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## Competition and Career Advancement

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# Competition and Career Advancement

## Abstract

In standard promotion tournaments, contestants are ranked based on their output or productivity. We argue that workers' career progression may also depend on their relative rankings in dimensions a priori unrelated to their job performance, such as visibility or in-person presence. Such implicit tournaments may rationalize a variety of seemingly counterproductive practices in the workplace, including long working hours, low uptake of statutory leave, and presenteeism. We illustrate the significance of implicit tournaments using the case of paternity leave among new fathers, where we exogenously vary a focal worker's ranking within a contest, not via his own leave status but that of his competitors, exploiting a policy reform. We show that the focal worker is put on a better earnings trajectory than otherwise when a larger share of his competitors take leave because of the reform. The focal worker's own absolute leave, however, has no direct effect on his earnings path as long as his own and his competitors' leave statuses are symmetric. With effective coordination, it should thus be possible for all fathers to utilize paternity leave without incurring unwarranted career costs. This has implications for statutory leave policies, flexible work arrangements, and gender equality.

JEL-Codes: M510, M520, J160, J220, J240, J310.

Keywords: implicit tournaments, relative rank, promotion, parental leave, flexible work arrangements, gender differences.

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*“Showing up is 80 percent of life”* (Woody Allen).

## 1. Introduction

Workplace rat races are ubiquitous. For instance, employees in East Asian countries are known for working extremely long hours, often expected to remain at work until their manager and colleagues leave.<sup>1</sup> Similar examples abound in other parts of the world. Despite generous income replacement during leave, few men in Nordic countries utilized any parental leave until policy reforms in the 1990s introduced a dedicated and non-transferable paternity leave (see e.g. Ekberg et al. 2013 for Sweden; Rege and Solli 2013 for Norway). Presenteeism—attending work while ill—is yet another example (see Johns 2010).<sup>2</sup> In this paper, we propose implicit tournaments—operating along the margin of visibility or in-person presence at work—as a possible explanation for these seemingly counterproductive behaviors.

To conceptualize our argument, imagine there are (pre-determined) high vs. low wage slots in the firm. The wedge between high vs. low wages is denoted as a prize. Suppose that for any number of reasons, an ever-present contestant enjoys higher chances of winning the prize than another contestant who is absent for part of the time, even when the two are ex ante identically skilled.<sup>3</sup> Since everyone strives to win the prize, workers may forgo statutory leave benefits even when each of them would have preferred otherwise. Importantly, the competition at stake here is implicit or informal, unlike standard promotion tournaments (see Lazear and Rosen 1981; Rosen

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<sup>1</sup> In 2015, the average annual hours worked per person employed were 2077 in South Korea and 1719 in Japan as compared to 1525 in the UK and 1401 in Germany (Source: OECD.Stat).

<sup>2</sup> If an employee is present at work despite being unwell (e.g. with a flu), the worker may not only remain unproductive but also spread the disease to co-workers, customers, and the general population (Pichler and Ziebarth 2017).

<sup>3</sup> For instance, a worker—while on leave or in anticipation of an upcoming leave—may miss out on assignment to high impact projects or promotable tasks in the firm. Moreover, having relatively fewer face-to-face interactions with colleagues or supervisors may disadvantage the worker in acquiring tacit knowledge in the workplace, thereby affecting his/her relative performance evaluation (see Sandvik et al. 2020; Cullen and Perez-Truglia forthcoming).

1986) that are explicitly set up by the employer to incentivize workers on productivity-enhancing activities.<sup>4</sup>

There are at least two major challenges to detecting implicit tournaments. Take paternity leave as a case in point. First, it is difficult to obtain exogenous variation in leave-taking among otherwise comparable co-workers (i.e. with *ex ante* identical productivity). To the extent that their relative leave status matters, all fathers would (rationally) choose not to take leave in equilibrium, permitting no variation to use. To overcome this challenge, we require an *exogenous asymmetry* in the leave status among competing co-workers inside the firm, which is hard to come by in observational data.<sup>5</sup> Second, it is challenging to isolate the competition (rank) effect from the direct (absolute) effect of own leave, where we use “direct effect” as an umbrella term referring to any career consequences resulting from one’s own absolute leave.<sup>6</sup> To see this, consider an experiment where two identical workers are randomly assigned to leave and no leave, respectively, hence achieving an exogenous asymmetry in their leave status. In that experiment, standard designs comparing the outcomes of an exogenous leave-taker with that of an exogenous non-taker would identify only the *total* effect of leave, i.e. a combination of the *competition* effect and the *direct* effect of own leave. However, only the competition effect speaks to implicit tournaments.

