	100576	92298	79994	68714
Spain	242079	251166	251248	253041	251166	242697	241183	237809	354440	342441	330806	327380	330640	333897	306041	243456
Finland	72529	70294	70300	67549	65036	62104	59845	57493	88300	86057	84150	81327	78050	73929	70113	46706
France	136431	140276	136957	159966	188998	193597	189056	169900	265984	264250	266425	258609	254468	247450	190164	174014
Iceland	5118	6753	6600	6485	6521	6514	6501	6255	8964	8735	8213	7444	8993	8332	9046	8452
Italy	304198	295019	290164	281424	280103	274235	252471	252185	294519	288870	279198	276763	273541	267035	248813	236354
Lithuania	16987	22738	20885	22611	22493	21445	21044	20501	30769	29374	28484	29229	29247	27380	24374	23399
Netherlands	208197	188740	184935	180503	167968	177131	176313	182416	255847	245774	240071	229922	254227	244454	237021	96011
Norway	45109	44220	40974	40329	38438	37896	35295	33931	58620	57162	58115	60605	62232	61490	61465	49658
Poland	110290	103332	101157	100715	190976	189667	183079	165690	197385	171679	158180	145657	131993	117363	128851	127221
Slovenia	36864	35006	32927	32709	31551	29215	26680	27394	36198	34686	35105	35459	35544	33316	33129	36897
Slovakia	62569	59925	59083	54719	53279	52506	49964	48482	56597	53868	52320	49473	47816	45886	45186	42483
United Kingdom	179537	175938	171789	161875	151753	141547	137691	131198	209683	200776	192315	189017	187123	181706	112304	0

B.2 European Union Adult Education Survey (EU-AES)

The European Union Adult Education Survey (EU-AES) collects data on participation in education and learning activities, with the specific objective of understanding adult education patterns. The survey includes information on the type and characteristics of learning activities pursued, along with information on workers skills and demographic information. This survey utilizes harmonized definitions and concepts, and provides a set of methodological documents and guidelines to help countries properly collect data. EU-AES covers

individuals aged 25–64, and was conducted during 2007, 2011, and 2016.[14] We focus on the 2011 and 2016 waves for our analysis, since the 2007 wave was a pilot containing very different training definitions. We weight all the results using this data using the personal weights provided in the survey, which adjust for differences in selection probabilities, non-response, and population characteristics such as age, sex, and region.

Table B.3: Summary statistics in EU-AES

	Men			Women		
	Child	No Child	**Difference**	Child	No Child	**Difference**
Mean age	39.63	39.73	-0.1	38.72	41.33	-2.61
Fraction married	0.77	0.49	0.27	0.72	0.55	0.18
Fraction urban	0.71	0.76	-0.04	0.73	0.76	-0.03
Fraction w/ less than primary education	0.01	0.01	0.00	0.01	0.00	0.00
Fraction w/ primary education	0.02	0.02	0.00	0.02	0.01	0.01
Fraction w/ lower-secondary education	0.15	0.13	0.02	0.14	0.11	0.04
Fraction w/ upper-secondary education	0.44	0.43	0.01	0.40	0.37	0.02
Fraction w/ post-secondary education	0.32	0.35	-0.03	0.38	0.46	-0.07
Fraction employed	0.82	0.75	0.07	0.66	0.71	-0.05
Fraction engaging in on-the-job training	0.43	0.41	0.02	0.42	0.45	-0.04
Fraction participated in training - not wanted	0.31	0.29	0.02	0.28	0.30	-0.03
Fraction participated in training- wanted	0.18	0.17	0.01	0.21	0.21	-0.00
Fraction not participated in training - not wanted	0.39	0.42	-0.03	0.36	0.36	-0.00
Fraction not participated in training - wanted	0.12	0.12	0.00	0.16	0.13	0.04
Number of Observations	91,047	78,681		111,469	75,332	

Notes: These results are weighted using the personal weights provided in the survey.

[14] In particular, this survey was deployed as a voluntary survey in 26 EU countries in 2007, and then as a mandatory survey in 27 and 28 countries, respectively, during 2011 and 2016. Information about these countries and sample sizes are available in Table B.4.

Table B.4: Data availability and number of observations in EU-AES by country

Country	2011	2016
Austria	4,915	4,672
Belgium	4,250	4,148
Bosnia and Herzegovina	0	4,660
Bulgaria	5,045	4,478
Croatia	0	2,417
Cyprus	2,040	2,424
Czech Republic	7,428	8,465
Denmark	3,166	2,912
Estonia	2,873	3,227
Finland	2,952	2,517
France	10,884	12,173
Germany	5,339	5,782
Greece	4,800	4,092
Hungary	6,287	5,856
Ireland	10,377	3,910
Italy	8,026	9,323
Latvia	4,276	4,797
Lithuania	4,311	2,878
Luxembourg	2,743	3,337
Malta	2,218	1,486
Netherlands	2,419	2,283
North Macedonia	0	5,915
Norway	2,773	2,308
Poland	21,093	12,630
Portugal	9,205	9,112
Romania	9,968	10,547
Serbia	3,349	2,988
Slovak Republic	4,387	2,563
Slovenia	3,930	4,321
Spain	14,808	18,112
Sweden	2,627	2,492
Switzerland	8,233	6,922
United Kingdom	2,736	5,324

B.2.1 Training and other relevant variables

- On-the-job training: Participation in any activity (courses, workshops and seminars, guided on-the-job training, or private lessons) with the intention to improve knowledge/skills in any area (including hobbies) during the last 12 months.
- Training desirability:
  - Participated in training - not wanted: Participated in formal or non-formal education and training during the last 12 months, but did not want to participate in more of these activities then.
  - Participated in training - wanted: Participated in formal or non-formal education

and training during the last 12 months but wanted to participate in more of these activities then.

