Paternity Leave and the Careers of Young Men*

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Abstract

Workers often fear that taking leave may harm their career progression and future earnings, despite their entitlement to a variety of statutory leave policies and job protections. In this paper, we ask whether and why such concerns may be justified, focusing on two main reasons: loss of human capital (direct effect) and losing out against non-taking co-workers in rank-order tournaments (competition effect). By exploiting a policy reform that exogenously assigned new fathers to four weeks of paternity leave based on child birth dates, we find a strong support for the competition effect but not the direct effect. When a larger share of one's competitors are induced to take leave, own earnings are put on a better trajectory than otherwise for up to ten years post-child birth. The competition effect we uncover suggests a possible role of mandated paternity leave in narrowing the male-female earnings gap post-child births.

Key words: parental leave, family leave, leave of absence, career costs, gender gap

JEL codes: M51, M52, J16, J22, J24, J31, J33

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1. Introduction

In advanced economies, workers are entitled to a variety of statutory leave policies such as maternity leave, paternity leave, family leave and sick leave. Despite guarantees of job protection and income replacement for the duration of leave, workers often fear that taking leave may harm their career and earnings in the future. Given that the frequency and duration of leave are skewed towards women in many settings, understanding the consequences of leave taking on the career of young workers seems of particular relevance for the current debate on gender earnings gap (Goldin 2014; Blau and Kahn 2017) and in particular on the "child penalty" (Bertrand et al. 2010; Angelov et al. 2016; Adda et al. 2017; Kleven et al. 2019a, 2019b).[1]

In this paper, we investigate whether and why the presence or absence from work – even if brief and temporary – may affect the future earnings of workers, by focusing on the case of male workers and four weeks of fully paid paternity leave in Norway. Leave of absence may harm career development either directly or via competition among co-workers. The direct effect reflects loss of human capital and productive skills due to the leave itself (Mincer and Polachek 1974; Mincer and Ofek 1982). If pay reflects own absolute output, then lowered productivity should translate into lower future earnings. However, if compensation is based on relative (versus absolute) output as in rank-order tournaments (Lazear and Rosen 1981), then leave-taking may lower the chances of winning the contest even in the absence of a direct effect. Imagine, for instance, that projects, opportunities, and promotable tasks arise randomly and with a certain frequency over time. Then, a contestant who is present throughout is more likely to

[1] The divergent earnings paths of male and female workers in periods post-child birth are often referred to as the "child penalty" in this literature.

achieve a higher output and hence win the tournament than another contestant who is absent for part of the time. This is the competition effect.

Causally identifying the direct and competition effects in observed data is challenging, primarily due to worker sorting into leave-taking versus non-taking. For instance, less productive workers may select into more frequent or longer leave than others due to their low earnings and low opportunity cost of leave (Polachek 1981; Gronau 1988; Adda et al. 2017). Moreover, in situations where asymmetric information issue is prevalent, high productivity workers may engage in the costly action of foregoing paid leave to signal their commitment to the labor market.[2] In both examples, lower observed earnings of leave-takers relative to non-takers will be due to self-selection and the *correlation* between worker productivity and pay, rather than a consequence of leave *per se*.[3]

To isolate the competition effect, we propose a novel identification strategy taking advantage of a 1993 policy reform in Norway that provides four weeks of fully paid – by the social insurance system and not by the individual firms – paternity leave for fathers of children born on or after April 1, 1993.[4] Importantly, these four weeks are reserved for fathers only, and unused portions cannot be transferred to the mother of the child.[5]

[2] For instance, Tô (2018) presents a compelling case in Denmark where female workers of a high type (i.e, more committed to the labor market) choose to take shorter maternity leave than the statutory maximum to separate themselves from workers of a low type who exhaust the maximum leave allowance. Albrecht et al. (1999) also invoke a signalling story when discussing their findings from Sweden that different types of time out (e.g., parental leave, household time, unemployment, etc.) have different effects on wages and that these effects vary by gender, which cannot be explained by human capital depreciation alone.
[3] Note that in signalling models, *correlation* (as opposed to causation) between types, actions, and outcomes is precisely what the theory predicts and what researchers should look for.
[4] See Rege and Solli (2013), Dahl et al. (2014), and Cools et al. (2015) for prior research that exploited this policy reform.
[5] Prior to the 1993 reform, if the father did not use any of the shared parental leave, then the mother could use it, so the father's not taking any paternity leave did not imply a wasted leave (i.e., money on the table) at the household level. The newly introduced four weeks reserved for fathers come on top of the existing amount of shared leave, which the couple could share in any way they wish both before and after the 1993 reform.

As a consequence, the share of fathers taking paternity leave increased suddenly and dramatically after the policy cutoff date, as illustrated in Figure 1.

Our identification strategy exogenously moves contestants (say, a "focal father" and his "competitors" inside a firm) up and down the ranking, not via own leave-taking but through competitors' leave-taking induced by the 1993 reform. In our analysis, focal fathers are defined as male workers having a first child during a window spanning nine months before and after the policy cutoff date (April 1, 1993). For each focal father, we identify a set of relevant competitors, defined as male workers in the same plant having similar age and education as the focal father. For each focal father, we then count what share of his competitors are eligible for the paid paternity leave quota (i.e., child birth date being after the policy cutoff date), which is arguably exogenous to the focal father but correlates with the share of competitors taking leave.[6] Therefore, by comparing the career trajectories (-3 to 10 years since child birth) of focal fathers who are exposed to a high versus low share of competitor births being eligible for the paternity leave quota, we can identify the competition effect of paternity leave in a difference-in-differences (DiD) framework. Since our strategy does *not* rely on varying own leave (or eligibility) status, what we isolate here is indeed the competition effect, rather than a combination of the direct and competition effects.[7]

Consistent with the competition effect, we find that – holding own child birth dates fixed – when a larger share of one's competitors are eligible for the paid paternity leave quota, own earnings are put on a better trajectory than otherwise. Our reduced-form

[6] As Figure 3 shows, the competitor share eligible for the paternity leave quota has a strong predictive power for the competitor share actually taking leave, which will be the basis of our IV analysis.

[7] In our design, we hold fixed focal fathers' own eligibility status and exogenously vary their competitors' eligibility status. In contrast, in designs that exploit an exogenous shift in focal fathers' *own* eligibility status, both the direct and competition effects are induced. Such designs therefore will recover the pure direct effect only in special cases where the rank or competition effect is inoperative, as we consider below.

estimates show that when all of the competitor births are eligible for the paid paternity leave quota, a focal father earns on average a 2-3 percent higher income *annually* in the seven years following child birth compared to the counterfactual where none of the competitor births are eligible. These effects are stronger when the competition group is small in size relative to the number of births so that the contest among birth fathers is more salient.

We next turn to the direct effect from leave taking. Our goal is to understand whether (exogenous) leave taking – and being absent from work for four weeks – *causes* a focal father to become less productive than otherwise in absolute terms. We limit this exercise to two sets of focal fathers for whom the competition effect (between birth fathers) is likely to be important. The first is focal fathers who happen to be the only contestants having a child in their respective competition groups during our observation window (unique birth sample). The second is focal fathers who – while facing non-zero competitor births – happen to have symmetric eligibility status as their competitors (symmetric rank sample). In both samples, we do not find any significant negative effect of own leave taking (induced by the 1993 reform) on own earnings post-child births. This is consistent with prior research showing little direct effect of own leave taking in a sample similar to our unique birth sample above and based on a regression discontinuity design (Dahl et al. 2014).

Overall, our results indicate that leave of absence – four weeks of paternity leave in this context – *does* matter for the career of young workers. However, it is not because workers become, in absolute terms, less productive due to the leave but because leave-takers lose out in the relative comparison against non-takers as in rank-order tournaments (Lazear and Rosen 1981). A remaining question then is why the relative presence or absence of contestants matters. One explanation is competition on opportunities: A present contestant can join projects randomly arising inside the firm at that particular moment whereas an absent contestant cannot. Even if the two contestants are identical in skills, the contestant involved in the project will contribute more to the firm's output relative to the other contestant. An alternative explanation is incomplete information (Farber and Gibbons 1996; Altonji and Pierret 2001; Kahn and Lange 2014). For instance, the employer has more chances to learn about the worker or the match quality when present than when absent. While the competition effect we find is compatible with both competition on opportunities and employer learning, the pattern we find in the data is more consistent with the former. In particular, the competition effect persists in situations where there is little scope for additional learning about employee productivity. The competition effect is not diminishing in the tenure of the focal worker and is stronger in competition groups of smaller size, where the employer should have more knowledge about each contestant to begin with.

By cleanly identifying the competition effect of parental leave in male-to-male contests, our analysis isolates an important channel how leave taking affects workers' careers. When applied to a broader context, the competition effect we uncover here may provide a clue to why in the current state of the world – where child or family related leave is heavily skewed towards women – the earnings paths of women and men may diverge especially after child births (Bertrand et al. 2010; Angelov et al. 2016; Adda et al. 2017; Kleven et al. 2019a, 2019b).

