Innovation and motherhood

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Abstract

We investigate the impact of motherhood on the careers of women in innovation, a male-dominated field. We find that the fertility rate of female inventors is remarkably low. Most female inventors have their first child only after submitting their first patent application. Following birth, female inventors are less likely to apply for a patent and they file patents of lower quality. Upon returning from maternity leave, the majority of female inventors work part-time. The innovation gap after childbirth leads to economically meaningful wage disparities, indicating a substantial depreciation of female inventors' human capital. A recent maternity benefits reform that provides better structural support to mothers reduces the innovation child penalty. Our findings emphasize the difficulties of reconciling a career in innovation with being a mother.

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1. Introduction

Women are severely underrepresented in innovation and female inventors produce fewer patents than men over their life-cycle.[1] Despite the significance of innovation for economic growth and the future development of society, our understanding of the causes for the lack of women in innovation is still limited.

In this paper, we examine whether a career as an inventor may be difficult to reconcile with being a mother. The existing literature provides several cues why this may be the case. First, it is widely acknowledged that innovation is a process that is difficult to plan and eventual outcomes are hard to predict (Fleming, 2001; Rosenberg, 2009), which makes it difficult to align a career in innovation with family planning. Second, inventor mobility has been shown to be important for innovation (Topel and Ward, 1992; Trajtenberg, 1990), whereas mobility is limited when you have children. Moreover, several studies highlight that the human capital of inventors is embedded in teams and that human capital is lost when teams brake up or team members leave. (Jaravel et al., 2018; Pöge et al., 2022; Baghai et al., 2024). Hence, female inventors may risk their team-specific human capital when they take a longer break or leave their team to have children.

We build on these cues from the literature and a unique data set to provide first descriptive evidence on the relationship between innovation and motherhood. Our analysis relies on a record linkage of European patenting data with German administrative data, which allows us to observe detailed patenting data, biographical data of inventors, including childbirths, as well as inventors' career paths. Our data set covers 152,335

[1]Based on data of the World Intellectual Property Organization, globally only 13% of inventors are women in the last two decades (World Intellectual Property Organization 2023). Based on data of the European Patent Office, the share of women has grown from 2% in 1978 to around 13% in 2018, a significant improvement, but far from gender parity.

inventors, of which 11,632 (7.6%) are female, from 1980 to 2014.

We start our analysis by examining the fertility of female inventors. Female inventors display a much lower fertility rate than women in the overall population. According to our data, only 60% of female inventors have children. This rate is 26% lower than the fertility rate of women in Germany. Even if we take only highly educated women into account, the gap between this group and female inventors still amounts to 22%.

Female inventors who eventually become mothers appear to hold off motherhood until they have filed their first patent. We find that fertility peaks two years after the first patent application, whereas there are hardly any childbirths before the first patent application. This finding suggests a causal impact of patent output on the timing of motherhood: if female inventors accelerated patenting because they expect a child, we should observe that patent application and childbirth take place at about the same point in time. Consequently, female inventors have their first child at the age of 33, which is four and a half years later than the average age of women who have their first child. In general, our results suggest that a career in innovation delays fertility and that women who pursue a career in innovation are less likely to become mothers.

We further explore the interplay of innovation and fertility by looking at the patenting activity of female inventors over their lifetime. This perspective reveals a number of striking differences between female inventors who become mothers and female inventors who stay childless. Mother inventors outperform in terms of patenting activity in their late 20s to early 30s. Moreover, mother inventors' patenting output peaks earlier and at a higher level than the one of female inventors who do not become mothers. One interpretation of this result is that innovation output positively affects motherhood. Another striking feature of the productivity life-cycle of mother inventors is that patenting output declines substantially after the age of 30, just when female inventors become mothers on average.

The life cycle results motivate us to examine the impact of childbirth on the innovation output of female inventors. To this end, we match 2,737 women who have a track record in innovation and have their first child to comparable female inventors who have a similar track record in innovation, but stay childless. From this matched sample, we create a panel data set that covers the period from five years before childbirth to five years thereafter. We use this panel to estimate the effects of childbirth on innovation productivity using a stacked difference-in-differences research design.

Childbirth has substantial consequences for the productivity of female inventors. In the five years after childbirth, female inventors are between 16% (five years after childbirth) and 33% (one year after childbirth) less likely to file at least one patent in a given year. Those female inventors who continue to file patents receive fewer citations for their patents—in absolute terms and relative to the number of inventors per patent. We interpret the evidence on the intensive margin as "rushed" patents. Overall, childbirth affects innovation output both in terms of the quality of patents and the quantity of patents.

The consequences of childbirth directly affect female inventors' career paths. Mother inventors are 53 percentage points more likely to work part-time in the long-run. They are less likely to be employed and they work fewer days even five years after having a child. They are also less likely to be promoted to a management position or to change their employer. Hence, female inventors exhibit overall lower job mobility after childbirth.

We also study the the impact of childbirth on the earnings of mother inventors. Five years after childbirth, the earnings of mother inventors are around 23,000 Euros below those in the control group. Notably, the loss in earnings materializes in the year of childbirth and persists on the long-run. Approximately half of the difference can be accounted for by employment conditions (e.g., working part-time), career path changes, and past innovation output. Hence, mother inventors earn approximately 12,000 Euros per year less on the long-run even after accounting for the (drop in) innovation productivity.

Female inventors lose a sizable portion of their human capital——roughly 20% of their pre-childbirth earnings—when they quit or take a break from working in innovation.

The loss in human capital is at least partly due to the fact that some of the female inventors' human capital is tied to inventor teams. Female inventors may lose this human capital when they leave or take a break from their team after childbirth. To investigate this hypothesis, we form three subsamples based on the team size of the most recent patent before childbirth. We observe striking differences of the impact of childbirth on patenting activity across different team sizes. Female inventors who work on their own or have only one collaborator, face an immediate child penalty which declines in the long-run. Female inventors who work in small teams face a child penalty on the short-term and long-term, whereas female inventors who work in large teams face hardly any child penalty. Female inventors who do not work in teams or just with one collaborator usually suspend their research when they become mothers, but they have more flexibility to pick their research up again at a later point.

In 2006, Germany implemented a major reform of maternity benefits. The reform substantially increased the financial benefits during parental leave and provided the first direct incentives for men to take parental leave. We find that female inventors are more likely to become mothers after the reform is introduced. Moreover, the negative impact of childbirth on innovation productivity becomes less severe after the reform is enacted. These results are consistent with the notion that women inventors continue their careers in innovation when they can manage to reconcile work in innovation with motherhood. Therefore, these results also underline that mothers do not stop patenting after giving birth due to choice alone.

In conclusion, female inventors have a much lower propensity to have children than other women in Germany. Inventors who do decide to have a child are highly productive and time the birth of children relative to their innovation output. Childbirth hampers the

productivity of female inventors as they stay home or work only part-time. Childbirth results in a wage gap between mother inventors and other female inventors, of which only half can be accounted for by career path changes, employment conditions, and innovation output. A maternity benefits reform indicates that support structures can help to reduce differences in fertility and post-childbirth innovation output. The innovation gender gap is directly related to how difficult it is to reconcile working in innovation with having children.

To the best of our knowledge, we provide the first study of how motherhood affects careers of female inventors. We add these insights to an evolving literature on the gender gap in innovation. Bell et al. (2018) and Kaltenberg et al. (2023) provide detailed descriptive evidence on the innovation gender gap. Further studies in this field explore potential explanations for this gap. Hoisl and Mariani (2017) show that the wage gap between male and female inventors cannot be explained by patenting output. Chien and Grennan (2024) show that female inventors‘ ideas lead to fewer patents and Hochberg et al. (2023) document that female inventors' patents are "under-cited". We make our primary contribution to this literature in that we highlight the role of motherhood for the gender gap in innovation.

We also contribute to the literature on child penalties (Kleven et al., 2019; Kleven et al., 2019; Kleven et al., 2023; Kim and Moser, 2021; Rutigliano, 2024; Ginzinger et al., 2024; Bonney et al., 2025). While this literature has established that women's labor market outcomes are negatively affected by childbirth, our study is the first to examine innovation outcomes.[2] In this literature, our paper is most closely related to Kim and Moser (2021). The authors examine how children affect the productivity of women in

[2]A large literature has occupied itself with identifying and understanding gender inequality (for reviews see Altonji and Blank (1999), Bertrand (2011), and Blau and Kahn (2017)). The literature on child penalties highlights that motherhood can account for most of the observed gender inequality in labor market outcomes (Kleven et al. (2019); Kleven et al. (2019); Kleven et al. (2023)).

science and find that the scientific productivity of mother scientists, measured in terms of number of publications, declines until children reach school age. An advantage of our study is that we can identify the precise date of childbirths (Kim and Moser, 2021, assume that the first child is born four years after marriage) and trace out detailed career consequences. There are also striking differences between mother scientists and mother inventors. Most notably, mother scientists reach their productivity peak after children enter school, whereas mother inventors reach their peak before childbirth.

We also contribute to the literature on team-specific human capital. This literature has extensively analyzed the loss of team-specific human capital due to the death of a co-inventor (e.g., Azoulay et al., 2010; Jaravel et al., 2018; Azoulay et al., 2019; Pöge et al., 2022) or due to bankruptcy (Baghai et al. 2024).

2. Maternity benefits in Germany

The German social security system supports mothers and their families through statutory maternity leave around childbirth and subsequent parental leave.

Expecting working mothers usually enter maternity leave six weeks before the expected due date and exit maternity leave at least eight weeks after the actual due date. During this period, the maternity allowance is equal to the previous net wage.[3]

As an addition to the short-term maternity leave, West Germany introduced parental leave in 1986. Both fathers and mothers are entitled to take parental leave. Parental leave was initially limited to a maximum duration of 10 months and financial benefits of of DM600 (€300) per month throughout the parental leave period. High income earners were not or only partially eligible for the benefit if their household income exceeded

[3]The employee receives 13 euros per day from the statutory health insurance provider as maternity allowance. The employer makes an additional payment so the total compensation equals the average net wage over the previous three months. The period of maternity leave does not count towards days in employment and the maternity benefits are not considered earnings from labor.

certain thresholds. Parental leave was gradually extended until 1992, when the parental leave period was extended by 18 months of unpaid leave. Then, parents could take 36 months of parental leave, of which 18 months paid out financial benefits.

The maternity benefits reform on January 1 2007 substantially increased the financial benefits of parental leave. Since 2001, women could choose between a monthly flat cash transfer of 300 EUR for up to 24 months or 450 EUR for up to 12 months both for either the father or the mother. To be eligible for these benefits, family income had to be less than 40,400 EUR gross (30,000 EUR net). The earnings of female inventors in 2006 amounted to 43,599 EUR gross on average. As many mother inventors are married and most men contribute to family income, it is, therefore, reasonable to assume that a vast majority of mother inventors did not qualify for maternity benefits before the reform. After January 1 2007, the government offered a monthly cash payment of 67% of the average net labor earnings during the 12 months before childbirth to parents with newborns. Maternity benefits were paid out over a period of 12 months, with a minimum of 300 EUR and a maximum of 1,800 EUR. Hence, for most female inventors in our sample, maternity benefits increased from 450 Euros to 1,800 Euros per month. Moreover, if both partners take at least two months of leave, the period can be extended to 14 months. This clause represented a landmark change in family policy as it provided the first direct incentive for fathers to use parental leave.