  - Not participated in training - not wanted: Did not participate in formal or non-formal education and training during the last 12 months and did not want to participate.

  - Not participated in training - wanted: Did not participate in formal or non-formal education and training during the last 12 months but wanted to participate.

- Training financing for training during the last 12 months:

  - By employer: Training is fully or partially paid for by the employer.

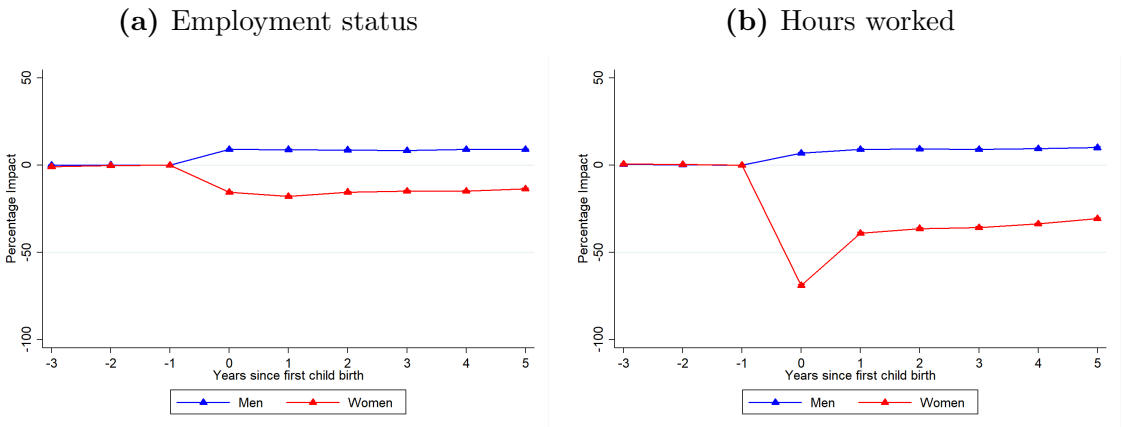
  - By public institutions: Public institutions or the government programs finance the training.

  - By themselves: The individual worker self-financed the training.

  - Mixed: When both the employer and the worker share the costs of the training.

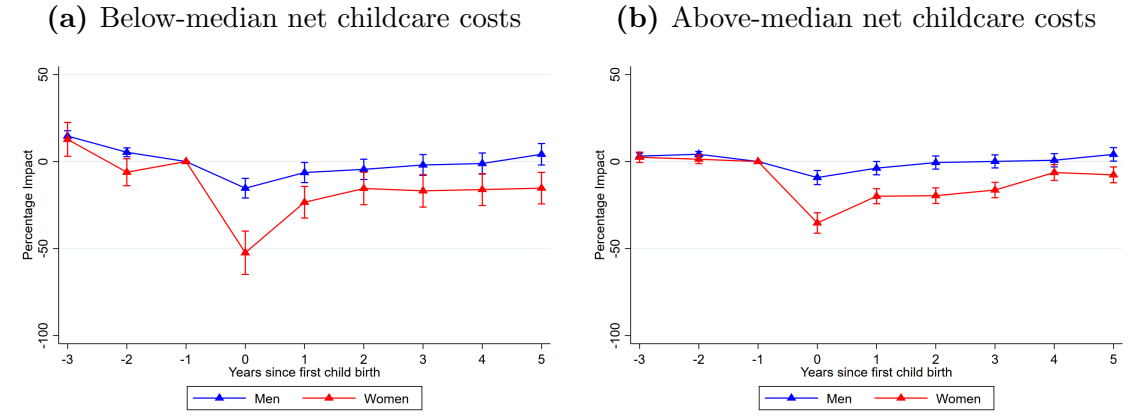
C Additional results from EU-LFS

Figure C.1: Impact of first child birth on the employment and hours worked of men and women (EU-LFS)



Notes: This figure presents pseudo-event studies of the impact of first childbirth on men's and women's employment status and hours worked using pooled data from all EU-LFS countries. We limit the sample of parents to individuals whose age at first birth is between 25 and 45, and follow the specification in Equation (1). The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

Figure C.2: Impact of first child birth on the participation of men and women on on-the-job training activities, by net childcare costs (EU-LFS)



Notes: These figures present pseudo-event studies of the impact of first childbirth on men's and women's participation in on-the-job training using pooled data from all EU-LFS countries, following the sample refinements that restrict the analysis to full-time employed individuals described in Section 2.3, and applying the specification in Equation (1). The sample is divided into subsamples based on whether countries have above- or below-median net childcare costs, measured as a percentage of average earnings for a two-earner, two-child (ages 2 and 3) household, after childcare-related benefits, following the OECD Family Database (2024). The series depict the percentage impact of childbirth (P_τ^m and P_τ^w in Equation (2)) at each event time τ relative to the base year before childbirth ($\tau = -1$). Error bars show 95% confidence intervals based on robust standard errors.

D Additional results from EU-AES

Table D.1: Motherhood gap in employer-financed training

	Employer financed training
Mother	-0.0410***
	(0.0116)
Industry FE	Y
Occupation FE	Y
Firm size FE	Y
Observations	48,246

Notes: This table presents the results from regressing an indicator variable for whether training undertaken in the past 12 months was financed fully or partly by the employer. Data comes from the EU-AES 2011 and 2016, and focuses on mothers and fathers who participated in training in the past 12 months. Occupation and industry fixed effects are at the 2-digit level. The results are weighted using the personal weights provided in the survey. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$