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<sup>4</sup> Even if not intended, the firm *may* gain from workers’ responses to the implicit tournament. For instance, competition in hours (spent at work) among employees may lead to higher output for the firm, while the workers bear the costs as foregone leisure. In this paper, we remain agnostic about the origin and/or efficiency of such form of competition. Instead our contribution is showing the existence of implicit tournaments.

<sup>5</sup> In the absence of quasi-random variation, observed differences in leave status between workers likely reflect other unobservable differences between the workers, and not just their leave status, making it difficult to isolate the causal effect of leave per se. For instance, less productive workers may select into more frequent or longer leave periods than others because of their low earnings and the low opportunity cost of leave (Becker 1985; Polachek 1981; Gronau 1988; Adda et al. 2017). Moreover, in situations where information asymmetry is prevalent, workers may try to signal their productivity types by sorting into different leave decisions (Albrecht et al. 1999; Tô 2018).

<sup>6</sup> For instance, absence from work may lead to depreciation of human capital or productive skills (Mincer and Polachek 1974; Mincer and Ofek 1982; Adda et al. 2017), which may be reflected in a worker’s future earnings. Moreover, the experience of paternity leave may alter the worker’s priorities over career and family (see e.g. Ekberg et al. 2013; Patnaik 2019; Farré and González 2019; Tamm 2019), leading to lowered effort or labor supply at work even after the initial leave has ended.

To address both empirical challenges discussed above, we focus on the case of paternity leave among new fathers in Norway. In particular, we leverage a 1993 policy reform that provides four weeks of paid paternity leave for fathers of children born on or after April 1, 1993, with full pay furnished by the social insurance system and not the individual firm.<sup>7</sup> Most importantly, these four weeks are reserved for fathers only, with no unused portions transferable to the child's mother.<sup>8</sup> The outcome of this reform was a sudden and dramatic increase in the share of paternity leave taken by fathers of children born after the policy cutoff date (see Figure 1).

To identify the competition effect operating along the margin of paternity leave, we propose a new research design in which we exogenously shift a focal worker up and down the ranking, not via his own leave but through the reform-induced leave of his competitors. We define focal fathers as male workers who had their first child within a window spanning 9 months before and after the policy cutoff date. For each focal father, we identify a set of relevant competitors, defined as male workers in the same plant—hereafter referred to as firm—who also fathered a child in the same window and have similar age and education as the focal father. We then calculate the share of each focal father's competitors who are leave eligible (i.e. whose children are born after the policy cutoff date), which is arguably exogenous to the focal father but correlates with the share of his competitors taking leave. By comparing the career trajectories (-3 to 7 years since their children's births) of focal fathers exposed to a high vs. low share of leave-eligible competitors in a difference-in-differences framework, we identify the competition (rank) effect operating via paternity leave.

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<sup>7</sup> See Kotsadam and Finseraas (2011), Rege and Solli (2013), Dahl et al. (2014), and Cools et al. (2015), for prior research exploiting this policy reform.

<sup>8</sup> 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 failure to take paternity leave did not imply a wasted benefit at the household level. The newly introduced four-week paternity quota is in addition to the existing amount of shared leave, which the couple can divide any way they wish both before and after the 1993 reform.

We find that—holding fixed his own status at either leave-ineligible or leave-eligible—a focal worker enjoys a better post-child earnings trajectory than otherwise when a larger share of his competitors take leave *because of* their eligibility for the new policy. In particular, our reduced-form (intention-to-treat) estimates show that when the share of leave-eligible competitors increases by 0.37 (1 *SD* in the sample)—which is equal to an additional two out of five competitors (the sample average)—a focal worker’s earnings are on average 0.85 percent higher annually in the seven years following the child’s birth than they would have been otherwise. We find the competition effect to be stronger in firms where the wedge between the high vs. low wage slots is larger (see Lazear and Rosen 1981) and also in firms where promotion slots are scarcer, such as slower-growing firms or firms with a broader span of control (see Lazear et al. 2018; Bianchi et al. *forthcoming*).