The 2007 maternity benefits reform has been analyzed extensively. Raute (2019) documents that the reform delivers on its main goal which is to increase fertility, in particular among high-income women. The results on labor force participation are mixed. On the short-run, the increased maternity benefits are shown to incentivize women to take maternity leave (Kluve and Tamm 2013). On the medium-run, however, more women, in particular from the group of highly educated women, return to the labor force after the maternity leave (Bergemann and Riphahn 2010, Kluve and Schmitz 2018). These results

are attributed to the fact that the reform paid higher transfers for a shorter period of time.[4]

3. Data

Our data set is based on a record linkage of German inventor data provided by the European Patent office with German employment biographies provided by the Institute of Employment Research (IAB).[5] To be included in the record linkage, inventors need to have submitted at least one patent application between 1999 and 2011. For this sample of inventors, we observe the full patenting activity and employment biographies between 1980 and 2014.[6] The full sample of patent data matched to employment histories comprises 152,335 inventors, in total 3.9 million inventor-year observations.

3.1. Inventor Data

Patent-related variables are recorded at the patent family level and include all patents under the jurisdiction of the European Patent office.[7] A patent family represents a group of patent applications which refer to the same technical content. We attribute innovation output to the application year instead of the grant or publication year to have the most timely measure of innovation creation. We aggregate all patent variables at the inventor-year level and compute the following measures:

[4]Previous changes in the duration of parental leave did not have meaningful effects or reduce the likelihood that mothers return to the labor force (Lalive and Zweimüller 2009). Kleven et al. (2024) decompose 60 years of maternity leave reforms in Austria and conclude more broadly that government policies had virtually no impact on converging labor market outcomes of men and women.

[5]Since patent records do not include a unique, disambiguated inventor identifier, the research data center of the IAB matched patent data to employment histories using machine learning algorithms. For further details regarding the record linkage, see Dorner et al. (2019).

[6]We do not observe the period between 1980 and 1991 for inventors who lived in East Germany before 1992 because there was no census data collection in East Germany before 1992.

[7]For a detailed description of patent families, see: https://www.epo.org/en/searching-for-patents/helpful-resources/first-time-here/patent-families

- *Application Dummy* is equal to one if the inventor files a patent in a given year and zero if not.
- *Log Number of Applications* is equal to the natural logarithm of one plus the number of applications.
- *Cumulative Applications* is equal to the number of patent applications the inventor has filed over the course of her career until today.
- *Grant Dummy* is equal to one if the inventor files an eventually granted patent application in a given year and zero if not.
- *Log Number of Grants* is equal to the natural logarithm of one plus the number of patent grants.
- *Log Citations* is equal to the natural logarithm of one plus the sum of European Patent Office forward citations received within five years of the earliest publication date. This approach accounts for truncation bias, as newer patents naturally receive fewer citations than older patents (Lerner and Seru 2021). The measure is winsorized at the 99th percentile for privacy-preserving reasons.
- *Log Citations per Inventor* is equal to the natural logarithm of one plus citations scaled by the number of inventors listed on the patent.
- *Log Citations per Patent* the natural logarithm of one plus citations scaled by the number of patent applications.
- *Cumulative Citations*, is equal to the cumulative number of forward citations received over the course of the inventors' career until today.

We use the patent data to construct a number of additional variables. (1) We calculate the average team size of each inventor. To do so, we count the number of inventors listed

on each patent. We construct a rolling average based on the average number of co-inventors on all patents filed so far. (2) We obtain a main technology classification, which indicates in which modal innovation technology each inventor works. These are: electronics, instruments, chemistry, mechanics, and others.

3.2. Employment Biographies

The research data center of the German Federal Employment Agency at the Institute for Employment Research (IAB) provides data on German employment biographies. The Integrated Employment Biographies (IEB) data set includes all individuals who (1) are employed and subject to social security, (2) have marginal part-time employment, (3) receive social security transfers or benefits, (4) are registered job seekers, or (5) participate in employment or training measures. Hence, we cannot observe self-employed inventors in the data. The data is recorded in employment spells, with precise start and end dates for each employment, allowing us to construct the following labor market outcomes at the inventor-year level:

- *Earnings*: The inventor's earnings summed up over all employment spells in a given year.
- *Wage*: Earnings of the inventor in a given year, divided by the number of days worked during the year. Set to missing if the inventor works part time.
- *Employed dummy*: A dummy variable equal to one if the inventor is employed subject to social security in Germany during the year.
- *Days worked*: The number of days in a given year the inventor is employed.
- *Part-time dummy*: A dummy variable equal to one if the inventor works part-time.

- *Manager change*: A dummy variable equal to one if the inventor works in a managing position, compared to her occupation in the year t-1 obtained via occupational codes.

- *Employer change*: A dummy variable equal to one if the inventor moves to another employer compared to her employer in the year t-1.

We use a number of additional variables from this data set such as the age of the inventor, the education level of the employee, which is a categorical variable ranging from 1 to 3. We also construct the tenure of the employee at her employer measured in days. Employment biographies are also linked to the employer through an establishment identifier. On the establishment level, we observe the total number of employees, the place of work at the state/county level, and the industry code of the firm at the Destatis 1-digit level, split into manufacturing, services, education, and others.

3.3. Data on childbirth and maternity leave

The employment biographies record information on why an employment spell is terminated. This information can be used to estimate with a high degree of precision when women gave birth to a child. We rely on the algorithm developed and described by Müller and Strauch (2017) and use their code to identify childbirth. This algorithm comes with two major limitations. First, the algorithm is less likely to catch consecutive births because identification rests on a spell being terminated. There is no spell in the data if the mother does not work or does not look for work between the births of two children. Hence, in these cases it is likely that the algorithm misses the birth of the consecutive child. This is the primary reason why we focus on the first child of an inventor. Second, the algorithm generates false positives for women over the age of 38. For these reasons, we follow Müller and Strauch (2017) and focus our analysis on firstborn children and

women under the age of 39. As a consequence, we may falsely identify some late mothers as non-mothers and we run the risk that these are picked as female control inventors. However, note that only 5.6% of women have their first child after their 39th birthday.[8] To the extent that late mothers enter our control sample because we mislabel them as non-mothers, it will bias our results towards zero, making it more difficult for us to obtain significant results.

3.4. Sample Construction and Matching Statistics

Table 1 presents the selection criteria for an inventor to enter our analysis. Of the full sample of 152,335 inventors, 7.6% of inventors are female. That is, we have 11,632 female inventors in total. 40% (N=4,624) of female inventors have at least one child *at any point* before the age of 39. In our baseline regressions, we are interested in the impact of having a child on the innovation output and careers of female inventors. Therefore, we exclude women who have no patenting activity before having their first child. This reduces the sample from 4,624 to 2,977 female inventors. As pointed out above, inventors only enter the the sample when they applied for at least one patent application between 1999 and 2011. To rule out that our results are driven by survivorship bias, we, therefore, only keep those female inventors whose latest patent before birth is after 1998. The final sample of inventors is then 2,737.

In the following step, we match inventor mothers to never-treated women, which we refer to as non-mothers. For each mother inventor we pick the best match according to the Mahalanobis distance with respect to the following variables: Cumulative number of applications, cumulative number of citations, yearly labor earnings, the number of citations in the current year, their age, and a part-time dummy. We use the cumulative

[8] https://www.destatis.de/EN/Themes/Society-Environment/Population/Births/Tables/live-birth-age.html

number of applications and citations as of the birth year, but labor characteristics in the year before birth. Our final matched sample contains 2,737 mother inventors and 1,822 unique female control inventors.[9] The matched sample, which we use for our analysis, includes 54,015 inventor-year observations.

Table 2 compares mother inventors to non-mothers for our measures of innovation output, earnings from labor, and further key matching variables. In Panel A, the likelihood of filing a patent in the year before childbirth is 32%. Even for a sample of female inventors, this application rate is unusually high as we find in Appendix Table A4 that the average application rate for the whole sample is only 20%. Mother inventors hold a university degree to a large extent (*Education* is equal to three if an employee has a university degree) and earn a daily wage of about 153 Euros on average. Only 6% of women work part-time in the year before childbirth.

The table furthermore provides matching diagnostics. We use the normalized differences proposed by Imbens and Wooldridge (2009) and used by Imbens and Rubin (2015) to examine significant differences between two groups of observations. The Imbens-Wooldridge statistic is far below the threshold of 0.25 recommended by Imbens and Wooldridge (2009) for all variables. Our control group matches mother inventors closely on all relevant criteria.

In Appendix Table A4, we provide summary statistics for the matched sample. The matched sample includes all matched mother and non-mother inventors over an eleven year period from five years before childbirth to five years after childbirth. The average female inventor applies for a patent in 20% of inventor-year observations. Inventors have

[9]The number of female control inventors is smaller because we match with replacement. In our regression analysis, we have an equal amount of mother inventors and control inventors by allowing duplicate control inventors in the sample. We account for this standard procedure by including an inventor identifier for each matched observation and this inventor fixed effect as well as clustering the standard errors on the inventor level.

on average 3 patent applications and receive 5.4 cumulative citations. 17% of inventor-year observations are in part-time employment. The daily wage is, on average, around 140 EUR. Inventors in the sample are relatively young at 33 years old. The average establishment size is around 4,400 employees. Inventors are highly educated with a value of the categorical education value of 2.7. The majority of inventors has thus a completed degree at a university (educational variable equal to 3). In Appendix Table A3 Panel A, we provide summary statistics for the whole sample, including male inventors.

4. Empirical Specification

Since fertility is not randomized, identification relies on sharp changes precisely from the year of child birth onward, while other observed or unobserved determinants likely evolve smooth over event time. The following specification estimates the full dynamics around the time an inventor has her first child, using treated and control female inventors five years before having the first child until 5 years afterwards:

$$Y_{it} = \sum_{t \neq -1} \delta_k (D_k \times \text{Mother}_i) + \psi_i + \zeta_t + \theta k + \gamma_{age} + \varepsilon_{it} \tag{1}$$

where Y_{it} are innovation and labor outcomes on an inventor-year level. As dependent variables, we focus on a dummy variable whether the inventor applies for a patent in a given year and the natural logarithm plus one of forward citations received. We employ a full set of leads and lags around the time of childbearing, captured by the coefficients D_k interacted with a treatment indicator. k indicate time in years relative to the birth of the first child starting from 5 years before birth to 5 years after. We omit the year before birth of the first child in the regression to represent the baseline group. The coefficients of interest are thus δ_k. The regression includes ζ_t, which are year dummies

to control for macroeconomic business cycle effects. ψ are inventor fixed effects which control for non time-varying effects such as inherent inventor ability. We include γ_{age}, which are age dummies, to non-parametrically control for life-cycle effects common to all inventors in the same life-cycle stage. We use a fully interacted specification which includes relative time indicators to treatment and control observations to address the concern that inventor, year, and age fixed effects might not fully account for trends in the life-cycle of patenting of inventors. Using the staggered timing of childbirth, we additionally include θk which capture relative time fixed effects into the regression. Control and treatment mothers are matched, however they are both relatively young and likely at the beginning of their inventive career. Thus, even conditioning on the granular set of fixed effects, our regression might introduce a bias not captured by the fixed effects. We thus control for relative time indicators and isolate effects that are solely due to having a child.