We also speak to the literature linking parental leave policies to women's labor market outcomes (see e.g., Baker and Milligan 2008; Lalive and Zweimueller 2009; Lalive et al. 2013; Schönberg and Ludsteck 2014; Dahl et al. 2016).[8] Focusing on maternity leave

[8] See Olivetti and Petrongolo (2017) for an overview and Waldfogel (1998) for discussion on child penalty in particular. Also see Ruhm (1998) for cross-country evidence on parental leave and women's labor market outcomes.

legislation, this literature tends to find that each expansion in paid leave increases mothers' time spent at home and delays women's return to employment, with mixed findings on earnings or income.[9] However, these are results based on a comparison among (treated and non-treated) *mothers*, who are subject to different leave duration. Therefore, the existing studies can tell us little about the impact of gender asymmetry in leave taking on the gender pay gap conditional on employment. Our analysis suggests that in workplaces where workers are subject to implicit or explicit rank-order tournaments for promotion, retention, and pay rises (Lazear and Shaw 2007), a female worker with children, who by default takes maternity leave, will likely lose out against non-taking, and identically skilled (male and female) colleagues, resulting in a relatively low pay.

2. The Paternity Leave Reform and Theoretical Framework

2.1 The paternity leave reform in 1993

The universal Norwegian parental leave scheme offers employment protection and income replacement. It is part of the broader Social Security System financed through worker and firm taxes. Prior to the 1993 reform we make use of in our research design, the paid parental leave period consisted of 35 weeks, eight of which were reserved for the mother. Parents could share the remaining 27 weeks between them as desired, but only three percent of fathers took any leave prior to the reform.

Because of the low take-up of paid paternity leave among fathers, the Norwegian government implemented a paternity leave quota on April 1, 1993 with the explicit aim

[9] There is also a separate literature assessing the causal effect of parental leave reforms on children's outcomes, see e.g., Liu and Skans (2010); Rasmussen (2010); Dustmann and Schönberg (2012); Carneiro et al. (2015).

to promote gender equality in the use of paid parental leave. The reform expanded the paid parental leave period to 42 weeks and reserved four weeks of the leave specifically for the father.[10] The reserved four weeks could not be transferred to the mother and would be lost to the family if the father did not use them. The reform was announced in October 1992 and passed in parliament in December 1992.

The income replacement rate in the paid parental leave scheme is 100 percent, up to a cap. The income cap is non-binding for most parents and all public and most private employers compensate for income above the cap. The law states that the firm cannot dismiss the worker while he is on parental leave.

2.2 Rank-order tournaments and the implications of the reform

We present a simple and stylized model of a 2-player contest where each person chooses whether to take paternity leave or not. The objective of each player is to maximize individual utility, which consists of utility at home and wages at work (determined via rank-order tournaments). Paternity leave affects both components of the individual utility. An equilibrium is a pair of actions chosen by the two players from which neither has an incentive to deviate.

We use this model to illustrate how the 1993 reform (i.e., introduction of paid paternity leave quota) shifts the *equilibrium* in a contest. In particular, analysis of the policy's impact entails comparison of equilibria *across* games.[11] Specifically, depending on either worker's child birth date relative to the policy cutoff date, the contest may fall into four different games or scenarios: (Ineligible, Ineligible), (Ineligible, Eligible),

[10] The leave reserved for the mother also expanded from eight to nine weeks.

[11] This is different from analysis of a single person's response to a policy change in the absence of strategic interactions. Strategic interactions arise in our model because wages at work are determined by rank-order tournaments.

(Eligible, Ineligible), and (Eligible, Eligible). We will first characterize the equilibrium of each of these scenarios, and then compare the equilibria across scenarios. The empirical analogue of the "shifting equilibria between scenarios" is our instrumental variables (IV) strategy (see Section 3.2) where we evaluate focal fathers' outcomes by exogenously shifting their competitors' leave status via competitors' eligibility for the paternity leave quota.

We consider two workers, worker i and worker j, who just fathered a child with identical abilities and preferences. Each worker tries to maximize his individual utility through an optimal choice regarding paternity leave. Each worker's utility consists of two components, utility at home and wages at work (which is determined through rank-order tournaments), as described below.

Utility at home. For each child, normalize the shared parental leave at unity. Let $\rho \in (0,1]$ be the length of paternity leave specified in the new, paternity leave quota policy, say four weeks.

For a father who has a child prior to the policy cutoff date and hence is ineligible for the new paternity leave quota, utility at home looks as follows:

$$B^N = \begin{cases} \rho b^m + (1-\rho) b^f & \text{if take paternity leave,} \\ b^f & \text{if not taking paternity leave.} \end{cases}$$

where b^m is the non-pecuniary benefit (e.g., child welfare) generated when the father spends one unit of time with the child, and b^f is that for when the mother spends one unit of time with the child. In the status quo, if the father takes a leave for duration ρ, that eats into the leave available to the mother. For simplicity, assume that $b^f > b^m$.[12]

[12] This assumption is not crucial. It is to ensure that no father takes paternity leave prior to the introduction of the new policy, which is consistent with the empirical evidence (less than 3 percent of men taking paternity leave prior to 1993), and to simply our analysis.

For a worker who has a child after the policy cutoff date and hence is eligible for the paid paternity leave quota, utility at home is:

$$B^Y = \begin{cases} \rho b^m + b^f & \text{if take paternity leave,} \\ b^f & \text{if not taking paternity leave.} \end{cases}$$

Since the new paternity leave quota of ρ comes on top of the existing shared leave (of length 1), the father's leave taking no longer shortens the leave available for the mother.

Wages at work. Wages at work are determined by rank-order tournaments (Lazear and Rosen 1981). Different from Lazear and Rosen (1981), worker's choice variable here is binary (take paternity leave or not). Worker ranks are determined by their (broadly construed) output, and whoever produces more output is ranked higher. The wage for the higher ranked person is W_1 whereas that for the lower ranked person is $W_2 (< W_1)$. Assume that $W_1 - W_2 < 2b^m$.[13]

Worker output has some stochastic element. But the worker can increase the chances of drawing a high output by being present rather than being absent. Specifically, assume that each worker's output is i.i.d. and drawn from the following distributions:

$$y \sim \begin{cases} N\big((1-\rho)\mu, \sigma^2\big) & \text{if taking paternity leave,} \\ N(\mu, \sigma^2) & \text{if not taking paternity leave.} \end{cases}$$

where $N(m, s)$ denotes a normal distribution with mean m and variance s. This is to capture the notion that present workers have greater chances to encounter projects, opportunities, and promotable tasks unpredictably arising inside the firm than workers who are absent for ρ share of the time.

[13] This assumption ensures a unique equilibrium in each scenario below, which greatly simplifies our analysis of the policy's impact. Otherwise, we have to compare each of the multiple equilibria across scenarios, which is cumbersome without adding any additional insights.

In this contest, worker i wins the tournament (i.e., worker i's output is higher than worker j's) with the probability $P(y_i > y_j) = P(y_j - y_i < 0) = P(\xi < 0)$, where $\xi \equiv y_j - y_i$. Given the distributions of y_i and y_j, we know that ξ is normally distributed as:

$$\xi \sim \begin{cases} N(0, 2\sigma^2) & \text{if neither takes leave,} \\ N(-\rho\mu, 2\sigma^2) & \text{if } j \text{ takes leave but } i \text{ does not,} \\ N(0, 2\sigma^2) & \text{if both take leave.} \end{cases}$$

Then, $P(y_i > y_j)$ can be simplified to

$$P(y_i > y_j) = \begin{cases} 1/2 & \text{if neither takes leave,} \\ P\ (> 1/2) & \text{if } j \text{ takes leave but } i \text{ does not,} \\ 1/2 & \text{if both take leave,} \end{cases}$$

where $P \equiv P(\xi' < 0)$ when $\xi' \sim N(-\rho\mu, 2\sigma^2)$. Because of symmetry between the two workers, we also know that $P(y_i > y_j) = 1 - P$ if worker i takes leave but worker j does not.

Worker payoffs and the Nash equilibria. For ease of exposition, set $\rho = 1$ from here on.[14] We also use the following abbreviations: [15]

$$\begin{aligned} W &\equiv (1/2)W_1 + (1/2)W_2, \\ W_H &\equiv PW_1 + (1-P)W_2, \\ W_L &\equiv (1-P)W_1 + PW_2. \end{aligned}$$

For each scenario of policy eligibility, the expected payoffs of worker i (row player) and worker j (column player) are then summarized in Figure 2.[16] In each contest, the Nash equilibria are marked in bold.

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[14] Otherwise, ρ will appear much in our payoff matrices in Figure 2, from which we do not gain any substantive insights since our goal here is to analyze the impact of the 1993 policy on equilibrium outcomes rather than to determine the optimal length of the paid paternity leave quota.

[15] We know that $W_L < W < W_H$ because $W_1 > W_2$ and $P > 1/2$. It should also be the case that $W_H + W_L = W_1 + W_2 = 2W$ and $W - W_L = W_H - W$.

[16] Since the two workers are identical, the outcomes of (Ineligible,Eligible) and (Eligible,Ineligible) should be symmetric, so we do not include the scenario (Eligible,Ineligible) in the figure.

Policy eligibility of contestants and equilibrium shifts. We are now ready to analyze the implications of the 1993 policy on workers' leave taking and their labor market outcomes. Consider a thought experiment where we exogenously shift the contest that workers i and j are in from (Ineligible, Ineligible) to (Ineligible, Eligible). That is, we fix worker i's status and exogenously shift worker j's status from Ineligible to Eligible. In this case, worker i's expected wage at work increases from W to W_H (compare the Nash equilibrium in panel (a) with that in panel (b) in Figure 2, paying attention to the row player's *expected wage at work*).