By cleanly isolating the competition effect, we shed light on the mechanisms driving the total effect of a worker’s own leave previously documented among Norwegian fathers. In the context of the 1993 parental leave reform, Rege and Solli (2013) and Dahl et al. (2014), based on different research designs, estimate the total effect of a worker’s own leave eligibility on his own earnings to be between -1 to -3 percent. We conduct a similar analysis, directly comparing leave-ineligible and leave-eligible focal fathers. Consistent with prior findings, we also estimate a negative total effect of own leave on own earnings. However, once we shut down the competition channel—by conditioning on the difference between the leave eligibility of the focal father and that of his competitors—the effect of the focal father’s own leave on his earnings disappears, suggesting that the competition effect, rather than the direct effect of own leave, is the main driver of the negative total effect in this context.<sup>9</sup>

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<sup>9</sup> In our case, paternity leave is relatively short, 4-5 weeks. If the leave in question were far lengthier, as is the case for maternity leaves in Austria and Germany (see Lalive and Zweimüller 2009; Schönberg and Ludsteck 2014), for



Overall, our findings suggest that *conditional on having a child*, all fathers would be better off if leave-taking became universal. Then all fathers could reap the benefits of parental leave without incurring unwarranted career costs (associated with informal competition), which gets activated only when leave-taking is asymmetrical among relevant contestants.<sup>10</sup> In fact, the 1993 reform seems to have been conducive to such a transition in the medium run, as the take-up rate of parental leave among Norwegian fathers reached almost 70 percent by 2000 (see Dahl et al. 2014).<sup>11</sup>

By illustrating the workings of implicit tournaments in a concrete example, we provide a novel explanation as to why workers may engage in seemingly futile competition in the workplace, leading to collectively undesirable outcomes such as excessive working hours, low uptake of statutory leave, and presenteeism. In doing so, we add a new layer to the extensive literature in labor and personnel economics focused on wage determination and career advancement of workers within firms.<sup>12</sup> Our main point of departure from the literature is that unlike standard promotion tournaments (Lazear and Rosen 1981; Rosen 1986) or performance pay schemes (Lazear 2000; Lemieux et al. 2009) that reward workers based on metrics explicitly set by the firm, e.g. hours billed or new client revenue generated by attorneys at law firms (see Landers et al. 1996; Azmat

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instance, then there may well be direct negative effects stemming from own leave. Importantly, however, the possible presence of direct (absolute) effects does not negate the competition (rank) effects at play.

<sup>10</sup> Note that shutting down the competition effect among new fathers that operates via the paternity leave margin, does not imply an elimination of competition between fathers and non-fathers within a firm, which may operate via the child (vs. no child) margin, in addition to the paternity leave (vs. no leave) margin. Isolating the direct and competition effects of having a child (vs. no child), however, is beyond the scope of the present study.

<sup>11</sup> While every father should gain in the new equilibrium, in the short run and during the transition from the old to the new equilibrium, there are individuals for whom the competition effect becomes activated, in particular those whose children's birth dates are straddling the policy cutoff date. Our empirical analysis focuses specifically on those fathers caught in the transition period and exploits the exogenous asymmetry in their leave status created because of the policy, which facilitates identification of the competition effect. See further discussion in Section 2.2.

<sup>12</sup> See Gibbons and Waldman (1999a, 1999b), Prendergast (1999), Lazear and Shaw (2007), Lazear and Oyer (2012), and Lazear (2018) for a review.

and Ferrer 2017), implicit tournaments, by definition, create winners and losers based on dimensions that are not part of the firm's performance evaluation criteria.

We also speak to the increasingly important debate on alternative and flexible work arrangements (see e.g. Oettinger 2011; Bloom et al. 2015; Mas and Pallais 2017; Wiswall and Zafar 2018; Aksoy et al. 2022). Previous work by Bloom et al. (2015) showed that working from home can disadvantage workers on promotion even when their productivity is not lowered.<sup>13</sup> Our findings suggest that such a penalty for remote work could be mitigated if symmetry between (otherwise comparable) employees could be maintained. For instance, if a team adopts a hybrid work model, mandating the same on-site (vs. remote) work days across employees will prevent the competition effect from being activated. In contrast, allowing employees to freely choose their remote work frequency and days of the week may result in unintended negative consequences for those who opt for more and/or different remote working days (e.g. due to caring responsibilities), as they become less present and visible compared to their co-workers.