As a second baseline regression, we use a difference-in-differences specification as follows:

$$\begin{aligned} Y_{it} = \; & \delta \, \text{Mother}_i \times \text{Before}_{it} \\ & + \beta_1 \, \text{Mother}_i \times \text{Birthyear}_{it} \\ & + \beta_2 \, \text{Mother}_i \times \text{Short-Term}_{it} \\ & + \beta_3 \, \text{Mother}_i \times \text{Long-Term}_{it} \\ & + \psi_i + \zeta_t + \theta k + \gamma_{age} + \varepsilon_{it} \end{aligned} \tag{2}$$

where the treatment variable *Mother* is a dummy variable equal to one if the inventor is a mother. The variable is interacted with relative time indicators which are grouped together into four distinct parts as follows: *Before* is a dummy variable equal to one in the years t=-5 to t=-2. *Birthyear* is a dummy equal to one in the year of birth. *Short-*

Term is a dummy variable equal to one in the years t=1 to t=3. *Long-Term* is a dummy variable equal to one in the years t=4 to t=5.

5. Empirical analysis: innovation and motherhood

As in many other countries, women are also severely underrepresented in innovation in Germany. In our sample of 152,335 inventors, only 11,632 (7.6%) are female. Not only are female inventors fewer, but they are also less productive than male inventors. In Figure 1, Panel A, we plot the patenting activity of men and women over their lifetime. Female inventors are more active than male inventors at the beginning of their career —- female inventors are more likely to apply for at least one patent per year in their 20s. However, the patenting activity of female inventors peaks in their early thirties, whereas the patenting activity of male inventors peaks about ten years later at a much higher rate. As a consequence, female inventors are much less productive in terms of patent applications than men over their lifetime (cf. Figure 1, Panel B).

In this paper, we want to explore the underlying reasons for this gender gap in innovation. Our main hypothesis is that women find it difficult to reconcile a career in innovation with having children. We explore this hypothesis from two angles. In Section 5.1, we examine the timing of childbirth relative to patenting output. In Section 5.2, we examine the impact of childbirth on patent production and career outcomes of female inventors.

5.1. Innovation and fertility

In this section, we examine the fertility (decisions) of female inventors. The first striking result in this regard concerns the fertility of female inventors. We find that only

60% of female inventors in our sample become mothers.[10] This rate is substantially lower than the population average, which is 81%. Even if we only look at highly educated women, the population average is still 77%. Hence, the fertility rate among female inventors is about 21 percentage points lower than it is for women in Germany more generally. This observation opens up the question whether the low fertility of female inventors is explained by selection or treatment. A selection-based hypothesis is whether women who do not want children in the first place are more likely to choose a career as an inventor. A treatment-based hypothesis is whether a career in innovation makes women less likely to have a child.

In Figure 3, we explore whether patenting output is associated with the timing of motherhood, which would support the notion that a career in innovation curbs fertility. In Panel A, we observe that the majority of female inventors give birth after they have filed their first patent application.[11] There are hardly any childbirths before the first patent application. Fertility peaks two years after the first patent application, suggesting that family planning begins after the patent has been filed. If female inventors accelerate patenting because they expect a child, we should observe that patent application and childbirth take place at about the same point in time. Hence, our findings suggest a causal impact of patent output on the timing of motherhood.

In Panels B, C, and D, we furthermore show that motherhood succeeds the filing of the patent, rather than the granting of the patent, which usually comes 4.5 years later on average (median: 4 years). Specifically, Panel B highlights that there are no differences

[10]We obtain this number for the 1975 cohort. For this cohort. we observe all inventors who have patented after their 24th birthday and we observe their fertility up to 2014, at which point they are 39 years old.

[11]The analysis in Panel A of Figure 3 focuses on childbirths around the first filing of a patent. For this sample, which plots childbirths from five years before childbirth to five years thereafter, 85% of childbirths take place in the five years following childbirth. In total, 59% of mother inventors have their first child within five years after childbirth.

in childbirths between those applications that will be granted and those applications that will not be granted. Hence, assuming that inventors can gauge the likelihood of having a patent granted, we can conclude that expectations regarding the granting of a patent do not have an impact on fertility. Panels C and D furthermore show that most female inventors have a child before they learn about the outcome of the patent review. Specifically, childbirths peak before the first patent is granted (Panel C) and childbirths also peak before the first application is granted (Panel D). Consistent with the findings in Figure 3, we find that female inventors have children more than four years later than German mothers on average (33.3 vs. 28.8). In general, these findings suggest that the motherhood of female inventors is timed with respect to patent output.

In Figure 2, we look at the patenting activity of female inventors over their lifetime. However, this time, we distinguish between female inventors who become mothers and female inventors who do not become mothers. The trajectory of mother inventors is much different from the trajectory of other women. Mother inventors outperform other women in terms of patenting activity from their late 20s to early 30s. Mother inventors' patenting output peaks earlier and at a higher level than the one of female inventors who do not become mothers. One interpretation of this result is that women who wish to become mothers exert additional effort in the run-up to having a child. Women file what are high quality patents and afterwards decide to have a child. It is also plausible that innovation output positively affects motherhood.

Another striking observation of Figure 2 is that the productivity of mother inventors drops dramatically in their early 30s, just when female inventors become mothers on average. We explore this potential child penalty—the disadvantage that mother inventors experience due to having children—in the next section.

5.2. Childbirth, innovation output, and career paths

In this section, we explore the consequences of childbirth for the innovation output and career paths of female inventors. Based on our matched sample (see Section 3.4 for a detailed discussion of the construction of the matched sample and matching statistics), we estimate difference-in-differences as presented in equation 1.

In Figure 4, we plot difference-in-differences estimates of innovation output at the extensive margin (the coefficient estimates are reported in Appendix Table A5). In Panel A, we observe that female inventors are much less likely to apply for a patent in the year after childbirth: in the year before childbirth, 32% of female inventors applied for at least one patent. Two years later, we observe a decline of 8 percentage points or 25%. Even after five years, we still observe a decline of 5 percentage points. If we measure patent output in terms of number of applications (*Log Applications*), we observe a decline of about 10% on the short-run and 7% on the long-run (Panel B). If we measure patent output in terms of whether the inventor files a granted patent (*Granted dummy*), we observe a decline of about 3 percentage points (20%, calculated as 3 percentage points divided by the average value of *Granted Dummy* in the year before childbirth of 15%) after two years. Overall, we conclude from Figure 4 that childbirth has severe consequences for the productivity of female inventors.

In Figure 5, we estimate the difference-in-differences of innovation output at the intensive margin (the coefficient estimates are reported in Appendix Table A6). In Panel A, we analyze the changes in yearly citations conditional on a patent filing. That is, we remove all inventor-years from the sample for which we do not record at least one patent application. This setup allows us to gauge changes in the quality of patents after childbirth, looking at the number of citations as a proxy for the economic quality of

patents.[12] We observe that patents filed in the two years after childbirth collect between 21% and 32% fewer citations. In Panel B, we divide the number of citations by the number of patent applications, and in Panel C we divide the number of citations by the number of inventors. For these outcome variables, we observe similar patterns, which are about half as strong in terms of economic magnitude.

Overall, we conclude from Figures 4 and 5 that female inventors file fewer patent applications in the years after childbirth and those applications that are filed shortly after childbirth receive fewer citations. Hence, childbirth affects innovation output in terms of both quality and quantity.

In Figure 6, we explore how childbirth affects the career paths of female inventors. Mother inventors are 35 percentage points less likely to be employed in the year of childbirth and 27 percentage points less likely to be employed in the year thereafter. The gap in employment between mother inventors and other female inventors closes gradually until the fifth year after childbirth. Nevertheless, mother inventors are still 7 percentage points less likely to be employed five years after childbirth. Looking at *Days worked* instead of *Employed Dummy* provides a similar picture. In Panel D, we observe that the majority of mother inventors who return to work, do so in part-time. In terms of economic significance, five years after childbirth, mothers are 53 percentage points more likely to work part-time. In contrast to other measures, the likelihood of working part-time only increases in the years following birth. Mother inventors are also less likely to be promoted to a management position and they are also less likely to change their employer. Hence, female inventors have overall lower job mobility after childbirth.

In Table A12, we explore the consequences of childbirth for the human capital of female inventors in terms of their annual earnings. In the year of birth, mother inventors

[12] See for instance Trajtenberg (1990) and Kogan et al. (2017) on how patent citations and the economic value relate to each other.

earn almost 21,000 Euros less than other female inventors. On the long-term, this child penalty widens to 22,500 Euros, roughly half of female inventors' earnings in the year before childbirth. Differences in mobility (county, occupation, industry, technology), education, part-time work, days in employment, tenure, and patenting output can account for approximately half of this child penalty. The other half materializes immediately in the year of child birth and persists on the long-run. Female inventors lose a sizable portion of their human capital——roughly 20% of their pre-childbirth earnings—when they quit or take a break from working in innovation.

We hypothesize that the loss in human capital is at least partly due to the fact that some of the female inventors' human capital is tied to inventor teams. Female inventors may lose this human capital when they leave or take a break from their team after childbirth. To investigate this hypothesis, we form three subsamples based on the average team size before childbirth. Table 4 presents the results. We observe a striking heterogeneity of the impact of childbirth on patenting activity across different team sizes. Mother inventors who work on their own or have only one collaborator, face an immediate child penalty which declines on the long-run. Mother inventors who work in small teams face a child penalty on the short-term and long-term, whereas mother inventors who work in large teams face hardly any child penalty. Hence, mother inventors who do not work in teams or just with one collaborator usually suspend their research when they become mothers, but they have more flexibility to pick their research up again at a later point. Mother inventors who work in small teams also suspend their research when they become mothers, but they do not have the flexibility to pick up their research again. We suspect that small teams fall apart when one inventor leaves (temporarily) or need to hire an immediate replacement. Either way, it seems most difficult for mother inventors to continue their research if they have conducted their work inside a small team. Maybe somewhat surprising, mother inventors working in large teams face the

lowest child penalty, probably because large teams can better compensate the temporary absence of a team member, allowing mother inventors to return to the team after a short-term hiatus.

5.2.1. Can maternity benefits help to reconcile innovation with having children? Evidence from the 2007 maternity benefits reform

In this paper, we explore whether the innovation gender gap can be explained by the difficulty of reconciling work in innovation with having children. To further corroborate our earlier findings, we examine in this section whether better maternity benefits help to reduce the innovation gender gap. The maternity benefits reform of 2007 may help female inventors to reconcile their innovation careers with having children for two reasons (for a detailed discussion of maternity benefits in Germany, the reform of 2007, and the existing empirical evidence, see Section 2). First, increased financial benefits may make it easier to bridge the time until female inventors can return to work in innovation. Hence, they may not be forced to take on a part-time job in another line of work in the first few years after childbirth. Second, the reform incentivizes fathers to take parental leave, relieving mother inventors from parental duties and making it easier for mother inventors to return to their work in innovation. Unfortunately, we cannot distinguish between these two channels, but both channels unequivocally predict that the reform makes it easier for women to reconcile work in innovation with motherhood.