Similarly, consider another experiment where we exogenously shift the contest that workers i and j are in from (Ineligible, Eligible) to (Eligible, Eligible). That is, we fix worker j's status and exogenously shift worker i's status from Ineligible to Eligible. In this case, worker j's expected wage increases from W_L to W (compare the Nash equilibrium in panel (b) with that in panel (c) in Figure 2, paying attention to the column player's *expected wage at work*).

That is, holding fixed own eligibility status (either at Ineligible or Eligible), a given worker (say, "focal father") will have a higher expected wage when his competitor is induced to take leave for reasons exogenous to the focal father. This will be the theoretical basis of our identification strategy discussed in Section 3.

3. Empirical strategy

3.1 The sample

We combine several administrative registers provided by Statistics Norway and covering the full Norwegian population. The registers are linked through unique individual identifiers. The birth register provides information on gender and month of birth and links each individual birth to a mother and father identifier. Other registers further provide yearly information on marital status, educational attainment, and income from 1967 onwards. Matched employer-employee registers provide data on firm size, industry, etc. from 1986 onwards, allowing us to match each worker to all his colleagues in the firm. Social security registers provide information on take-up of parental leave from 1992 onwards.

We restrict attention to men who fathered their first child in the 18 months around the reform cutoff date of April 1, 1993 (i.e., 1 July 1992 to 31 December 1993). Focal fathers are restricted to have stable employment in the firm, defined as working in the same firm in the year before birth, the year of birth, and the year after. We drop focal fathers who had twins or multiple births in the 18 months period around the reform and keep focal fathers aged within p10 and p90 of the age distribution. To investigate the career development of the focal fathers, we track log income of focal fathers from three years prior to ten years after the birth of their first-born child. We restrict attention to focal fathers with some minimum level of labor market attachment by requiring income to be above one social security basic amount (1G) in each period. For the pre-birth years, this also proxies for the individual eligibility criteria for paid paternity leave (Dahl et al., 2014).

For each focal father, we define his competitors as workers who work in the same firm as him during years 1992 and 1993, the calendar years corresponding to our observation window. To capture relevant competitors, we further define competitors as male workers of similar age to the focal father (+/- five years) with the same education level as the focal father. We also restrict the sample to focal fathers with at least one competitor having a child within the 18 months window around the reform. We drop focal fathers and competitors where at least one contestant had twins or multiple children within the 18 months window around the reform.

Table 1 shows the baseline characteristics of the focal fathers in our sample as measured in the year of child birth, separately by high versus low share of competitor births occurring after the policy cutoff date. Baseline characteristics of focal fathers are balanced in the two cases.

3.2 Identification strategy

To isolate the competition effect of paternity leave, we need exogenous variation in the leave status among contestants. As illustrated in Section 2, our identification strategy relies on exogenously shifting the contest from (a) to (b), or from (b) to (c) in Figure 2, where we hold fixed own eligibility status and only vary his competitor's eligibility for the paid paternity leave quota. Empirically, we aim to achieve this by exploiting the composition of child birth dates (before or after the policy cutoff date) among the competitors of each focal father.

We focus a symmetric window of nine months on either side of the reform cutoff date (April 1, 1993). For each focal father, there are a set of competitors, some of whom will have a child birth within our observation window. Crucially, whether a high versus low share of their competitors' births fall within the latter half of the observation window is arguably exogenous to the focal father.[17] Therefore, by comparing the career trajectories (-3 to 10 years since child birth) of focal fathers who are exposed to a high versus low share of competitor births being eligible for the new policy, we can identify

[17] The observable characteristics of focal fathers with high versus low shares of competitor eligibility are balanced (Table 1). Moreover, in Figure 4 and 5 also show that the pre-birth trends of log income between the two groups of focal fathers are comparable.

the competition effect of paternity leave on focal fathers in a difference-in-differences (DiD) framework.

Specifically, in a sample of focal fathers, we estimate the following DiD equation:

$$(1) \quad y_{it} = \phi_i + \psi_{\tau(it)} + \sum_{\tau=-3}^{10} \beta_\tau I(it = \tau) \times C_i + \boldsymbol{G}_{it}\lambda + u_{it},$$

where y_{it} is the log income of focal father i in year t. The event year, or year-since-birth (YSB), is denoted by τ, where the year of child birth is designated as zero. The variable C_i measures the share of i's competitors taking paternity leave (conditional on having a child).

Conditioning on individual fixed effects (ϕ_i) and YSB fixed effects ($\psi_{\tau(it)}$), we estimate the evolution of focal father's income after child birth depending on the leave status of their competitors. We normalize the income just before child birth ($\tau = -1$) at zero throughout. Equation (1) corresponds to an event study, which also allows us to compare the pre-trends prior to child births. The vector $\boldsymbol{G}_{it}$ includes additional controls that varies at the worker-year level such as cubic in age.

We also estimate a variant of (1), where we collapse the β_τ's for all the post-birth periods and estimate a single parameter β:

$$(2) \quad y_{it} = \phi_i + \psi_{\tau(it)} + \beta Post_{\tau(it)} \times C_i + \boldsymbol{G}_{it}\lambda + u_{it},$$

where $Post_{\tau(it)}$ indicates whether the period is in the year of or after the child birth ($\tau \geq 0$).

We estimate equation (2) by OLS and then by IV, where we instrument C_i (share of competitors taking paternity leave) by S_i (share of competitors eligible for the new paternity leave quota). As shown in Figure 3, S_i (share of competitors eligible for the paternity leave quota) has a strong predictive power for C_i (share of competitors taking paternity leave), which is anticipated by the discrete jump around the policy cutoff date in Figure 1. There are two key differences between OLS and IV estimates: (i) OLS uses the variation in C_i which is driven by both choice (of competitors) and policy whereas IV uses only the policy driven variation in C_i; and (ii) OLS concerns the average focal father in the sample whereas IV is based on the marginal focal father whose C_i is shifted by S_i.

Our research design has a clear advantage in isolating the competition effect of leave. In particular, we hold fixed focal fathers' own eligibility status and exogenously vary their *competitors'* eligibility status. In contrast, in designs that exploit an exogenous shift in focal fathers' *own* eligibility status, both the direct and competition effects are induced and a combined effect of the two will be identified.

4. The Career Costs of Leave Taking

4.1 The competition effect

Baseline effects. Our empirical strategy compares the evolution of log income between focal fathers who are exposed to high versus low shares of (policy-induced) competitor leave. As Table 1 shows, focal fathers in these two groups are similar in terms of baseline (year of child birth) characteristics. Moreover, the raw trends in log income prior to birth are highly comparable between the two groups of focal fathers prior to child birth (Figure 4), before diverging in the periods after child birth. We explore this more systematically through a regression analysis.

We first estimate equation (1) covering the year-since-child birth (YSB) or event year of τ from -3 to 10, in a reduced-form regression where C_i (share of competitors taking paternity leave) is replaced with S_i (share of competitors eligible for the paternity leave quota). The estimated coefficients of this event study regression are plotted in

Figure 5. As shown, the focal fathers with a larger share of competitor births being eligible are put on a better income trajectory and only in the post-child periods.[18]

To facilitate subsequent discussions, we now estimate equation (2), focusing on the event years, -3 to 7. The coefficient β will thus show the average effect for up to 7 years after child birth.[19] Panel A of Table 2 shows the results of the OLS, reduced-form, and IV estimates in our baseline sample. The OLS estimate (columns 1 and 2) show that focal fathers have a higher income in post-birth periods if a larger share of their competitors take paternity leave than otherwise. Here, the competitors' leave taking may be endogenous to the focal father or group characteristics.

In contrast, the reduced-form estimates (columns 3 and 4) exploit variation in competitor eligibility to the 1993 paternity leave quota (which is arguably exogenous to the focal father), and hence shows the intention-to-treat (ITT) effect of competitor eligibility on focal fathers. Our reduced-form estimates show that when all of the competitor births are eligible for the paid paternity leave quota, a focal father earns on average 2-3 percent higher income *annually* in the seven years after child birth compared to the counterfactual where none of the competitor births are eligible.

The corresponding IV estimates are presented in columns 5 and 6. The IV estimates show the local average treatment effect (LATE) of being exposed to a larger share of competitor leave than otherwise *because of* the 1993 paternity leave quota policy. Unlike the ITT effect, the IV estimates captures the LATE among focal fathers in contests

[18] During the period of leave, our identification strategy could capture both interactions in production between focal fathers and leave-takers, and the competition effect. For example, if production features diminishing marginal product of labor, then leave taking by one worker could raise the wages of competitors, even with no competition effects. However, we find the wage impacts from competitors' leave are most significant after the leave period, which suggests these forms of production interactions are not particularly strong.

[19] The choice of up to 7 years here is arbitrary. For short term, we could look at the average effect up to 3 years, and for long term we could look at the average effect up to 10 years, etc. The year-specific coefficients are shown in Figure 5.

where the share of competitors eligible for the paid paternity leave quota (S_i) *does* affect the share of competitors taking leave (C_i). To shed light on who this applies to among the focal fathers, we compare the characteristics of focal fathers with low (C_i below median) versus high (C_i equal to or above median) shares of competitor leave in a sample where the competitor eligibility share is relatively high ($S_i \geq 0.5$).[20] The sample with a high values of C_i can be thought of as "compliers" in binary treatment settings. Note that the "compliers" here refer to the focal fathers in contests where the instrument has more bite. Table 3 shows that although the characteristics of focal fathers with low C_i versus high C_i are largely similar, there are some dimensions along which the "compliers" differ from the "non-compliers". In particular, the compliers are more educated, and more likely to be in public sector and in larger firms, than non-compliers. Moreover, the former are less likely to be in construction and more likely to be in finance.