Further, we contribute to the debate on gender differences in labor market outcomes.<sup>14</sup> Implicit tournaments often occur along dimensions such as presence (vs. absence). But these are the aspects that go hand in hand with long and inflexible working hours, and unpredictable work schedules, where women (especially those with young children) are not the most competitive (see Goldin 2014).<sup>15</sup> As a result, women may be disproportionately sorting themselves into lower-paying firms (Card et al. 2016; Barth et al. 2021) or jobs with shorter commuting distances (Le

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<sup>13</sup> Unlike Bloom et al. (2015) where workers are randomly assigned to remote vs. on-site work, Emanuel and Harrington (2022) documents a case where low productivity workers tend to self-select into remote (vs. on-site) work, which may explain the low prevalence of remote work prior to the Covid-19 pandemic.

<sup>14</sup> See Altonji and Blank (1999), Bertrand (2011), Goldin (2014), Olivetti and Petrongolo (2016) and Blau and Kahn (2017) for overviews, and Cortés and Pan (forthcoming) for a recent review focused in particular on the role of parenthood.

<sup>15</sup> For empirical research relating working hours to the gender gap, see e.g. Bertrand et al. (2010), Gicheva (2013), Cha and Weeden (2014), Goldin and Katz (2016), Azmat and Ferrer (2017), Cortés and Pan (2019), Cook et al. (2021), Azmat et al. (2022), Bolotnyy and Emanuel (2022), and Wasserman (forthcoming).

Barbanchon et al. 2021; Caldwell and Danieli *forthcoming*) to deal with implicit tournaments. This in turn suggests that technological and organizational innovations (see Goldin 2014; Goldin and Katz 2016) that lessen the importance of long and inflexible working hours may not only reduce the gender pay gap within firms but also expand the set of firms in which women can compete.

## **2. Setting and Conceptual Framework**

### **2.1 The 1993 reform and paid paternity leave quota**

The universal Norwegian parental leave scheme is part of the broader Social Security System financed through worker and firm taxes. It offers not only employment protection but also a 100% earnings replacement, with a cap that is generally not binding as all public and most private employers compensate for any earnings above it. Prior to the 1993 reform (proposed in October 1992 and passed in parliament in December 1992), the paid parental leave period comprised 35 weeks, eight of which were reserved for the mother. The parents could then share the remaining 27 weeks between them as desired, although only three percent of fathers took any leave (see Figure 1).

Because of this low take-up rate, on April 1, 1993, the Norwegian government enacted a paternity leave policy whose explicit aim was to promote gender equality in the use of paid parental leave. This reform expanded the paid parental leave period to 42 weeks, with four weeks reserved specifically for the father and nontransferable to the mother, meaning that they are lost to the family if the father does not use them.<sup>16</sup> The policy was proposed only 6 months before its implementation, which means that fertility decisions for births around the implementation date could not have been affected by the policy itself.

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<sup>16</sup> The leave reserved for the mother also expanded from eight to nine weeks.

Figure 1 shows that the reform resulted in a sudden and dramatic increase in the share of paternity leave taken by fathers of children born after the policy cutoff date, while there is no notable change in the incidence of birth across different months. As to the length of leave taken, Figure A1 shows that an overwhelming majority (around 80%) of leave takers choose 4-5 weeks, a leave duration as specified by the paid paternity leave quota.

## 2.2 Conceptual framework

To illustrate the operation of implicit tournaments, we present a simple and highly stylized model of a two-player contest in the context of paternity leave among new fathers. While we borrow the framework of rank-order tournaments (Lazear and Rosen 1981) to emphasize the competition (rank) effect underlying implicit tournaments, it should be noted that the “tournament” in question here is by definition informal and implicit, along dimensions unrelated to productivity. Therefore, the motives and implications of implicit tournaments are entirely different from that of standard rank-order tournaments. In particular, firms here have no reason to incentivize workers through competition along such dimensions. Otherwise, firms would have set up explicit tournaments along those margins.

**Contestants.** Consider two workers, the focal worker and his competitor, who have *identical abilities and preferences*, and both fathered a child within a narrow time frame. Each worker’s objective is to maximize their individual utility, which comprises utility at home and wages at work. Each worker chooses whether or not to take paternity leave to maximize his individual utility. In this model, paternity leave affects both components of the individual utility, and the equilibrium

is a pair of actions chosen by the two workers such that neither has an incentive to deviate from their respective choices.