We use the variation provided by the reform to study the impact of the reform along two dimensions. First, we are interested in whether the reform was successful to incentivize inventors to have a child. Second, we analyze the likelihood that female inventors continue to innovate after giving birth if they are affected by the reform.

We find that female inventors are more likely to have a child in the years following the reform. Before the reform, 7.1% of female inventors who had not become mothers

by the end of 2004 become mothers in 2005 or 2006. After the reform, 8.8% of female inventors who had not become mothers by the end of 2006 become mothers in 2007 or 2008. Hence, fertility among female inventors increases by 24% (statistically significant at the 1% level) in the two years after the reform. We conclude that the reform was successful in incentivizing female inventors to have a child.

Next, we ask whether female inventors are more likely to continue to innovate after giving birth after the reform. The 2007 maternity benefits reform affected all mothers who have a child on or after January 1 2007. To mitigate the possibility that mothers self-select themselves into the treatment regime, we only consider mothers in a narrow time frame around the reform. We include inventors with their first child born in the seven months after the reform in the reform group and inventors with their first child born in the seven months before the reform in the pre-reform group. There are 124 inventors mothers in the control and 109 inventor mothers in the reform group. We estimate the following regression:

$$Y_{it} = \beta \text{Reform}_i + \gamma \text{Post}_{it} + \delta \text{Reform}_i \times \text{Post}_{it} + \psi_i + \zeta_t + \varepsilon_{it} \tag{3}$$

where Y_{it} are innovation output or labor market outcomes on an inventor-level similar to before. $Reform$ is a dummy variable equal to one for inventors who had their first child seven months after the reform. The variable is equal to zero for mothers who had their first child seven months before the reform. $Post$ is a dummy variable equal to one for years after the birth of the first child. The coefficient of interest is δ, which captures the effect for innovation and labor outcomes for mothers who have their first child after the regulatory change in the years after having a child. The regression additionally includes an inventor fixed effect and a year fixed effect. Standard errors are clustered on an inventor level.

In Table 5, we report the impact of the maternity benefits reform of 2007. The productivity dip after childbirth declines after the introduction of the reform across all measures of patenting output. The decline is economically meaningful as it cuts the productivity dip by approximately 50%. Hence, higher financial benefits and incentives for fathers to take parental leave make it more likely that female inventors continue their careers. The results, therefore, underline that mothers do not simply stop patenting after giving birth solely due to choice.

Overall, we find the consequences of the maternity benefits reform of 2007 on motherhood and innovation to be consistent with the notion that women inventors continue their careers in innovation when they are able to reconcile working in innovation with motherhood. Moreover, when being able to reconcile working in innovation with having a child, female inventors appear to also more likely to become mothers.

6. Conclusion

We analyze how a career in innovation and childbirth is reconciled using a sample of female inventors in Germany. Female inventors feature low fertility and time their first child after filing their first patent. Childbirth hampers the productivity of female inventors as they return only part-time after parental leave and have lower job mobility. Childbirth results in a huge wage gap between mother inventors and other female inventors, of which only half can be accounted for by career path changes, employment conditions, and innovation output. A maternity benefits reform allows us to attribute at least some of the negative consequences of childbirth to an inadequate support structure. Women may find it hard to reconcile their career in innovation with having children.

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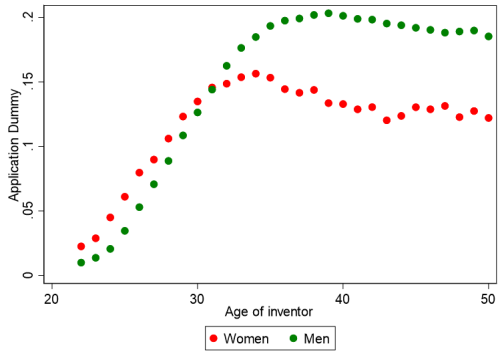
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Figure 1 – Patenting activity over the life-cycle: men vs. women
This figure depicts the innovation output of men and women over their lifetime. Panel A plots the number of patent applications over inventors' age. Panel B plots the cumulated number of patent applications over inventors' age. The figure is based on the full sample of 152,335 inventors, of which 11,632 are female (7.4%).

Panel A: Patent Applications



Panel B: Cumulative Patent Applications

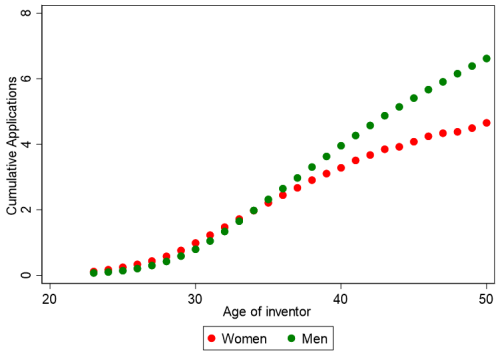
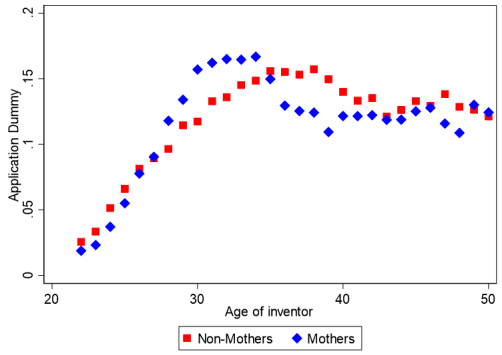


Figure 2 – Patenting activity over the life-cycle mothers vs. other women
This figure depicts the productivity of female inventors over their lifetime according to whether they become mothers or not. Panel A plots the number of patent applications over inventors' age. Panel B plots the cumulated number of patent applications over inventors' age. The figures are based on the full sample of 11,632 female inventors, of which 4,624 become mothers. In both panels, the plots for men are the same as the plots presented in Figure 1.

Panel A: Patent Applications



Panel B: Cumulative Patent Applications

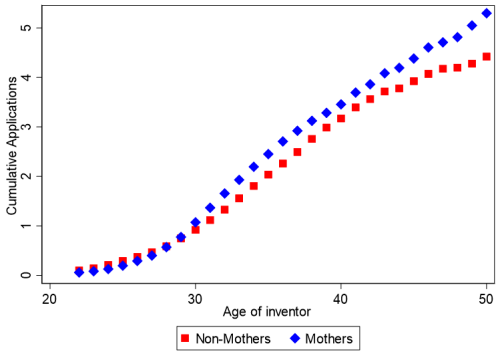
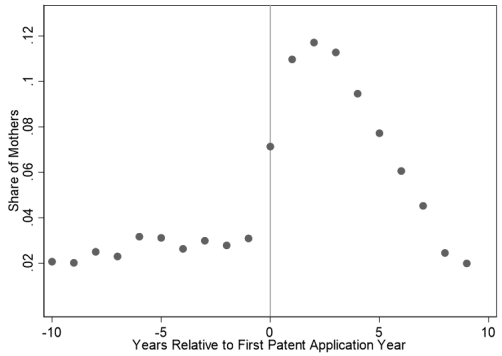
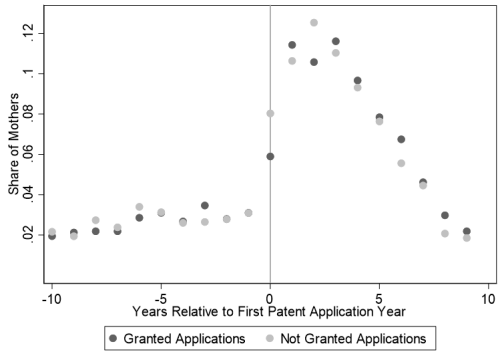


Figure 3 – Innovation and the timing of motherhood
This figure plots the number of childbirths of female inventors relative to the filing date of their first patent (Panel A and B) or the granting of the first patent (Panel C and D). Panel A plots childbirths relative to the time when female inventors filed a patent for the first time. Panel B splits the graph in Panel A according to whether the filed patent is granted or not. Panel C plots births relative to the time when female inventors are granted a patent for the first time. Panel D restricts Panel C to first-time grants of first-time applications.

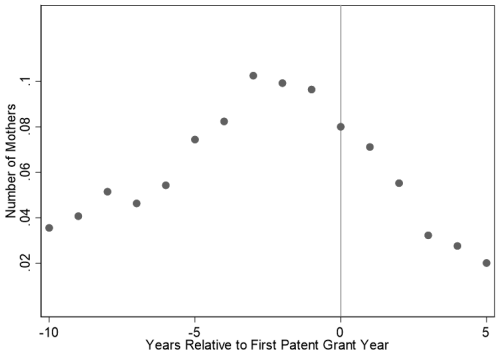
Panel A: First Application Year



Panel B: First Application Year



Panel C: First Grant Year



Panel D: First Application Grant Year

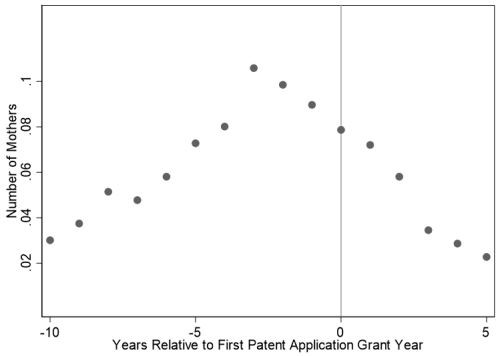
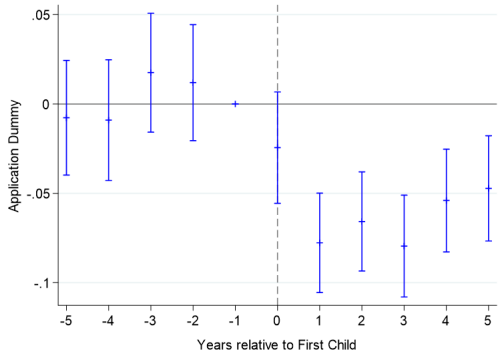


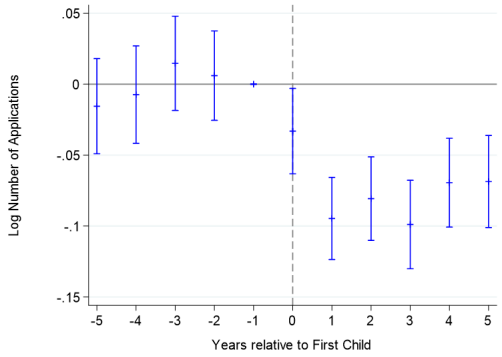
Figure 4 – Childbirth and innovation - extensive margin

This figure plots the impact of motherhood on innovation output at the extensive margin following equation 1. On the x-axis is the time in years relative to the birth of the first child. All regressions include inventor fixed effects, age fixed effects, time fixed effects, and year fixed effects. Standard errors are clustered at the inventor-level. Each regression is based on 3,727 female inventors who become mothers and the same number of female control inventors who do not become mother. The total number of firm-years in each regression is 54,015.