Therefore, our IV estimates reveal the LATE among focal fathers with the above mentioned characteristics for whom exposure to C_i (competitor leave) is exogenously shifted by S_i (competitor eligibility to the paternity leave quota policy). The difference between the IV (-0.06) and OLS (-0.02) coefficients results from two factors: (i) OLS uses the variation in C_i which is driven by both choice (of competitors) and policy whereas IV uses only the policy driven variation in C_i and (ii) OLS concerns the average focal father in the sample whereas IV is based on the marginal focal father whose C_i is shifted by S_i.

By choice of our observation window (symmetric around the policy cutoff date), about a half of our focal fathers have a child before the cutoff date and hence are ineligible and about a half of them have a child after the cutoff and hence are eligible. Since our

[20] If we had restricted our sample to the special case where each focal father has just one competitor (and hence C would be binary instead of being continuous as here), the exercise here would boil down to the comparison of focal fathers with C=0 versus C=1 conditional on S=1. In our current sample where C and S are continuous, to be more systematic, we could compare low versus high C samples within a more narrowly defined intervals of S than here.

empirical strategy relies on shifting the focal fathers' competitors in and out of leave taking (through the policy) while holding fixed the focal fathers' own leave or eligibility status, the competition effect shouldn't depend on the focal fathers' own leave status. To check this, we split the sample into ineligible and eligible focal fathers and re-estimate equation (2). As shown in Panels B and C of Table 2, we find that the effects are quite similar to that found in the overall sample though less precise. This reinforces our design where we exogenously change relative absence/presence situation of the focal father and his competitors, by exogenously shifting his competitors' leave taking, and not his own. Moreover, the fact that the competition effects estimated among ineligible focal fathers (Panel B) are similar to that among eligible focal fathers (Panel C) suggests that focal father's own human capital appreciation/depreciation is unlikely to be important in determining his post-child earnings (which we investigate in Section 4.2).

Robustness. Next, we conduct several robustness checks for our main competition effect. Column 1 of Table 4 replicates our main reduced-form estimate (column 4 in Table 2). In column 2, we additionally include birth year-month specific linear trend in event time. This hardly affects our result, since our design exploits the child birth dates of competitors relative to the policy cutoff date, which are plausibly exogenous to the focal father. Therefore, possibly differential income trend by focal father's birth year-month should not affect our estimate of the competition effect stemming from competitors' leave eligibility. In column 3, we allow for linear trends in event time that differ by the number of competitor births in the group (1, 2, 3, 4, and 5+) as the number of births in itself may affect the performance or even survival of the firm. Our estimate is invariant to the inclusion of this control. So far, we have used a very demanding specification where we include individual fixed effects (see equation (2)). We now relax that and instead control for birth year-month fixed effects, where we allow for a common effect in each of the 18 birth months cells. As shown in column 4, doing so does not change our result much. Lastly, to address the concern about strategic timing of births, we exclude from our sample the contests in which any birth (to focal father or competitor) occurs either in March or April of 1993 (column 5). Although less precisely estimated, the competition effect is still present and is similar to that in our main sample.

Salience of paternity leave. The variation in C_i or S_i we use is the share of i's competitors taking paternity leave or being eligible for one, conditional on having births. We then focus on the competition effect of paternity leave between a focal father and his "birth competitors". For each focal father in our sample, we have about 30 competitors on average, out of which about five have a child. In this setting, we expect that the competition between a focal father and his birth competitors to be more important when birth competitors take up a larger share of the competition group. To examine this, we estimate equation (2) in separate samples of focal fathers based on the ratio total number of births (to focal father and to birth competitors) to the competition group size (focal father plus all his competitors) being above or below the median in the sample. The results are shown in columns 1 and 2 of Table 5. As expected, the competition effect is present where the competition among fathers is more important in determining the ranking among all competitors. Although we cannot identify it, suppose that having births in itself puts the fathers at the bottom of the rank relative to non-fathers. To the extent that the rank-order tournaments are about rewarding the high ranked persons than punishing the low ranked persons, then the competition between two birth fathers should matter less if there are a large number of non-fathers who are all ranked higher than these two.

We also investigate another type of heterogeneity, private versus public sectors. Due to different promotion and wage setting practices, rank-order tournaments operating via worker absence/presence is likely to be less important in the public sector. That is indeed what we find in the data (column 3 and 4 of Table 5).

4.2 The direct effect

The competition effect we document here hinges on a *relative comparison* between contestants where some of them are exogenously assigned to leave-taking because of the 1993 policy reform. Our next question is whether (exogenous) leave taking – and being absent from work for four weeks – *causes* a focal father to become less productive than otherwise in absolute terms. Unlike the competition effect above where we exploit the *competitors'* child birth dates – which are likely to be orthogonal to the focal father – here, we rely on the randomness of *own* child birth dates around the policy cutoff date. For this reason, we first consider the same window as in our analysis of the competition effect, and then restrict attention to focal fathers having a child within 3 months on either side of the policy cutoff date for robustness.

Unlike exogenous changes in *competitors'* leave, a shift in *own* leave – even if exogenously induced through a policy – activates both the direct and competition effects. Therefore, to not convolute the direct effect with the competition effect, we limit this exercise to two sets of focal fathers for whom the competition effect (between birth fathers) is less relevant. The first is focal fathers who happen to be the only contestants having a child in their respective competition groups during our observation window (unique birth sample). The second is focal fathers who – while facing non-zero competitor births – happen to have symmetric eligibility status as their competitors (symmetric rank sample). To eliminate possible rank effect between competitors without and with child births, we further restrict this sample to competition groups where the share of births among competitors is relatively high (above the median).

In Table 6, we estimate a variant of (2), where C_i (share of competitors taking leave) is replaced by D_i (indicator of own leave). We also instrument D_i by Z_i (indicator of whether own child birth is after the policy cutoff date). Columns 1 through 3 show estimates in the full window (9 months on either side of the cutoff) and columns 4 through 6 show estimates in a narrower window (3 months on either side of the cutoff).

Focusing on the reduced-form coefficients in both samples, we do not find any significant negative effect of own leave taking on own earnings post-child births. This is consistent with prior research showing little direct effect of own leave taking in a sample similar to our unique birth sample above and based on a regression discontinuity design (Dahl et al. 2014).[21] To some extent, it is anticipated as four weeks are a relatively short period to make worker skills obsolete. In this sense, our estimates of direct effect should not be extrapolated to situations where workers take much longer leave, such as maternity leave. In contrast, the competition effect is less subject to such concerns.

4.3 What's driving the competition effect?

Overall, our results indicate that (leave of) absence – four weeks of paternity leave in this context – *does* matter for the career of young workers. However, it is not because workers become, in absolute terms, less productive due to the leave but because leave-takers lose

[21] Note that in most designs that exploit an exogenous shift in focal fathers' *own* eligibility status, both the direct and competition effects are induced. Such designs therefore will recover a combination of the direct and competition effects, as opposed to the direct effect alone. In contrast, here we try to isolate the direct effect by focusing on two special cases where the rank or competition effect is less likely to be important. Nonetheless, our estimated effect may still pick up some competition effect, and in this respect it should be viewed as an upper bound – in absolute terms – on the direct effect.

out in the relative comparison against non-takers. A remaining question is why the relative presence or absence of contestants matters.

One explanation is competition on opportunities. For instance, there may be competition for *roles*, and/or competition for *tasks. C*ompetition for roles would involve competing over a promotion/different job role that arises during the leave period. Competition for tasks would involve competing over an allocation of quantity or quality of tasks, whereby performing those tasks improves the worker's human capital by a learning by doing process (Mincer 1974). Our findings that wage impacts are not immediate in the year of leave but instead grow over time suggests a more dynamic learning by doing process. An alternative explanation is incomplete information (Farber and Gibbons 1996; Altonji and Pierret 2001; Kahn and Lange 2014). For instance, the employer has more chances to learn about the worker or the match quality when present than when absent.

While the competition effect we find is compatible with both the competition on opportunities and incomplete information, we try – to the extent the data permits – to distinguish between these two channels. In particular, we estimate whether the competition effect varies by worker or competition group characteristics that make the information problem (between employer and worker) and the learning effect more or less important: tenure, age, and group size.

As Table 7 shows, the magnitude of competition effect does not become smaller as we look at workers with longer and longer tenure (in our baseline, workers have a minimum of 3 years' tenure due to the stable employment condition imposed). Moreover, the competition effect is also stable across worker ages and is not stronger for younger workers who likely have less labor market experience and hence carry shorter labor market records (Table 8).[22] Finally, we examine the role of competition group size with the idea that the manager or boss is less likely to be informed of worker skill levels in larger groups. To disentangle his group size effect from the number of birth effect, we restrict attention to competition groups with just two births (focal father and another competitor). As Table 9 shows, the competition effect is not stronger in larger competition groups.

Overall, the pattern we find in the data appears to be more consistent with competition on opportunities channel rather than the incomplete information channel. These effects may be reinforced if leave taking competitors remain more attached to their family (and less to the employer) than non-leave taking competitors, even after their leave has ended.