**Utility at home.** We normalize the pre-existing and shared parental leave to unity, and designate the paid paternity leave quota specified in the new policy by  $\rho \in [0,1]$ . Each worker makes the binary choice of whether or not to take paternity leave (of length  $\rho$ ). For a worker who had a child *before* the policy cutoff date (and is thus ineligible for the paid paternity leave quota), utility at home is

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

where  $b^f$  is the nonpecuniary benefit (e.g. child welfare) when the father spends one unit of time with the child, and  $b^m$  is that when the mother does so. For simplicity, we assume that  $b^m > b^f$ .<sup>17</sup> Under the status quo, if the father takes leave for a duration  $\rho$ , it eats into the leave available to the mother.

For a worker who has a child *after* the policy cutoff date (and is thus eligible for the paid paternity leave quota), utility at home is

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

Since the paid paternity leave quota of  $\rho$  is additional to the existing shared leave (of length 1), the father's leave-taking no longer reduces the leave available to the mother. For simplicity, we set  $\rho = 1$  from here on.

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<sup>17</sup> Although not crucial for deriving the qualitative implications of the new paternity leave policy, this assumption ensures that no father takes paternity leave prior to the policy's introduction, which not only simplifies our analysis but is consistent with the empirical evidence of less than 3 percent of men taking leave before the 1993 reform.

**Wages at work.** Since the two contestants are otherwise identical (i.e. in terms of abilities and preferences), their relative leave status alone determines their rank in this model. The higher ranked worker receives  $W_H$  compared to  $W_L (< W_H)$  for the lower rank, with an assumption of  $W_H - W_L < 2b^f$ .<sup>18</sup> In the case of a tie, each worker receives  $\frac{1}{2}W_H + \frac{1}{2}W_L \equiv W$ . Because these wage levels are fixed ex ante, the employer's total wage bill remains fixed at  $W_H + W_L$  regardless of which worker attains the higher wage of  $W_H$  ex post.

**Worker payoffs.** Each worker's payoff is the sum of the utility at home and the wages received at work. Depending on his child's birthdate, each worker can be either ineligible or eligible for the new policy. Below we analyze the payoffs of the focal father according to his policy eligibility status and under different contingencies with respect to his own and his competitor's leave choices.

If the focal father is *policy ineligible* (i.e. his child is born before the policy cutoff date), then his payoff is equal to:

$$(1) \quad V^N = \begin{cases} b^m + W & \text{if no leave, no leave,} \\ b^f + W_L & \text{if leave, no leave,} \\ b^m + W_H & \text{if no leave, leave,} \\ b^f + W & \text{if leave, leave,} \end{cases}$$

where the first and second actions in each row refer to that of the focal father and the competitor, respectively. Based on (1), we see that when the focal father is policy ineligible, not taking leave is his dominant strategy.<sup>19</sup> The intuition is that utility at home attainable from taking leave is lower

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<sup>18</sup> That is, the potential loss in wages due to paternity leave is never too large. This assumption ensures a unique equilibrium in each subsequent scenario, which greatly simplifies our illustration of the policy's impact.

<sup>19</sup> If the competitor does not take leave, the *policy-ineligible* focal father receives a higher payoff by not taking leave. Comparing rows 1 and 2 in (1), we can see that  $b^m + W > b^f + W_L$ , because  $W - W_L = \frac{1}{2}(W_H - W_L) > 0$  and  $b^m - b^f > 0$ . If the competitor does take leave, the focal father again receives a higher payoff by not taking leave. From rows 3 and 4 in (1), we see that  $b^m + W_H > b^f + W$ , because  $W_H - W = \frac{1}{2}(W_H - W_L) > 0$  and  $b^m - b^f > 0$ .

than that from not taking leave—irrespective of the competitor’s choices—and taking leave can only (weakly) lower his rank in the firm.

If the focal father is *policy eligible* (i.e. his child is born after the policy cutoff date), then his payoff is equal to:

$$(2) \quad V^Y = \begin{cases} b^m + W & \text{if no leave, no leave,} \\ b^f + b^m + W_L & \text{if leave, no leave,} \\ b^m + W_H & \text{if no leave, leave,} \\ b^f + b^m + W & \text{if leave, leave,} \end{cases}$$

where the first and second actions in each row again refer to that of the focal father and the competitor, respectively. When he is policy eligible, taking leave is the dominant strategy for the focal father, because the utility at home attainable from taking leave is higher than that from not taking it, and the assumption that  $W_H - W_L < 2b^f$  guarantees that the potential loss in wages is never too large.<sup>20</sup>

Based on the analysis above, we know that for each worker, not taking (taking) leave is the dominant strategy if he is ineligible (eligible) for the 1993 policy. From here on and when there is no risk of confusion, we use leave-ineligible (leave-eligible) and not taking leave (taking leave) interchangeably.