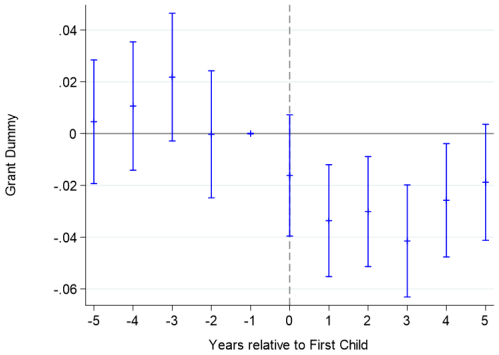
Panel A: Application Dummy



Panel B: Log Number of Applications



Panel C: Grant Dummy



Panel D: Log Number of Grants

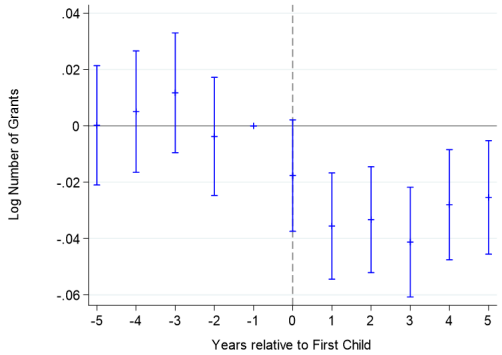
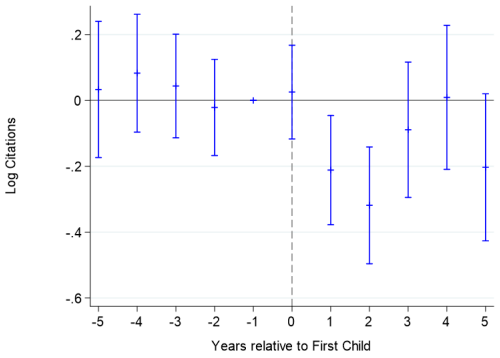


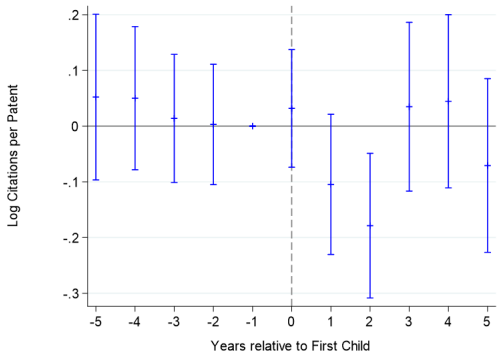
Figure 5 – Childbirth and innovation - intensive margin

This figure plots the impact of motherhood on innovation output at the intensive margin following equation 1. To explore changes at the intensive margin, we set an inventor-year to missing if there is no record of a patent application, that is, all variables are observed conditional on applying for a patent in a given year. All regressions include inventor fixed effects, age fixed effects, time fixed effects, and year fixed effects. Standard errors are clustered at the inventor-level. Each regression is based on 3,727 female inventors who become mothers and the same number of female control inventors who do not become mother. The total number of firm-years in each regression is 54,015.

Panel A: Log Citations



Panel B: Log Citations Per Patent



Panel C: Log Citations Per Inventor

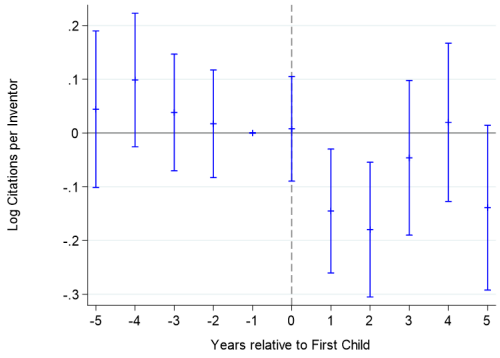
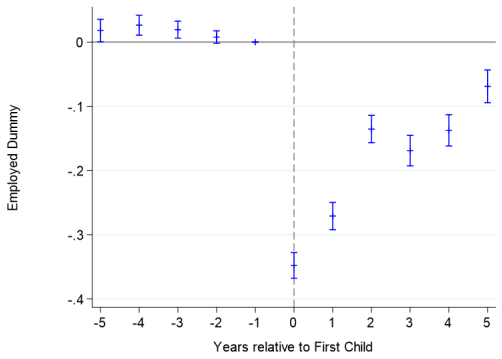


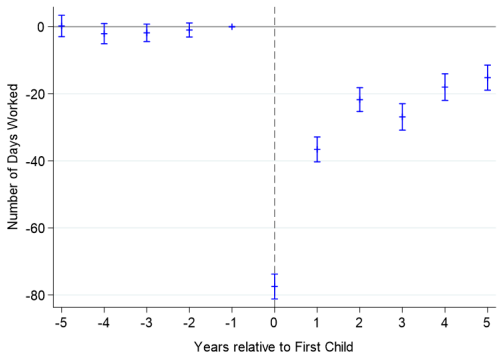
Figure 6 – Childbirth and innovation - career paths

This figure examines the impact of having a child on the career paths of female inventors following equation 1. All regressions include inventor fixed effects, age fixed effects, time fixed effects, and year fixed effects. Standard errors are clustered at the inventor-level. Each regression is based on 3,727 female inventors who become mothers and the same number of female control inventors who do not become mother. The total number of firm-years in each regression is 54,015.

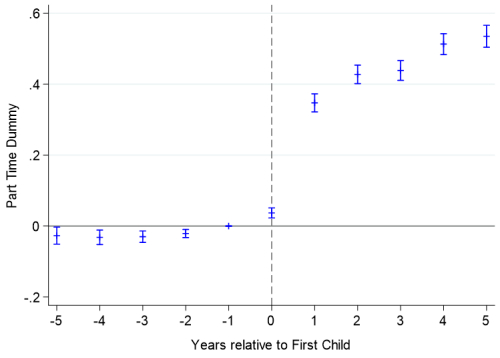
Panel A: Employed Dummy



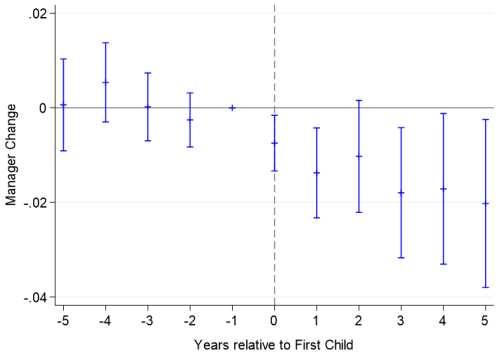
Panel B: Days Worked



Panel C: Part Time Dummy



Panel D: Manager Change



Panel E: Employer Change

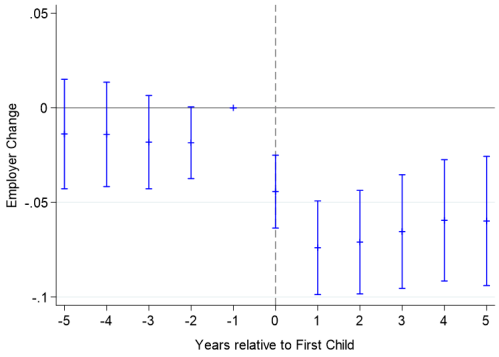


Table 1 – Sample Selection Steps
This table breaks down the main steps that we took to select our sample of female inventors that have a child during our sample period.

Step	Selection Criteria	N
(1)	Inventors in IAB patent and administrative data	152,335
(2)	Keep female inventors	11,632
(3)	Keep female inventors with a child	4,624
(4)	Keep if active as inventor before childbirth	2,977
(5)	Keep if last patent before birth after 1998	2,737

Table 2 – Matching Statistics
The following table examines the balancing of our matched sample. Labor outcomes are measured in the year before birth. Cumulative patent output is measured in the year of birth. The unit of observation is at the inventor level. The Imbens-Wooldridge statistic (cf. Imbens and Wooldridge, 2009) measures the normalized difference between two variables. The test divides the difference between two variables by the square root of the sum of their variances. Variable definitions are provided in the Appendix.

	Mother inventors			Control group			Matching Diagnostics		
Variable	**Mean**	**Median**	**Variance**	**Mean**	**Median**	**Variance**	**% Diff**	**I.-W.**	**t-stat**
Age	32.33	33.00	9.14	32.56	33.00	11.11	-0.72%	-0.05	-2.69
Application Dummy	0.32	0.00	0.22	0.31	0.00	0.21	4.32%	0.02	1.11
Cumul. Applications	3.54	2.00	31.10	3.28	2.00	24.89	7.52%	0.04	1.86
Cumul. Citations	6.32	2.00	191.41	5.74	2.00	154.09	9.26%	0.03	1.65
Days Worked	359.96	365.00	661.47	357.10	365.00	1,481.34	0.80%	0.06	3.23
Earnings	49,558	51,772	1.69E+08	49,221	51,913	1.95E+08	0.68%	0.02	0.92
Education	2.70	3.00	0.26	2.70	3.00	0.26	-0.20%	-0.01	-0.38
Establishment Size	4,323	1,148	0.76E+08	4,576	1,142	0.82E+08	-5.83%	-0.02	-1.04
Granted Dummy	0.15	0.00	0.13	0.15	0.00	0.13	0.73%	0.00	0.11
Log Citations	0.33	0.00	0.53	0.31	0.00	0.50	5.78%	0.02	0.98
Log Citations per Inv.	0.19	0.00	0.21	0.18	0.00	0.21	3.43%	0.01	0.52
Log Citations per Pat.	0.24	0.00	0.27	0.23	0.00	0.28	1.93%	0.01	0.32
Part Time	0.06	0.00	0.06	0.07	0.00	0.06	-7.23%	-0.01	-0.67
Log Applications	0.32	0.00	0.28	0.30	0.00	0.25	7.48%	0.03	1.71
Log Grants	0.13	0.00	0.11	0.12	0.00	0.10	3.69%	0.01	0.55
Wage	152.78	160.23	1,317.74	152.71	160.51	1,383.71	0.05%	0.00	0.07