5. Broader Implications: Towards Gender Equality and the Case for Mandated Paternity Leave

So far we focused on isolating the causal effect of (leave of) absence in workplaces, pointing out the rank or competition effect as an important channel. The fact that we find the competition effect in a male-to-male comparison highlights that it is leave or absence *per se* that drives our results, and not the gender of the leave taker. When applied to a broader context, the competition effect we uncover here may provide one important clue to why in the current state of the world – where child or family related leave is heavily skewed towards women – the earnings paths of women and men may diverge especially

[22] Note that even in the "oldest" category, workers in our sample are still aged 35 or below (at the time of child birth).

after child births (Bertrand et al. 2010; Angelov et al. 2016; Adda et al. 2017; Kleven et al. 2019a, 2019b).

To shed light on this issue, we explore the implications of the 1993 paternity leave quota (and subsequent expansions on the leave duration) on "within-firm child penalty". We define within-firm child penalty as the difference in post-child income (relative to pre-child income) among male and female co-workers who have child births around the same time. We then examine whether the paid paternity leave quota may have impacted on reducing this penalty.

To construct the sample for the within-firm child penalty exercise, we make use of the administrative employer-employee registers covering the full population of Norwegian workers and link it to the birth register. We construct a quarterly measure of the penalty, focusing on the period 1990 to 2003 (The 1993 paternity leave quota applies from the second quarter of 1993). For each quarter q, we define the within-firm child penalty as the difference between the income growth of male and female co-workers who had a child in quarters $q-1$ to $q+1$. The within-firm child penalty is thus only observed for firms in which at least one male and one female employee had a child within the nine months moving window. We define income growth for each individual as the log income in year 7 after child birth minus the log income in the year before child birth. Therefore, our measure of within-firm child penalty of 30, for instance, means that a female worker's income progression from pre-child birth to seven years after child birth is 30 percentage point below that of a male worker in the same firm who had a child during the same nine months period.

The evolution of this penalty measure is plotted in Figure 6 (left axis). In the same figure, we overlay the evolution of paternity leave take up in the economy (right axis). There is a sign that the penalty is decreasing after the introduction of the paternity leave quota. However, this is merely correlation, based on two time-series. In Figure 7, we look at public and private sectors separately and find that the decrease in penalty is more pronounced in private sector as predicted by the competition effect we uncover in previous sections. As shown in Table 10, these patterns are confirmed in regression analysis where we examine whether the secular decline in child penalty is more pronounced in the private sector and only after the policy was introduced (Post = 1 if q is the second quarter of 1993 or after). The disproportionate decline (in the private sector) in the within-firm child penalty of 4 percentage point (column 1 of Table 10) amounts to about 13 percent of the pre-1993 level of within-firm child penalty. This suggests a possible role of mandated paternity leave in narrowing the male-female earnings gap post-child births, since the policy reduces the gender asymmetry in leave taking and limits the scope for the competition effect associated with leave within workplaces.

6. Conclusions

We explore the question whether and why leave of absence from work matters in determining workers' career trajectories, focusing on the competition effect where workers taking leave lose out against non-taking co-workers. To break the possible link between leave status and (observable and unobservable) determinants of worker productivity, we exploit a policy reform in Norway that provides four weeks of fully paid paternity leave for fathers of children born after a cutoff date together with the composition of child birth dates within pre-specified competition groups. We find that leave of absence – four weeks of paternity leave in this context – *does* matter for the career of young men. However, it is not because workers become, in absolute terms, less productive due to the leave but because leave-takers lose out in the competition against non-takers.

The small direct effect on productivity is not surprising in that the paternity leave in this context is just four weeks. For longer leaves, there may be direct consequences on workers' skills and human capital. The competition effect is consistent with the fact that in many organizations, workers are subject to a variety of implicit and explicit contests or tournaments (Lazear and Shaw 2007), where absent workers are likely to be disadvantaged relative to present workers even when identically skilled. The competition effect we uncover may therefore provide a clue to why in the current state of the world – where child or family related leave is heavily skewed towards women – the earnings paths of women and men may diverge especially after child births (Bertrand et al. 2010; Angelov et al. 2016; Adda et al. 2017; Kleven et al. 2019a, 2019b).

To limit the scope for the competition effect (with respect to statutory leave), breaking the gender asymmetry in leave taking seems important. Governments' mandating or strongly incentivizing paternity leave is one option. Some countries or regions have already moved in this direction, including Norway as examined here, Quebec (Patnaik 2018), Sweden (Ekberg et al. 2013; Avdic and Karimi 2018), and Spain (Farré and González 2019). Once leave taking among men becomes sufficiently common, the next generation of men will likely conform to the new norm, obviating the need for further monetary incentives (Dahl et al. 2014; Bertrand et al. 2015).

The findings here also have implications for firms' personnel and remuneration policies. Some firms or professions tend to disproportionately reward individuals working long hours or particular hours (Landers et al. 1996; Bertrand et al. 2010; Goldin 2014; Goldin and Katz 2016; Azmat and Ferrer 2017), which is a hindrance to women's progression in the labor market. Goldin (2014) stresses enhanced temporal flexibility in the labor market – through changes in how jobs are structured and remunerated – as a way forward to reach gender equality. We add to that by bringing to light one overlooked aspect of firms' personnel policies: the allocation of opportunities or promotable tasks between workers. If the allocation of tasks itself is biased – albeit inadvertently – in favor of present (versus absent) workers, even pay-for-performance compensation schemes (Lazear 2000; Lemieux et al. 2009) will not help close the gender pay gap in the present rates of leave taking among male and female workers.

Our discussion suggests that ultimately, effective parental and family leave policies at a legislative level are contingent on effective personnel and remuneration policies at the firm level, and vice versa, which opens exciting new avenues for future research.

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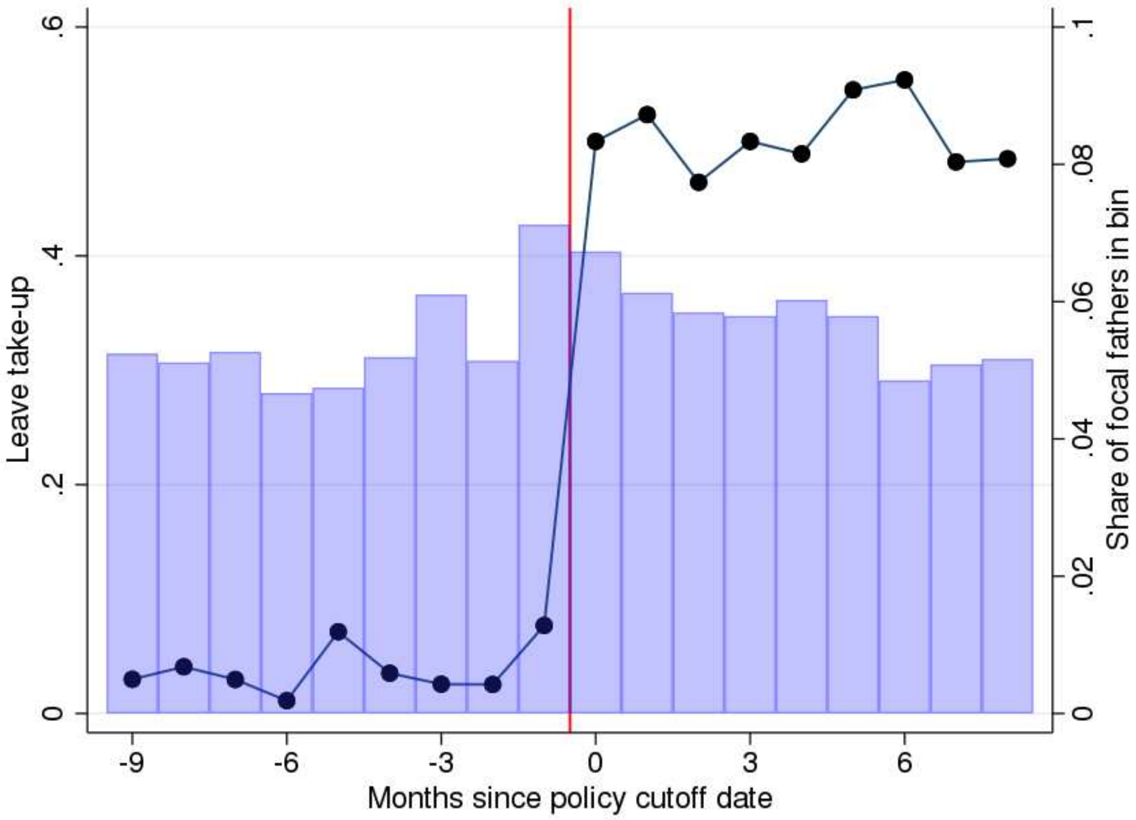
Figure 1: The 1993 policy (paid paternity leave quota) and leave take up by fathers



Notes: The connected circles (left axis) show the take-up of paid parental leave among first-time fathers in each month relative to month the paternity quota was introduced (April 1993 = 0). The bars (right axis) represent the share of focal fathers by birth month of their first child.