**Pre-reform equilibrium.** Prior to the 1993 reform, (focal worker, competitor) = (ineligible, ineligible) was the only possible configuration. Therefore, in equilibrium, both workers (rationally) did not take leave, obtaining a payoff of  $b^m + W$  each.

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<sup>20</sup> If the competitor does not take leave, the *policy-eligible* focal father receives a higher payoff from taking leave. From rows 1 and 2 in (2) and the assumption  $W_H - W_L < 2b^f$ , it follows that  $b^f + b^m + W_L > b^m + W$ . Similarly, when the competitor does take leave, the focal father obtains a higher payoff from taking leave:  $b^f + b^m + W > b^m + W_H$  (rows 3 and 4 in (2)).

**Post-reform equilibrium.** After the 1993 reform, (focal worker, competitor) = (eligible, eligible) is the only possible configuration. Therefore, in equilibrium, both workers (rationally) take leave, obtaining a payoff of  $b^f + b^m + W$  each. Clearly, the payoff in the post-reform equilibrium is higher than that in the pre-reform equilibrium by  $b^f$ . The reform, by making paternity leave universal (through strongly incentivizing leave-taking), enabled both contestants to benefit from paternity leave while ensuring that the competition effect is not activated.

**Transition period and connection to empirical strategy.** Notice that in both the pre- and post-reform equilibria above, the actions of the two contestants are symmetric. However, in order to empirically detect the competition (rank) effect, we need to induce *exogenous asymmetry* in the leave status of the two contestants. To achieve this, we consider a specific window of child birth dates that straddles the policy cutoff date, which represents the period of transition from the pre- to the post-reform equilibrium. During this period, there are four possible scenarios: (focal worker, competitor) = (ineligible, ineligible), (ineligible, eligible), (eligible, ineligible), and (eligible, eligible). We know that for each worker, not taking (taking) leave is the dominant strategy when policy ineligible (eligible). Therefore, under each scenario (and the corresponding pair of actions specified in (1) and (2)), the payoff to the focal father will look as follows:

$$(3) \quad V = \begin{cases} b^m + W & \text{if ineligible, ineligible,} \\ b^m + W_H & \text{if ineligible, eligible,} \\ b^f + b^m + W_L & \text{if eligible, ineligible,} \\ b^f + b^m + W & \text{if eligible, eligible,} \end{cases}$$

where the first and second eligibility statuses in each row refer to that of the focal father and the competitor, respectively.

To understand the logic of the competition effect in the transition period, we engage in two thought experiments. In the first, we fix the focal father's status as leave-ineligible but shift his



competitor's status from leave-ineligible to leave-eligible (i.e. from row 1 to row 2 in (3)). This exogenous shift increases the focal father's wage at work from  $W$  to  $W_H$ . In the second thought experiment, we fix the focal father's status as leave eligible but shift his competitor's status from leave-ineligible to leave-eligible (i.e. from row 3 to row 4 in (3)), which increases the focal father's wage at work from  $W_L$  to  $W$ . In these thought experiments, we alter the ranking of the focal father within the contest, not via his own leave eligibility but that of his competitor. This allows us to isolate the competition (rank) effect without convolution with possible direct (absolute) effects resulting from the focal father's own leave.

In reality, such experiments are not feasible and we can observe a given focal father (and his competitor) in one scenario only, and not across multiple different scenarios. To make progress, we therefore map our theoretical prediction above onto a new research design (see Figure 2), where we compare the earnings progression of two similar focal fathers (A vs. B or C vs. D) who are otherwise comparable but differ in their competitors' leave eligibility for plausibly exogenous reasons. Below, we detail the implementation of our research design.

### **3. Empirical Framework**

#### **3.1 Sample**

We build our dataset by combining data from several administrative registers, which cover the full Norwegian population and are linked through unique individual identifiers. The birth register contains not only the expected birthdate and actual birth month of all children born in Norway, but also links each individual birth to a mother and father identifier. The social security registers provide information on the take-up of parental leave from 1992 onwards. The matched employer-employee registers provide data on firms and their employees, allowing us to match each worker

to all his colleagues in the firm. We draw gross earnings data from the tax registers and deflate earnings to 1993. The national population and education registers provide additional annual information on marital/cohabitation status and educational attainment.