Table 3 – Earnings and motherhood

This table examines the impact of motherhood on earnings as depicted in equation 2. *Mother* identifies female inventors who have a child in t=0. *Before* is a dummy variable equal to one in the years t=-5 to t=-2. *Birthyear* is a dummy equal to one in the year of birth. *Short-Term* is a dummy variable equal to one in the years t=1 to t=3. *Long-Term* is a dummy variable equal to one in the years t=4 to t=5. Variable definitions are provided in the Appendix. All regressions include year fixed effects and other fixed effects as indicated. Standard errors are clustered at the inventor-level. t-statistics are displayed in parenthesis. ***, ** and * represent significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Earnings			
	(1)	(2)	(3)	(4)
Mother × Before	-1,710.70***	-370.70*	-149.30	-117.40
	(-8.57)	(-2.21)	(-1.06)	(-0.84)
Mother × Birthyear	-20,887.30***	-20,843.50***	-11,382.90***	-11,408.00***
	(-58.58)	(-57.47)	(-27.53)	(-27.58)
Mother × Short-Term	-22,765.60***	-21,323.80***	-14,515.20***	-14,499.20***
	(-60.88)	(-56.18)	(-36.48)	(-36.48)
Mother × Long-Term	-22,584.90***	-19,039.10***	-12,156.70***	-12,077.30***
	(-48.63)	(-41.65)	(-27.86)	(-27.74)
Part-Time Dummy			-9,410.90***	-9,407.50***
			(-30.44)	(-30.46)
Days Worked			119.00***	118.90***
			(62.07)	(62.09)
Log Tenure			340.30***	315.10***
			(4.83)	(4.48)
Cumulative Applications				89.44*
				(2.30)
Cumulative Citations				14.89
				(1.00)
Observations	46,908	42,944	42,944	42,944
R-squared	0.68	0.74	0.81	0.81
Year FE	YES	YES	YES	YES
Inventor FE	YES	YES	YES	YES
Age FE	NO	YES	YES	YES
County FE	NO	YES	YES	YES
Occupation FE	NO	YES	YES	YES
Education FE	NO	YES	YES	YES
Industry FE	NO	YES	YES	YES
Technology FE	NO	YES	YES	YES

Table 4 – Team size and productivity dip after childbirth
This table examines the impact of team size on innovation output as depicted in equation 2. *Mother* identifies female inventors who have a child in t=0. *Before* is a dummy variable equal to one in the years t=-5 to t=-2. *Birthyear* is a dummy equal to one in the year of birth. *Short-Term* is a dummy variable equal to one in the years t=1 to t=3. *Long-Term* is a dummy variable equal to one in the years t=4 to t=5. Variable definitions are provided in the Appendix. Panel A considers patent applications and Panel B considers granted patents. All regressions include inventor, time, and year fixed effects. Standard errors are clustered at the inventor-level. *t*-statistics are displayed in parenthesis. ***, ** and * represent significance at the 1%, 5%, and 10% level, respectively.

Panel A.						
Dependent variable:	Application Dummy			Log Applications		
Team Size:	1-2	3-4	>= 4	1-2	3-4	>= 4
	(1)	(2)	(3)	(4)	(5)	(6)
Mother × Before	0.00	-0.03	0.04	0.01	-0.03	0.03
	(0.01)	(-1.24)	(1.76)	(0.27)	(-1.15)	(1.11)
Mother × Birthyear	-0.05*	-0.03	0.01	-0.05*	-0.04	-0.01
	(-1.99)	(-1.07)	(0.40)	(-2.17)	(-1.55)	(-0.18)
Mother × Short-Term	-0.07***	-0.10***	-0.05*	-0.07***	-0.13***	-0.07**
	(-3.57)	(-4.29)	(-2.15)	(-4.00)	(-4.82)	(-2.77)
Mother × Long-Term	-0.04	-0.08***	-0.02	-0.04*	-0.10***	-0.06*
	(-1.83)	(-3.41)	(-0.93)	(-2.00)	(-3.59)	(-1.99)
Observations	18,161	18,785	17,065	18,161	18,785	17,065
R-squared	0.13	0.22	0.14	0.20	0.18	0.16
Panel B.						
Dependent variable:	Grant Dummy			Log Grants		
Team Size:	1-2	3-4	>= 4	1-2	3-4	>= 4
	(1)	(2)	(3)	(4)	(5)	(6)
Mother × Before	0.01	-0.01	0.03	0.01	-0.02	0.02
	(0.76)	(-0.57)	(1.47)	(0.86)	(-1.13)	(1.22)
Mother × Birthyear	-0.01	-0.05*	0.01	-0.01	-0.05*	0.01
	(-0.54)	(-2.28)	(0.60)	(-0.79)	(-2.51)	(0.43)
Mother × Short-Term	-0.04*	-0.05**	-0.01	-0.03*	-0.06***	-0.01
	(-2.28)	(-3.09)	(-0.60)	(-2.46)	(-3.73)	(-0.87)
Mother × Long-Term	-0.01	-0.06**	0.01	-0.01	-0.06***	-0.00
	(-0.66)	(-2.99)	(0.35)	(-0.70)	(-3.56)	(-0.07)
Observations	18,161	18,785	17,065	18,161	18,785	17,065
R-squared	0.20	0.14	0.20	0.14	0.20	0.13
For both panels:						
Inventor FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Age FE	YES	YES	YES	YES	YES	YES

Table 5 – Maternity benefits and female inventor's productivity after childbirth
This Table examines the impact of the maternity benefits reform of 2007 on female inventors' productivity after childbirth. The research design is depicted in equation 3. The sample is on an inventor-year level and only includes mothers. *Post* is a dummy variable equal to one in years after giving birth. $Benefit$ is a dummy variable equal to one if the child is born on or after January 1st 2007. Sample refers to how treatment and control inventors are defined. The sample is constrained to mothers who have their first child between June 1st 2006 and June 30th 2007. Variable definitions are provided in the Appendix. All regressions include inventor, and year fixed effects. Standard errors are clustered at the inventor-level. *t*-statistics are displayed in parenthesis. ***, ** and * represent significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Application Dummy	Log Applications	Grant Dummy	Log Grants
	(1)	(2)	(3)	(4)
Post	-0.15**	-0.17**	-0.14****	-0.12***
	(-2.25)	(-2.19)	(-2.99)	(-2.84)
$Reform \times Post$	0.09**	0.10**	0.07**	0.05
	(2.30)	(2.26)	(2.31)	(1.69)
Observations	2,513	2,513	2,513	2,513
R-squared	0.26	0.32	0.23	0.26
Year FE	YES	YES	YES	YES
Inventor FE	YES	YES	YES	YES

APPENDIX

A.1. Variable Definitions

This section provides variable definitions. For more details on the matched employer-employee inventor dataset, we refer to Dorner et al. (2019).

1. *Age* – Age of the inventor in the current year.
2. *Application Dummy* – Dummy variable equal to one if the inventor is applying for a patent in a given year. The year is based on the earliest patent filing date within the DOCDB family.
3. *Cumulative Applications* – The cumulative number of patent applications for an inventor in a given year. The year is based on the earliest patent filing date within the DOCDB family.
4. *Cumulative Applications* – The cumulative number of citations for each inventor.
5. *Cumulative Entry Dummy* – A dummy variable equal to one if the inventor has filed her first patent application. The year is based on the earliest patent filing date within the DOCDB family.
6. *Cumulative Exit Dummy* – A dummy variable equal to one if the inventor has filed her last patent application. The year is based on the earliest patent filing date within the DOCDB family.
7. *Days Worked* – The yearly days worked. Obtained from the total duration of the employment spell in a given year.
8. *Earnings* – The calculated yearly employee's gross wage in Euros. In the original data, this variable is provided on a gross daily level. It is calculated from the fixed-period wages reported by the employer and the duration of the (unsplit) original notification period in calendar days. The data is aggregated on a yearly level considering the duration of the employment spell. Wages are deflated to 2015 Euros using the consumer price index for Germany. A number of inventors are at

the contribution ceiling. The variable has not been imputed.

9. *Education* – A categorical variable equal to 1 if the inventor received no vocational training, equal to 2 if the inventor received vocational training and equal to 3 if the inventor completed a degree at a university or university of applied sciences.
10. *Employed Dummy* – Dummy equal to one if the inventor is employed in Germany subject to social security.
11. *Employer Change* – A dummy equal to one if the inventor moves to a new establishment.
12. *Establishment Size* – The total number of an establishment's employees reported to the social security agencies as of June 30th each year.
13. *Grant Dummy* – Dummy variable equal to one if the inventor is granted a patent in a given year. The year is based on the earliest patent filing date within the DOCDB family.
14. *Industry* – Industry classification based on 1-digit DESTATIS industries (1993).
15. *Log Citations* – The natural logarithm plus one of forward citations received. The variable counts all DOCBD (patent family) forward citations received at the European Patent Office within 5 years from the earliest publication date. Due to data protection reasons, citations are truncated at the 99th percentile of the distribution. The variable is aggregated on an inventor-year level.
16. *Log Citations per inventor* – Log Citations scaled by the number of inventors listed on the patent.
17. *Log Citations per patent* – Log Citations scaled by the number of patents.
18. *Log Grants* – Natural logarithm plus one of number of grants.
19. *Log Tenure* – Natural logarithm plus one of the number of days the employee is working at the establishment.

20. *Manager Change* – A dummy equal to one if the inventor moves from a non-managerial to a managerial position. Obtained from occupational codes. Managerial occupations are defined as a 2-digit Blossfeld 1988 classification code between 75 and 76.
21. *Number of Applications* – The total number of patent applications for an inventor in a given year. The year is based on the earliest patent filing date within the DOCDB family.
22. *Number of Grants* – The total number of patent grants for an inventor in a given year. The year is based on the earliest patent filing date within the DOCDB family.
23. *Occupation* – Occupational codes as provided by the Bundesagentur für Arbeit, based on the 2010 version (KLDB 2010).
24. *Part Time* – Dummy variable equal to one if the inventor works part-time in a given year as reported by the employer. The variable records whether the employee works below a certain thresholds of hours per week. Between 1979 and 1987, it was 15 hours per week and since 1988 it has been 18 hours per week.
25. *Team Size* – The average number of the team size. Team size is measured as the total number of inventors listed on each patent application. The average team size is calculated as the cumulative number of team members divided by the cumulative number of applications.
26. *Technology* – Patent technology classifications, grouped into 5 categories: 1) Electronics, 2) Instruments, 3) Chemistry, 4) Mechanics, and 5) Others.
27. *Wage* – The yearly earnings divided by the days worked. Set to missing if the inventor works part-time.

Figure A1 – Childbirth and innovation participation: raw differences
This figure visualizes raw differences in innovation output in years relative to childbirth. On the x-axis is the time in years relative to the birth of the first child. On the y-axis is the coefficient of a dummy equal to one if the inventor applies for a patent in a given year. The figure visualizes raw data without the inclusion of any fixed effects.

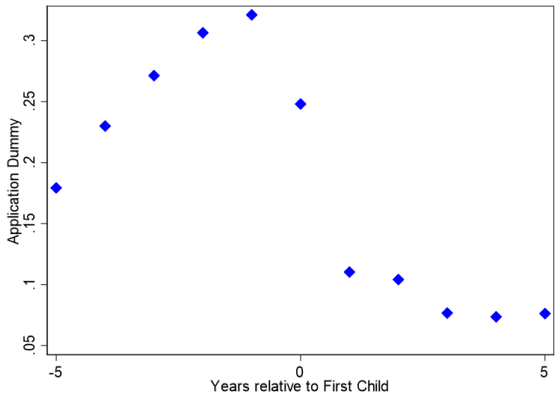


Table A1 – Sample composition
This table shows the sample composition across gender, mother and non-mothers, patent technologies and employer industries.