Figure 2: Equilibrium outcomes by own and competitor's eligibility for the paid paternity leave quota

(a) Scenario 1: (Ineligible, Ineligible)

		j	
		No leave	Leave
	No leave	$\boldsymbol{W + b^f, W + b^f}$	$W_H + b^f, W_L + b^m$
i	Leave	$W_L + b^m, W_H + b^f$	$W + b^m, W + b^m$

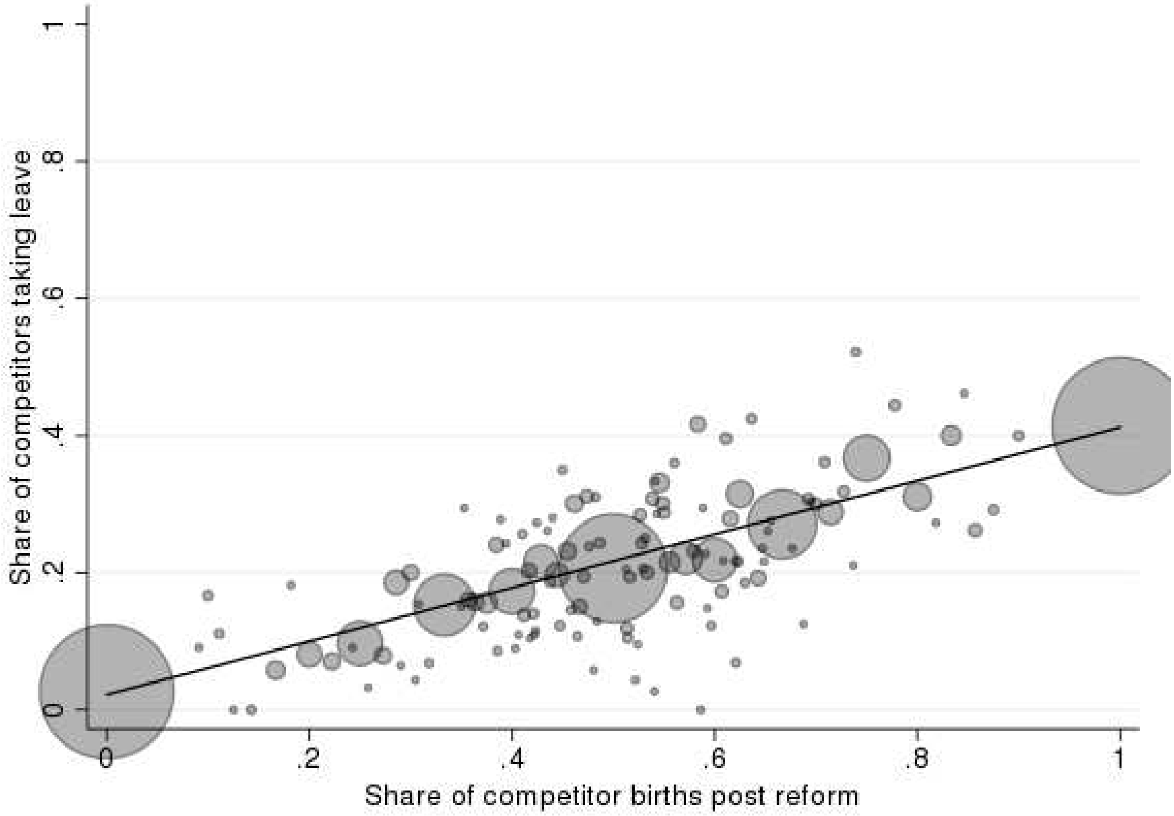
(b) Scenario 2: (Ineligible, Eligible)

		j	
		No leave	Leave
	No leave	$W + b^f, W + b^f$	$\boldsymbol{W_H + b^f, W_L + b^m + b^f}$
i	Leave	$W_L + b^m, W_H + b^f$	$W + b^m, W + b^m + b^f$

(c) Scenario 3: (Eligible, Eligible)

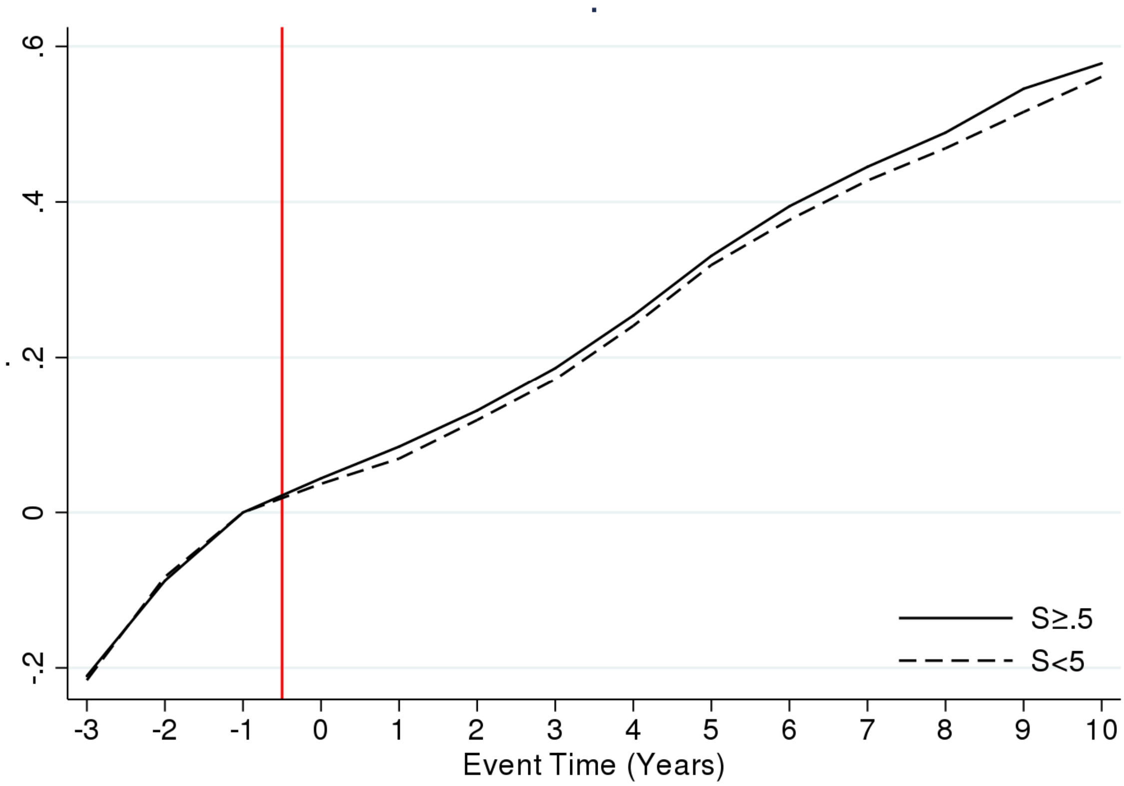
		j	
		No leave	Leave
	No leave	$W + b^f, W + b^f$	$W_H + b^f, W_L + b^m + b^f$
i	Leave	$W_L + b^m + b^f, W_H + b^f$	$\boldsymbol{W + b^m + b^f, W + b^m + b^f}$

Figure 3: Competitor eligibility and competitor leave taking



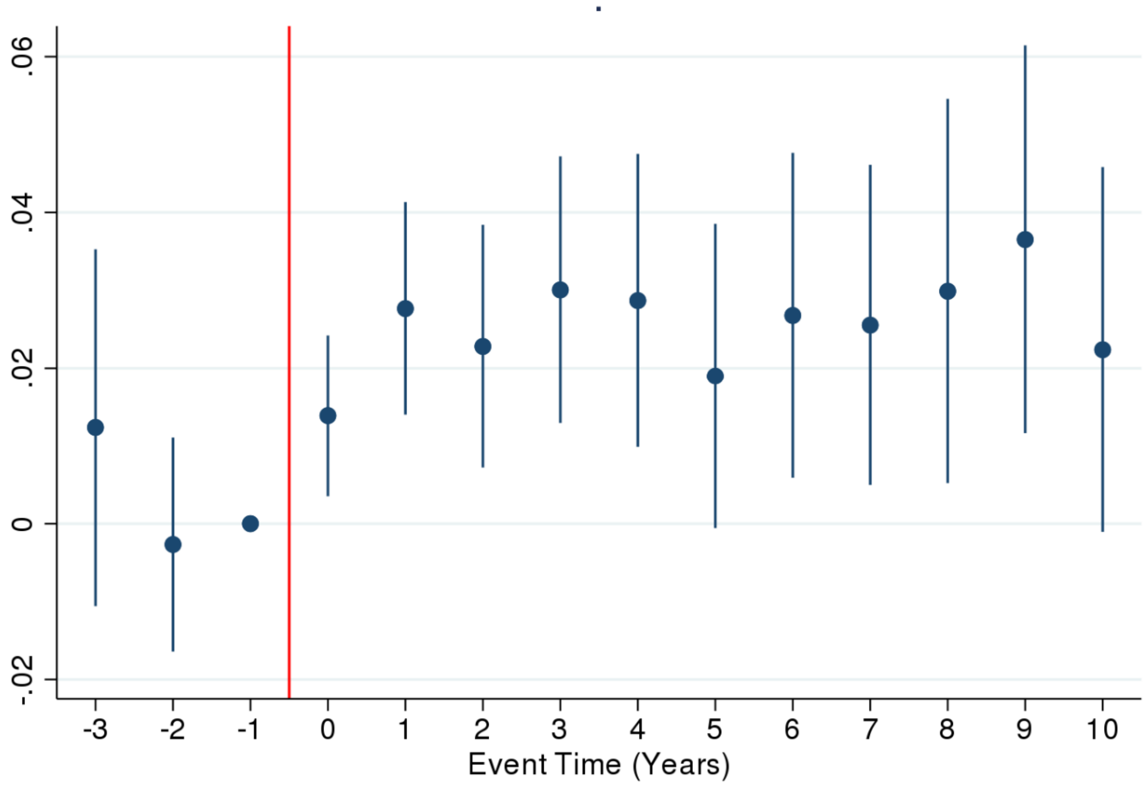
Notes: The figure shows the (weighted) relationship between the share of competitors eligible for the paid paternity leave quota and the share of competitors going on parental leave. The size of the circles represent the number of focal fathers with the given share of competitors eligible for the paid paternity leave quota. Regressing the share of competitors going on parental leave on the share of competitors eligible for the paid paternity leave quota gives a coefficient (SE) of .390 (012).