Our analysis focuses on contests between a focal father and a group of competitor fathers inside the same firm. We consider all possible contests (i.e. one focal father and non-zero competitors), constructed in the following two steps. Importantly, our research design (see Figure 2) compares the earnings paths of two focal fathers (A vs. B or C vs. D) who are otherwise comparable but happen to differ in their competitors' leave eligibility. We therefore first identify unique focal fathers across all firms in Norway who meet a set of criteria designed to ensure comparability in their earnings paths, absent differences in their competitors' leave eligibility. To this end, we focus on men who fathered their first child in the 18 months around the reform cutoff date (i.e. July 1, 1992 to December 31, 1993), with a history of stable employment in the same firm, defined as working there in the year of the child's birth and the two years prior. Among these focal fathers we exclude those who had twins or multiple births during the 18-month period. We also restrict our sample to focal fathers aged—at child's birth—within the 10<sup>th</sup> and the 90<sup>th</sup> percentiles (25 and 36 years) of the age distribution to make focal fathers most comparable. To investigate the focal fathers' career development, we track their log earnings from 3 years prior to 7 years after the birth of their child. We therefore restrict the sample to those with a minimum level of labor market attachment by requiring that earnings be above one social security basic unit in each period.<sup>21</sup> For the pre-birth years, this criterion also proxies individual eligibility for paid paternity leave (Dahl et al. 2014).

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<sup>21</sup> In 1993, one social security basic unit (1G) corresponds to about 18% of the average earnings in Norway, and the average earner would have to work around 6.6 hours per week to earn 1G.

In the second step, we identify relevant competitors among the co-workers of each focal father. In particular, we define competitors as male co-workers who fathered a child of any parity within the 18-month window and who worked in the same firm in the birth year of the focal father's child and the two years prior. To ensure that we capture only relevant competitors, we further define them as workers of similar age (within  $\pm 4$  years) to the focal father and with the same educational level (2 years of high school or less; high school diploma; some college including a college degree; or beyond a college degree). To enable our analysis of the competition effect, we restrict the sample to focal fathers with at least one competitor.<sup>22</sup> As this requires that at least two male workers (the focal father and one or more competitors) became fathers during the 18-month window, our sample by design excludes very small firms and firms with predominantly female employees.

In Table 1, we report the baseline characteristics of the focal fathers in our sample, as measured in the year of their child's birth. We report the characteristics first for the full sample and then separated by low ( $\leq 0.5$ ) vs. high ( $> 0.5$ ) share of competitor births occurring after the policy cutoff date.<sup>23</sup> On average, a focal father has 4.77 competitors who fathered a child during the 18-month window. That is, an average contest has around 6 contestants (i.e. focal father plus his competitors).<sup>24</sup> As the table shows, the focal fathers' baseline characteristics are largely balanced across the two groups, consistent with the notion that the share of competitors eligible for the paid paternity leave is exogenous to the focal fathers. Furthermore, Figure 3 shows that the raw earnings for the two groups are highly comparable in the pre-birth period. Raw earnings then

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<sup>22</sup> We also drop focal fathers and competitors in instances when at least one competitor had twins or multiple children within the 18-month observation window.

<sup>23</sup> The number of observations for the "low share" sample is larger than that for the "high share" sample as we assigned 0.5 to the former.

<sup>24</sup> The median contest in our sample has 3 contestants (i.e. one focal father plus two competitors), as illustrated in Figure A2 in the Appendix. The figure also displays the median firm size in our sample, 81 employees.

diverge between focal fathers with high vs. low share of leave-eligible competitors in the post-birth period, suggestive of the competition effect which we will examine more systematically below.

### 3.2 Identification strategy

To isolate the competition (rank) effect operating via paternity leave, we leverage variation in the *competitors'* leave eligibility among otherwise comparable focal fathers. Specifically, as explained in Section 2.2 and illustrated in Figure 2, we compare the outcomes of focal father A (C) with that of focal father B (D), to be able to isolate the competition (rank) effect, holding fixed the focal father's own status (at either leave-ineligible or leave-eligible).

Each focal father has at least one competitor having a child within our observation window. Crucially, the share of his *competitors'* children born within the latter half of this window is (arguably) exogenous to the focal father. Not only are the observable characteristics of focal fathers with high vs. low shares of leave-eligible competitors balanced (Table 1), but the pre-birth trends of log earnings between them are also comparable (Figure 3). Moreover, a focal father's leave taking is orthogonal to the *leave eligibility* of his competitors (Figure 4).