	(1)	(2)	(3)	(4)	(5)
	Whole Sample, N = 3.9 Million			Matched Sample, N = 54,015	
	Men	Mothers	Non-Mothers	Mothers	Non-Mothers
Panel A: All	93.5%	2.5%	4.0%	50.0%	50.0%
Panel B: Patent Technologies					
Electronics	19.8%	11.8%	11.5%	12.2%	11.1%
Instruments	13.0%	12.7%	12.4%	11.2%	11.6%
Chemistry	21.3%	52.7%	56.2%	56.9%	57.3%
Mechanics	40.0%	17.3%	15.1%	16.1%	16.3%
Others	6.7%	5.4%	4.8%	3.6%	3.7%
Panel C: Industries					
Manufacturing	71.9%	57.5%	54.5%	61.4%	61.5%
Services	12.6%	17.9%	20.2%	19.3%	19.2%
Education	3.9%	7.2%	7.7%	5.5%	5.5%
Others	11.6%	17.5%	17.6%	13.8%	13.8%

Table A2 – Inventor productivity statistics
This table summarizes inventor productivity by gender and motherhood.

	(1)	(2)	(3)	(4)	(5)
	Whole Sample, N = 3.9 Million			Matched Sample, N = 54,015	
	Men	Mothers	Non-Mothers	Mothers	Non-Mothers
Team Size	3.4	4.4	4.4	4.6	4.4
Lifetime Applications	8.5	5.3	4.9	5.6	6.1
Lifetime Grants	4.6	2.9	2.7	2.8	3.2
Citations per Patent	1.0	1.5	1.5	1.6	1.5
Years Active	4.3	2.8	2.6	2.8	3.1

Table A3 – Descriptive Statistics Matched Sample
The following table shows descriptive statistics of the matched sample in the year before birth. The unit of observation is at the inventor level. The Imbens-Wooldridge statistic (cf. Imbens and Wooldridge (2009) measures the normalized difference between two variables. The test divides the difference between two variables by the square root of the sum of their variances. Variable definitions are provided in the Appendix.

Variable	**Mean**	**Median**	**P1**	**P99**	**Variance**
Age	33.17	33.00	24.00	43.00	18.69
Application Dummy	0.20	0.00	0.00	1.00	0.16
Cumul. Applications	2.99	1.00	0.00	26.00	28.51
Cumul. Citations	5.36	1.00	0.00	66.00	174.34
Days Worked	350.12	365.00	125.00	366.00	2,186.27
Earnings	44,773.13	47,475.53	0.00	71,401.20	301,275,863
Education	2.68	3.00	1.00	3.00	0.28
Employed	0.87	1.00	0.00	1.00	0.11
Employer Change	0.23	0.00	0.00	1.00	0.18
Establishment Size	4,442.30	1,228.00	4.00	40,266.00	78,097,253
Granted Dummy	0.09	0.00	0.00	1.00	0.08
Manager Change	0.02	0.00	0.00	1.00	0.02
Log Citations	0.19	0.00	0.00	2.64	0.32
Log Citations per Inventor	0.14	0.00	0.00	2.05	0.18
Log Citations per Patent	0.11	0.00	0.00	1.79	0.13
Part Time	0.17	0.00	0.00	1.00	0.14
Number of Applications	0.19	0.00	0.00	1.79	0.18
Number of Grants	0.07	0.00	0.00	1.10	0.06
Wage	139.76	151.63	0.00	196.01	2,464.01

Table A4 – Summary statistics
The following table shows descriptive statistics of the full sample as well as in the first employment year of mothers and non-mothers. The unit of observation is on the inventor-year level. Variable definitions are provided in the Appendix.

Panel A: All Inventors (N = 3,9 Million)					
Variable	**Mean**	**Median**	**P1**	**P99**	**Var**
Age	39.69	39.00	19.00	69.00	131.84
Application Dummy	0.15	0.00	0.00	1.00	0.13
Cumul. Applications	3.75	1.00	0.00	42.00	94.64
Cumul. Citations	4.34	0.00	0.00	61.00	243.80
Days Worked	355.51	365.00	122.00	366.00	1,799.39
Earnings	45,682.54	49,084.93	1,660.75	71,401.30	325,809,359
Education	2.59	3.00	1.00	3.00	0.35
Establishment Size	4,233.01	846.00	3.00	48,111	86,873,006
Granted Dummy	0.08	0.00	0.00	1.00	0.07
Log Citations	0.11	0.00	0.00	2.20	0.17
Log Citations per Inventor	0.08	0.00	0.00	1.61	0.09
Log Citations per Patent	0.07	0.00	0.00	1.61	0.09
Part Time	0.05	0.00	0.00	1.00	0.05
Number of Applications	0.15	0.00	0.00	1.79	0.15
Number of Grants	0.65	0.00	0.00	1.10	0.06
Wage	152.22	168.14	12.05	196.01	1,992.84
Panel B: Non-Mothers (N = 7,008)					
Age	25.85	25.00	17.00	48.00	45.72
Application Dummy	0.04	0.00	0.00	1.00	0.04
Cumul. Applications	0.08	0.00	0.00	2.00	0.29
Cumul. Citations	0.15	0.00	0.00	4.00	3.01
Days Worked	306.77	365.00	0.00	366.00	7,819.12
Earnings	13,321.42	9,896.60	0.00	53,483.54	150,721,046
Education	2.07	2.00	1.00	3.00	0.80
Establishment Size	3,491.67	973.00	1.00	46,482	61,548,936
Granted Dummy	0.02	0.00	0.00	1.00	0.02
Log Citations	0.03	0.00	0.00	1.39	0.05
Log Citations per Inventor	0.03	0.00	0.00	1.10	0.04
Log Citations per Patent	0.02	0.00	0.00	0.69	0.02
Part Time	0.32	0.00	0.00	1.00	0.22
Number of Applications	0.03	0.00	0.00	0.69	0.03
Number of Grants	0.01	0.00	0.00	0.69	0.01
Wage	59.26	51.55	0.00	176.24	2,166.97
Panel C: Mothers (N = 4,624)					
Age	23.37	24.00	17.00	33.00	16.65
Application Dummy	0.03	0.00	0.00	1.00	0.03
Cumul. Applications	0.06	0.00	0.00	2.00	0.17
Cumul. Citations	0.10	0.00	0.00	3.00	1.26
Days Worked	304.94	365.00	33.00	366.00	7,628.92
Earnings	12,800.13	8,422.18	0.00	51,822.69	145,440,706
Education	1.96	2.00	1.00	3.00	0.84
Establishment Size	3,846.70	1,100.00	2.00	46,793	67,272,935
Granted Dummy	0.01	0.00	0.00	1.00	0.01
Log Citations	0.02	0.00	0.00	1.10	0.04
Log Citations per Inventor	0.02	0.00	0.00	0.92	0.03
Log Citations per Patent	0.01	0.00	0.00	0.56	0.02
Part Time	0.32	0.00	0.00	1.00	0.22
Number of Applications	0.02	0.00	0.00	0.69	0.02
Number of Grants	0.01	0.00	0.00	0.69	0.01
Wage	55.47	41.80	0.00	174.27	2,053.82

Table A5 – Motherhood and innovation: Event Study Extensive Margin
This table reports the results of equation 1. The sample is on an inventor-year level. The independent variable is the treatment indicator *Mother* which is interacted with relative event time dummies. Variable definitions are provided in the Appendix. All regressions include Inventor, Time, and Year fixed effects. Standard errors are clustered by Inventor. t-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Application Dummy	Log Applications	Granted Dummy	Log Patents
	(1)	(2)	(3)	(4)
Mother × t=-5	-0.01	-0.02	0.00	0.00
	(-0.47)	(-0.91)	(0.37)	(0.02)
Mother × t=-4	-0.01	-0.01	0.01	0.01
	(-0.52)	(-0.42)	(0.84)	(0.46)
Mother × t=-3	0.02	0.01	0.02	0.01
	(1.03)	(0.87)	(1.73)	(1.08)
Mother × t=-2	0.01	0.01	-0.00	-0.00
	(0.72)	(0.37)	(-0.02)	(-0.35)
Mother × t=-1	.	.	.	.
Mother × t=0	-0.02	-0.03**	-0.02	-0.02*
	(-1.54)	(-2.15)	(-1.35)	(-1.75)
Mother × t=1	-0.08***	-0.09***	-0.03***	-0.04***
	(-5.47)	(-6.42)	(-3.05)	(-3.70)
Mother × t=2	-0.07***	-0.08***	-0.03***	-0.03***
	(-4.65)	(-5.37)	(-2.77)	(-3.47)
Mother × t=3	-0.08***	-0.10***	-0.04***	-0.04***
	(-5.47)	(-6.22)	(-3.76)	(-4.15)
Mother × t=4	-0.05***	-0.07***	-0.03**	-0.03***
	(-3.68)	(-4.34)	(-2.31)	(-2.81)
Mother × t=5	-0.05***	-0.07***	-0.02*	-0.03**
	(-3.14)	(-4.15)	(-1.64)	(-2.47)
Observations	54,015	54,015	54,015	54,015
R-squared	0.24	0.31	0.20	0.22
Inventor FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Age FE	YES	YES	YES	YES

Table A6 – Motherhood and innovation: Event Study Intensive Margin
This table reports the results of equation 1. The sample is on an inventor-year level. The independent variable is the treatment indicator *Mother* which is interacted with relative event time dummies. Variable definitions are provided in the Appendix. All regressions include Inventor, Time, and Year fixed effects. Standard errors are clustered by Inventor. t-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Log Citations	Log Citations per Patent	Log Citations per Inventor
	(1)	(2)	(3)
Mother × t=-5	0.03	0.05	0.04
	(0.32)	(0.69)	(0.60)
Mother × t=-4	0.08	0.05	0.10
	(0.91)	(0.76)	(1.56)
Mother × t=-3	0.04	0.01	0.04
	(0.55)	(0.24)	(0.69)
Mother × t=-2	-0.02	0.00	0.02
	(-0.29)	(0.05)	(0.34)
Mother × t=-1	.	.	.
Mother × t=0	0.03	0.03	0.01
	(0.35)	(0.59)	(0.16)
Mother × t=1	-0.21**	-0.10	-0.15**
	(-2.50)	(-1.63)	(-2.47)
Mother × t=2	-0.32***	-0.18***	-0.18***
	(-3.52)	(-2.70)	(-2.81)
Mother × t=3	-0.09	0.03	-0.05
	(-0.85)	(0.45)	(-0.63)
Mother × t=4	0.01	0.04	0.02
	(0.08)	(0.56)	(0.26)
Mother × t=5	-0.20*	-0.07	-0.14*
	(-1.78)	(-0.89)	(-1.78)
Observations	8,357	8,357	8,357
R-squared	0.51	0.48	0.50
Inventor FE	YES	YES	YES
Time FE	YES	YES	YES
Year FE	YES	YES	YES
Age FE	YES	YES	YES