Figure 4: Log income of focal fathers with high versus low share of competitor births being eligible



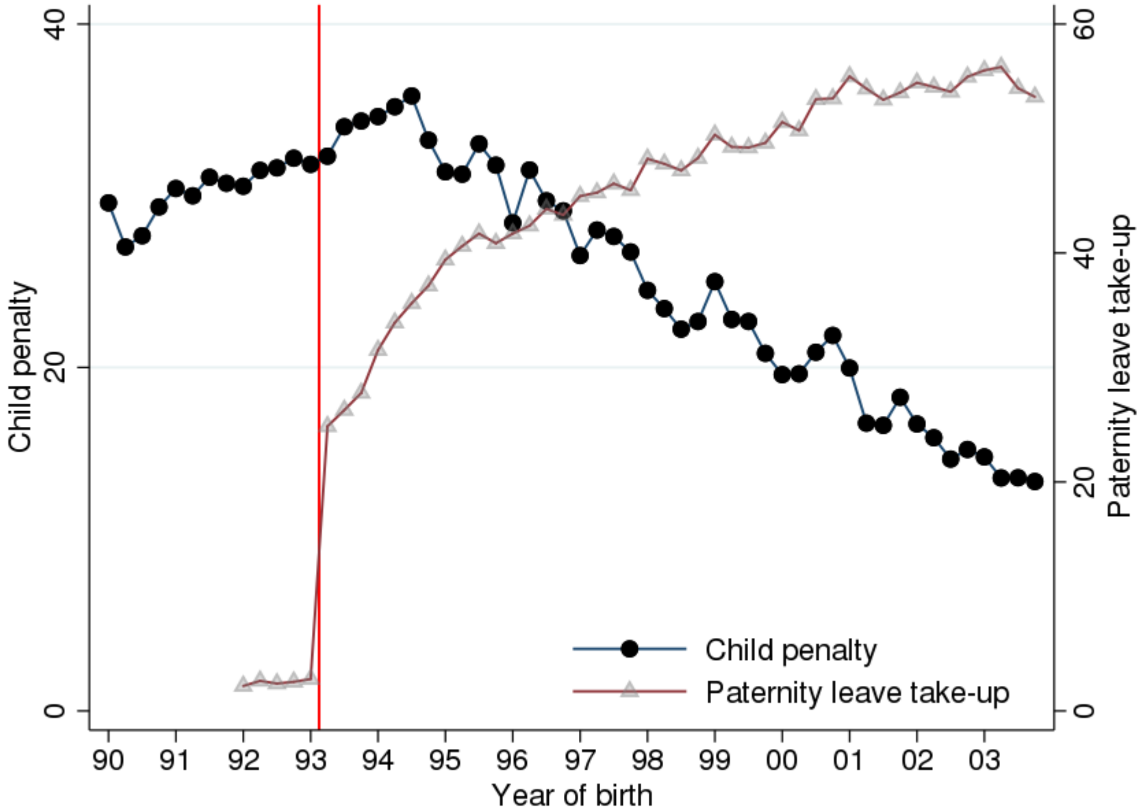
Notes: The figure displays log income for event time -3 to 10. The solid line represents focal fathers for whom the share of competitors eligible for the paid paternity leave quota was at least .5. The dashed line focal fathers for whom the share of competitors eligible for the paid paternity leave quota was less than .5.

Figure 5: Effects of competitor eligibility on log income of focal fathers



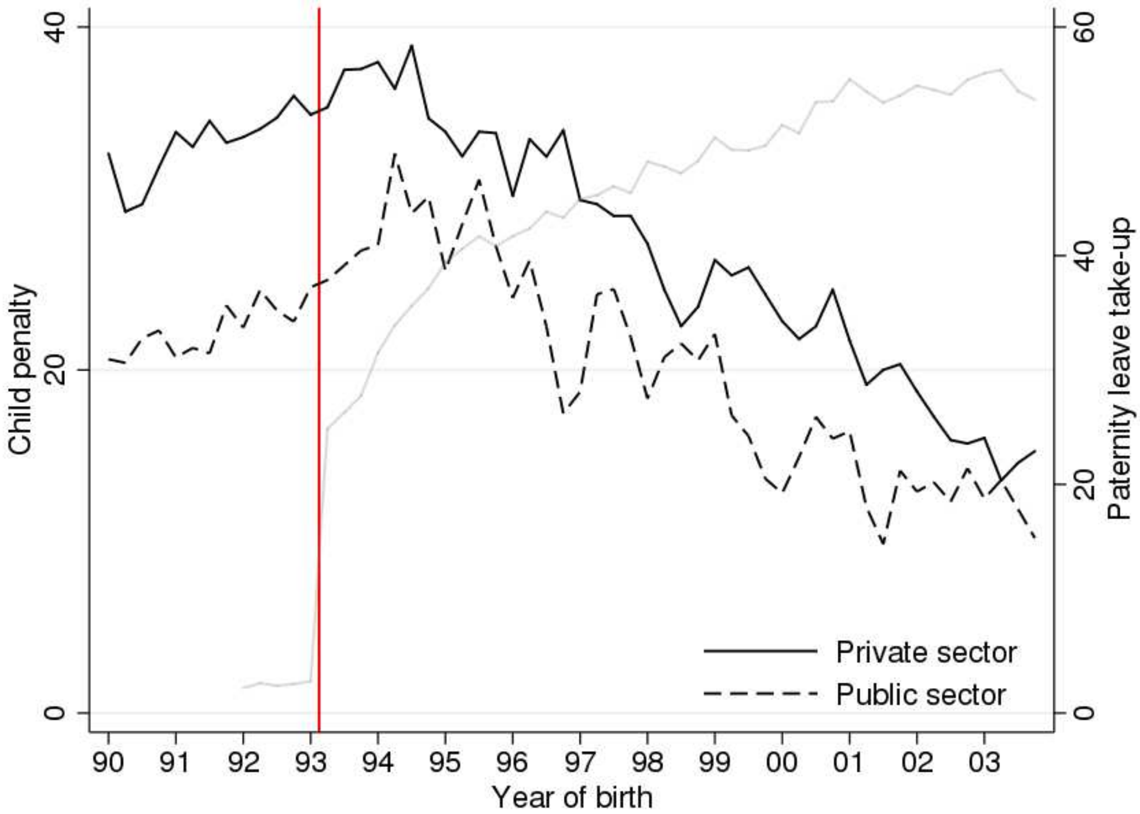
Notes: The figure displays the coefficients from a regression of year-since-child birth or event year specific effects of the share of competitors eligible for the paid paternity leave quota on log income relative to log income in event time -1 (year before child birth).

Figure 6: The evolution of paternity leave and within-firm child penalty



Notes: The connected circles show average within-firm child penalty for each quarter of the year from 1990 to 2003. The within-firm child penalty is defined as the male-female difference in post-child earnings relative to pre-child earnings (i.e., log income in year 7 after child birth minus the log income in the year before child birth) for male and female workers in the same firm who have child births in the same nine months period. The connected triangles (right-axis) show the take-up of paid parental leave among men fathers for each quarter of the year from 1990 to 2003.

Figure 7: The evolution of within-firm child penalty: public versus private



Notes: The figure compares within-firm child penalty for private (solid line) and public (dashed line) sector firms. The within-firm child penalty is defined as the male-female difference in post-child earnings relative to pre-child earnings (i.e., log income in year 7 after child birth minus the log income in the year before child birth) for male and female workers in the same firm who have child births in the same nine months period. The grey line (right-axis) shows the take-up of paid parental leave among men fathers for each quarter of the year from 1990 to 2003.

Table 1. Focal fathers with high versus low share of competitors eligible for paid paternity leave quota

	Share of eligible competitors			
	< 0.5		≥ 0.5	
	Mean	SD	Mean	SD
Focal father				
Birth year of child	1992.69	0.46	1992.70	0.46
Male child	0.52	0.50	0.52	0.50
Take-up of parental leave	0.28	0.45	0.28	0.45
Leave duration (days)	37.22	41.69	38.44	42.16
Age at birth of child	29.80	3.07	29.62	3.00
Income (1,000 NOK)	244.43	84.15	245.39	113.30
Education				
≤ 2 years of high school	0.23	0.42	0.21	0.41
High school diploma	0.66	0.47	0.67	0.47
≤ 4 year college degree	0.05	0.22	0.06	0.25
> 4 years of college	0.06	0.23	0.05	0.21
Focal father's competitors				
# of competitors	30.28	46.04	30.96	46.24
# of births among competitors	4.96	7.56	4.98	6.99
# of births / # of competitors	0.26	0.21	0.26	0.21
# of eligible competitors / # of births[a]	0.15	0.18	0.76	0.22
# of leave-takers / # births[a]	0.08	0.16	0.32	0.34
Focal father's firm				
Firm size	339.68	554.79	383.28	693.52
Public sector	0.15	0.36	0.16	0.37
Mean income in firm (1,000 NOK)	238.78	61.65	237.68	86.24
Mean age in firm	38.99	4.03	39.01	4.12
Industry/sector				
Primary	0.03	0.17	0.03	0.16
Manufacturing	0.38	0.49	0.38	0.49
Construction	0.11	0.31	0.10	0.30
Service and sales	0.23	0.42	0.24	0.43
Finance and consulting	0.10	0.30	0.10	0.30
Administration and health	0.13	0.33	0.13	0.34
Observations	1621		2312	

Notes: [a] By construction, focal fathers with a high share of competitors eligible for the paternity leave quota have more competitors eligible for leave and more competitors taking leave. All variables measured at the year of child birth.