Table A7 – Female Inventor Mobility After Childbirth

This Table reports the results of equation 2. The sample is on an inventor-year level. The independent variable is the treatment indicator *Mother* which is interacted with relative event time dummies. Variable definitions are provided in the Appendix. All regressions include Inventor, Time, and Year fixed effects. Standard errors are clustered by Inventor. *t*-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Employed Dummy	Days Worked	Part-Time Dummy	Manager Change	Employer Change
	(1)	(2)	(3)	(4)	(5)
Mother × t=-5	0.00	0.02*	-0.03*	0.00	-0.01
	(0.27)	(2.00)	(-2.20)	(0.12)	(-0.94)
Mother × t=-4	0.00	0.03***	-0.03**	0.01	-0.01
	(-0.06)	(3.32)	(-3.04)	(1.26)	(-1.00)
Mother × t=-3	0.00	0.02**	-0.03***	0.00	-0.02
	(-0.01)	(2.88)	(-3.66)	(0.05)	(-1.44)
Mother × t=-2	0.00	0.01	-0.02***	0.00	-0.02
	(-0.05)	(1.58)	(-3.58)	(-0.88)	(-1.91)
Mother × t=-1	.	.	.	.	.
Mother × t=0	-0.35***	-77.48***	0.04***	-0.01*	-0.04***
	(-34.07)	(-40.92)	(5.12)	(-2.48)	(-4.51)
Mother × t=1	-0.27***	-36.59***	0.35***	-0.01**	-0.07***
	(-24.97)	(-19.32)	(26.71)	(-2.84)	(-5.85)
Mother × t=2	-0.14***	-21.74***	0.43***	-0.01	-0.07***
	(-12.53)	(-11.99)	(32.23)	(-1.70)	(-5.09)
Mother × t=3	-0.17***	-26.90***	0.44***	-0.02*	-0.07***
	(-13.88)	(-13.37)	(30.86)	(-2.56)	(-4.27)
Mother × t=4	-0.14***	-18.00***	0.51***	-0.02*	-0.06***
	(-11.04)	(-8.89)	(34.22)	(-2.11)	(-3.64)
Mother × t=5	-0.07***	-15.18***	0.53***	-0.02*	-0.06***
	(-5.30)	(-7.99)	(33.85)	(-2.24)	(-3.43)
Observations	54,015	46,899	46,214	46,899	46,899
R-squared	0.52	0.30	0.51	0.34	0.47
Year FE	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES
Inventor FE	YES	YES	YES	YES	YES
Age FE	YES	YES	YES	YES	YES

Table A8 – Team size - labor outcomes

This table reports the results of equation 2. The sample is on an inventor-year level. The independent variable is the treatment indicator *Mother* which is interacted with four time dummies as follows. A *Before* dummy, equal to one in the years t-5 to t-2. A *Birthyear* dummy, equal to one in the year of birth. A *Short-Term* dummy equal to one for the years t to t+3. Lastly, a *Long-Term* dummy equal to one for the years after t+3. Variable definitions are provided in the Appendix. All regressions include Inventor, Time, and Year fixed effects. Standard errors are clustered by Inventor. *t*-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Employed Dummy			Part-Time Dummy		
Team Size:	1-2	3-4	>= 4	1-2	3-4	>= 4
	(1)	(2)	(3)	(4)	(5)	(6)
Mother × Before	0.03***	0.01	0.01	-0.04**	-0.01	-0.03*
	(3.33)	(0.74)	(1.44)	(-3.07)	(-0.95)	(-2.19)
Mother × Birthyear	-0.33***	-0.36***	-0.35***	0.03*	0.06***	0.02*
	(-18.44)	(-21.65)	(-18.99)	(2.07)	(4.71)	(1.96)
Mother × Short-Term	-0.19***	-0.20***	-0.20***	0.36***	0.43***	0.42***
	(-12.21)	(-14.72)	(-13.54)	(17.78)	(23.42)	(21.80)
Mother × Long-Term	-0.08***	-0.12***	-0.13***	0.46***	0.54***	0.56***
	(-3.88)	(-6.45)	(-6.78)	(17.68)	(23.15)	(23.28)
Observations	18,161	18,785	17,065	15,188	16,237	14,783
R-squared	0.31	0.31	0.31	0.50	0.53	0.51
Dependent variable:	Days Worked			Employer Change		
Team Size:	1-2	3-4	>= 4	1-2	3-4	>= 4
	(1)	(2)	(3)	(4)	(5)	(6)
Mother × Before	-1.45	-3.29*	1.22	-0.01	-0.02	-0.02
	(-0.74)	(-2.02)	(0.63)	(-0.63)	(-1.03)	(-0.94)
Mother × Birthyear	-80.23***	-76.29***	-75.83***	-0.02	-0.05***	-0.06***
	(-23.73)	(-24.07)	(-22.91)	(-1.09)	(-3.32)	(-3.38)
Mother × Short-Term	-33.62***	-27.65***	-24.37***	-0.07***	-0.07***	-0.06**
	(-12.51)	(-13.74)	(-9.95)	(-3.37)	(-3.66)	(-2.92)
Mother × Long-Term	-20.27***	-15.97***	-14.19***	-0.05	-0.08**	-0.05
	(-6.51)	(-5.90)	(-5.20)	(-1.76)	(-2.96)	(-1.75)
Observations	15,480	16,432	14,982	15,480	16,432	14,982
R-squared	0.31	0.30	0.28	0.48	0.47	0.47
For both panels:						
Inventor FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Age FE	YES	YES	YES	YES	YES	YES

Table A9 – Team size - earnings and wages

This table reports the results of equation 2. The sample is on an inventor-year level. The independent variable is the treatment indicator *Mother* which is interacted with four time dummies as follows. A *Before* dummy, equal to one in the years t-5 to t-2. A *Birthyear* dummy, equal to one in the year of birth. A *Short-Term* dummy equal to one for the years t to t+3. Lastly, a *Long-Term* dummy equal to one for the years after t+3. Variable definitions are provided in the Appendix. All regressions include Inventor, Time, and Year fixed effects. Standard errors are clustered by Inventor. *t*-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Earnings			Wage		
Team Size:	1-2	3-4	>= 4	1-2	3-4	>= 4
	(1)	(2)	(3)	(4)	(5)	(6)
Mother × Before	1,088.05*	438.11	1,055.76*	2.23*	1.10	0.48
	(2.34)	(1.08)	(2.27)	(2.04)	(1.19)	(0.46)
Mother × Birthyear	-19,811.72***	-20,975.36***	-20,993.32***	-39.39***	-38.79***	-41.77***
	(-29.16)	(-33.47)	(-30.53)	(-12.68)	(-12.82)	(-13.13)
Mother × Short-Term	-20,725.45***	-20,773.36***	-21,354.24***	-53.82***	-51.75***	-57.64***
	(-28.10)	(-31.42)	(-29.46)	(-19.03)	(-18.58)	(-18.76)
Mother × Long-Term	-17,629.20***	-17,442.79***	-18,290.44***	-40.38***	-34.07***	-39.45***
	(-18.98)	(-20.70)	(-20.85)	(-11.98)	(-11.43)	(-12.03)
Observations	15,480	16,432	14,982	12,527	13,613	12,410
R-squared	0.69	0.69	0.70	0.70	0.63	0.66
Inventor FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Age FE	YES	YES	YES	YES	YES	YES

Table A10 – Maternity benefits reform 2007 - other outcomes
This Table reports the results of equation 3. The sample is on an inventor-year level and only includes mothers. *Post* is a dummy variable equal to one in years after giving birth. $Benefit$ is a dummy variable equal to one if the child is born on or after January 1st 2007. Sample refers to how treatment and control inventors are defined. The sample is constrained to mothers who have their first child between June 1st 2006 and June 30th 2007. Variable definitions are provided in the Appendix. All regressions include Inventor, and Year fixed effects. Standard errors are clustered by Inventor. *t*-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Employed Dummy	Days Worked	Part-Time Dummy	Employer Change	Manager Change
	(1)	(2)	(3)	(4)	(5)
Post	-0.29***	-66.29***	-0.01	0.29***	0.01
	(-6.43)	(-11.54)	(-0.46)	(5.13)	(0.44)
$Reform \times Post$	-0.04	-16.52**	-0.16**	-0.17**	0.01
	(-1.10)	(-2.82)	(-2.74)	(-2.62)	(0.34)
Observations	2,513	2,073	2,038	2,073	2,073
R-squared	0.27	0.26	0.49	0.43	0.31
Year FE	YES	YES	YES	YES	YES
Inventor FE	YES	YES	YES	YES	YES

Table A11 – Maternity benefits reform 2007 - wages and earnings
This Table reports the results of equation 3. The sample is on an inventor-year level and only includes mothers. *Post* is a dummy variable equal to one in years after giving birth. $Benefit$ is a dummy variable equal to one if the child is born on or after January 1st 2007. Sample refers to how treatment and control inventors are defined. The sample is constrained to mothers who have their first child between June 1st 2006 and June 30th 2007. Variable definitions are provided in the Appendix. All regressions include Inventor, and Year fixed effects. Standard errors are clustered by Inventor. *t*-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

Dependent variable:	Earnings	Wage
	(1)	(2)
Post	-16,266.08***	-15.98**
	(-12.73)	(-2.64)
$Reform \times Post$	263.21	-11.98
	(0.13)	(-1.76)
Observations	2,073	1,497
R-squared	0.59	0.63
Year FE	YES	YES
Inventor FE	YES	YES

Table A12 – Wages and motherhood

This Table reports the results of equation 2. The sample is on an inventor-year level. The dependent variable is the daily wage in Euros. The independent variable is the treatment indicator *Mother* which is interacted with four time dummies as follows. A *Before* dummy, equal to one in the years t-5 to t-2. A *Birthyear* dummy, equal to one in the year of birth. A *Short-Term* dummy equal to one for the years t to t+3. Lastly, a *Long-Term* dummy equal to one for the years after t+3. Variable definitions are provided in the Appendix. All regressions include Year fixed effects and other fixed effects as indicated. Standard errors are clustered by Inventor. *t*-statistics are displayed in parenthesis. ***, ** and * represents significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Mother × Before	-3.171***	-0.39	-0.29	-0.24
	(-6.69)	(-0.85)	(-0.63)	(-0.51)
Mother × Birthyear	-40.16***	-40.11***	-31.76***	-31.79***
	(-22.72)	(-21.96)	(-14.64)	(-14.65)
Mother × Short-Term	-57.14***	-57.28***	-54.72***	-54.68***
	(-34.83)	(-32.80)	(-31.02)	(-31.02)
Mother × Long-Term	-47.01***	-40.99***	-39.53***	-39.40***
	(-25.95)	(-21.24)	(-20.88)	(-20.85)
Days Employed		0.11***	0.11***	0.11***
		(9.10)	(9.09)	(9.10)
Log Tenure		-0.40	-0.44	-0.40
		(-1.55)	(-1.71)	(-1.55)
Cumulative Applications				0.17
				(1.37)
Cumulative Citations				0.01
				(0.14)
Observations	38,557	35,809	35,809	35,809
R-squared	0.64	0.67	0.67	0.67
Year FE	YES	YES	YES	YES
Inventor FE	YES	YES	YES	YES
Age FE	NO	YES	YES	YES
County FE	NO	YES	YES	YES
Occupation FE	NO	YES	YES	YES
Education FE	NO	YES	YES	YES
Industry FE	NO	YES	YES	YES
Technology FE	NO	YES	YES	YES