Table 2. Effect of competitor leave (eligibility) on log income of focal fathers

	OLS		Reduced form		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Overall sample						
$C \times POST$	0.0192*	0.0229**			0.0612**	0.0553**
	(0.011)	(0.011)			(0.025)	(0.024)
$S \times POST$			0.0239**	0.0216**		
			(0.010)	(0.009)		
Cubic in age	no	yes	no	yes	no	Yes
Observations	43263		43263		43263	
B. Non-eligible focal fathers						
$C \times POST$	0.0200	0.0218			0.0634*	0.0523
	(0.016)	(0.015)			(0.034)	(0.033)
$S \times POST$			0.0249*	0.0206		
			(0.013)	(0.013)		
Cubic in age	no	yes	no	yes	no	Yes
Observations	21065		21065		21065	
C. Eligible focal fathers						
$C \times POST$	0.0185	0.0241			0.0590*	0.0582*
	(0.016)	(0.016)			(0.036)	(0.035)
$S \times POST$			0.0228*	0.0226*		
			(0.014)	(0.013)		
Cubic in age	no	yes	no	yes	no	yes
Observations	22198		22198		22198	

Notes: C is the share of competitors taking paternity leave. S is the share of competitors eligible for the 1993 paternity leave quota. We use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. We control for individual FEs and year-since-birth (event time) FEs. Standard errors clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01.

Table 3: Focal fathers by their competitors' leave take-up rate conditional on high share of competitors being eligible

	Competitors' leave take-up			
	< median		≥ median	
	Mean	SD	Mean	SD
Focal father				
Birth year of child	1992.70	0.46	1992.71	0.46
Male child	0.51	0.50	0.53	0.50
Take-up of parental leave	0.25	0.43	0.30	0.46
Leave duration (days)	38.91	47.14	38.06	37.82
Age at birth of child	29.53	3.09	29.70	2.92
Income(1,000 NOK)	246.68	132.24	244.14	91.30
Education				
<= 2 years of HS	0.27	0.44	0.17	0.37
HS diploma	0.65	0.48	0.69	0.46
<= 4 yr college degree	0.05	0.22	0.08	0.27
>4 yrs of college	0.03	0.17	0.06	0.24
Focal father's competitors				
# of competitors	31.09	51.31	30.84	40.76
# of births among competitors	4.86	7.55	5.10	6.41
# of births / # competitors	0.26	0.22	0.25	0.20
# of eligible competitors / # of births	0.76	0.22	0.76	0.21
# of leave-takers / # of births[a]	0.04	0.07	0.59	0.28
Focal father's firm				
Firm size	353.67	652.27	411.98	730.43
Public sector	0.12	0.33	0.20	0.40
Mean income in firm (1,000 NOK)	241.13	109.88	234.34	54.10
Mean age in firm	38.76	4.16	39.25	4.07
Industry/sector				
Primary	0.03	0.17	0.02	0.15
Manufacturing	0.40	0.49	0.37	0.48
Construction	0.12	0.33	0.08	0.27
Service and sales	0.25	0.43	0.23	0.42
Finance and consulting	0.08	0.27	0.13	0.33
Administration and health	0.11	0.31	0.16	0.36
Observations	1138		1174	

Notes: [a] By construction, focal fathers with a high share of competitors' leave take-up have more competitors taking leave. All variables measured at the year of child birth. Sample includes focal fathers with a relatively high share of competitors being eligible for the paternity leave quota (S>=0.5).

Table 4. Effect of competitor eligibility on log income of focal fathers - Robustness

	Specification				
	(1)	(2)	(3)	(4)	(5)
$S \times POST$	0.0216**	0.0206**	0.0215**	0.0231*	0.0202*
	(0.009)	(0.009)	(0.009)	(0.014)	(0.011)
Event time FE	yes	yes	yes	yes	yes
Cubic in age	yes	yes	yes	yes	yes
Individual FE	yes	yes	yes	no	yes
Linear trend by birth year-month	no	yes	no	no	no
Linear trend by # of competitor births	no	no	yes	no	no
Birth month FE	no	no	no	yes	no
Include March and April 1993	yes	yes	yes	yes	no
Observations	43263	43263	43263	43263	23661

Notes: Results from reduced-form regressions. S is the share of competitors eligible for the 1993 paternity leave quota. Column (1) replicates our main specification. Column (2) adds birth year-month specific linear trends in event time. Column (3) includes number of births among competitors (1, 2, 3, 4, 5+) specific linear trend in event time. Column (4) drops the individual FE and instead includes birth year-month FE. Column (5) is a donut specification dropping contests that include any births (to focal father or to competitor) occurring in March or April 1993. We use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. Standard errors clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01.

Table 5. Salience of paternity leave

	Share of births among focal father and competitor		Sector	
	High[a]	Low[b]	Private	Public
	(1)	(2)	(3)	(4)
$S \times POST$	0.0280**	0.0099	0.0261**	-0.0066
	(0.012)	(0.014)	(0.010)	(0.023)
Observations	21637	21626	36454	6809

Notes: Results from reduced-form regressions. S is the share of competitors eligible for the 1993 paternity leave quota. We use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. We control for individual FEs, year-since-birth (event time) FEs, and cubic in focal father's age. SEs clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01. [a] Above median, [b] below median.

Table 6. Direct effect of own leave (eligibility) on log income

	2x9 month window			2x3 months window		
	OLS	RF	IV	OLS	RF	IV
	(1)	(2)	(3)	(4)	(5)	(6)
A. Unique birth sample						
$D \times POST$	-0.0203**		0.0127	-0.0055		0.0220
	(0.010)		(0.024)	(0.015)		(0.034)
$Z \times POST$		0.0059			0.0088	
		(0.011)			(0.014)	
Observations	27896			10032		
B. Symmetric rank sample						
$D \times POST$	-0.0095		0.0225	-0.0252		0.0101
	(0.017)		(0.036)	(0.024)		(0.046)
$Z \times POST$		0.0111			0.0047	
		(0.018)			(0.022)	
Observations	10307			3971		

Notes: D is an indicator equal to 1 if the focal father took parental leave. Z is an indicator equal to 1 if the focal father was eligible for the 1993 paternity leave quota. In columns (1) through (3), we use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. In columns (4) through (6), we use a 3 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Sample is restricted to focal fathers with a high (above median) share of births (to focal father and to birth competitors) relative to the competition group size (focal father plus all his competitors). Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. We control for individual FEs, year-since-birth (event time) FEs, and cubic in focal father's age. In columns (1) through (3), we also control for POST * I(Year of birth = 1993). SEs clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01.

Table 7. Competition effects by tenure of focal fathers

	Focal father tenure (years)		
	3+	4+	5+
	(1)	(2)	(3)
$S \times POST$	0.0216**	0.0241**	0.0291***
	(0.009)	(0.010)	(0.010)
Observations	43263	33605	27984

Notes: Results from reduced-form regressions. S is the share of competitors eligible for the 1993 paternity leave quota. We use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. We control for individual FEs, year-since-birth (event time) FEs, and cubic in focal father's age. SEs clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01.

Table 8. Competition effects by focal father's age at child birth

	Quartiles of focal father's age at child birth			
	Q1	Q2	Q3	Q4
	(1)	(2)	(3)	(4)
$S \times POST$	0.0124	0.0251	0.0220	0.0268*
	(0.019)	(0.023)	(0.016)	(0.016)
Observations	11858	10230	12397	8778

Notes: Results from reduced-form regressions. S is the share of competitors eligible for the 1993 paternity leave quota. We use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. We control for individual FEs, year-since-birth (event time) FEs, and cubic in focal father's age. SEs clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01.

Table 9. Competition effects by number of competitors

	Number of competitors	
	High[a]	Low[b]
	(1)	(2)
$S \times POST$	-0.0124	0.0406**
	(0.015)	(0.017)
Observations	7579	7359

Notes: Sample is restricted to focal fathers with only one competitor birth. Results from reduced-form regressions. S is the share of competitors eligible for the 1993 paternity leave quota. We use a 9 months window on each side of the cut-off date for eligibility for the paid paternity leave quota. Pre-period = years -3 to -1 relative to child's birth year. Post-period = years 0 to 7 relative to child's birth year. We control for individual FEs, year-since-birth (event time) FEs, and cubic in focal father's age. SEs clustered at the focal father level. *p<0.10, **p<0.05, ***p<0.01.

Table 10. Implications of the 1993 paternity leave quota on within-firm child penalty

	(1)	(2)
$Private \times POST$	-4.2672***	-5.2494***
	(0.704)	(0.907)
Firm FE	no	yes
Observations	231155	227570

Notes: Sample period 1990 to 2003. For each quarter-firm, we compute the within-firm child penalty as the male-female difference in post-child earnings relative to pre-child earnings (i.e., log income in year 7 after child birth minus log income in the year before child birth) for male and female workers in the same firm having child births in the nine months period centered at that quarter. We control for year-quarter FEs and Private FE. Post = 1 in the period after the introduction of the paid paternity leave quota (quarter two of 1993 or later). Standard errors clustered at the firm level. *p<0.10, **p<0.05, ***p<0.01.