Exploiting the variation in the leave eligibility of competitors, we estimate the following equation in a sample of focal fathers:

$$(4) \quad y_{it} = \phi_i + \psi_{\tau(it)} + \sum_{\tau=-3}^7 \beta_{\tau} I(it = \tau) \times C_i + \mathbf{G}_{it} \lambda + u_{it},$$

where  $y_{it}$  is the log earnings of the focal father  $i$  in year  $t$ . The event year, or year-since-birth (YSB), is denoted by  $\tau$ , with the child's birth year designated as zero. The variable  $C_i$  measures the ratio of  $i$ 's competitors that take paternity leave to the total number of  $i$ 's competitors (who all

had children around the policy cutoff date). We define  $\tau = -1$  as the reference category such that all  $\beta_\tau$ s are relative to the year before the birth of focal father's child. Vector  $\mathbf{G}_{it}$  includes additional controls that vary at the worker-year level (e.g. a quadratic polynomial in age).

Conditioning on individual fixed effects ( $\phi_i$ ) and YSB fixed effects ( $\psi_{\tau(it)}$ ), we estimate the evolution of the focal father's earnings after his child's birth dependent on his competitors' leave status, relative to the earnings in  $\tau = -1$  (the year before the child's birth). Given that our observation window falls in two different calendar years (i.e. 1992 and 1993), we also estimate a specification where we allow the YSB fixed effects ( $\psi_{\tau(it)}$ ) to vary by the calendar year of the child's birth (i.e. 1992 vs. 1993). In some specifications, we also include  $\mathbf{\Omega}_{g(i)} \times \psi_{\tau(it)}$ , where the vector  $\mathbf{\Omega}_{g(i)}$  includes dummies indicating education-by-age at child's birth cell ("demographic group" hereafter) to which the focal father belongs, thus comparing focal fathers sharing the same education-by-age at child's birth configuration. We cluster standard errors at the initial firm level, within which the competition group (or contest) for each focal father is defined.

We also estimate a variant of (4) that collapses the  $\beta_\tau$ s for all the post-birth periods and estimates a single parameter  $\beta$ :

$$(5) \quad y_{it} = \phi_i + \psi_{\tau(it)} + \beta Post_{\tau(it)} \times C_i + \mathbf{G}_{it}\lambda + u_{it},$$

where  $Post_{\tau(it)}$  indicates year of child's birth or later ( $\tau \geq 0$ ). We estimate equation (5) first by OLS and then by IV, with  $C_i$  (share of competitors *taking* paternity leave) instrumented by  $S_i$  (share of competitors *eligible* for it). As Figure 5 shows,  $S_i$  has strong predictive power for  $C_i$ , which is anticipated in Figure 1 by the discrete jump around the policy cutoff date.

The OLS and IV estimates differ in two key ways: (i) whereas OLS uses the variation in  $C_i$ , which is driven by both choice (by competitors) and policy, IV uses only the *policy-driven*

variation in  $C_i$ ; and (ii) OLS is concerned with the average focal father/contest in the sample, whereas IV is based on the *marginal* focal father/contest whose  $C_i$  is shifted *because of*  $S_i$ .

## 4. Competition Effect

### 4.1 Main results

We start by estimating equation (4) in a reduced-form that replaces the competitor share *taking* paternity leave ( $C_i$ ) with the competitor share *eligible* for it ( $S_i$ ), conditioning on individual FE and year-since-birth FE. The estimated coefficients are displayed in Figure 6, which clearly shows that focal fathers with a higher share of leave-eligible competitors are on a better earnings trajectory than their lower share counterparts, but only in the periods following a child's birth, which is consistent with the competition (rank) effect.<sup>25</sup> The positive earnings effect is increasing until event year 4, after which it stabilizes. The persistence of the effect suggests that it is not an artefact of doing more work to make up for the competitors' temporary absence. Rather, the lasting impact implies that having a high share of leave-eligible competitors sets a focal father on a different earnings path compared to a focal father with a low share of leave-eligible competitors.

This finding relates to Jäger and Heining (2019), who show that the unexpected death of a co-worker can have a positive (and permanent) earnings effect on the incumbent workers in the same occupation, due to the firm's inability to perfectly substitute the deceased worker—who permanently exits the firm—and the resulting increase in the value of the remaining co-workers to the firm. In contrast, the competition effect we observe in our setting concerns the ranking or relative standing of the incumbents who all return to the firm once their leave period has ended.

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<sup>25</sup> If team production is important and a focal worker's productivity suffers from the (temporary) absence of his competitors/colleagues, then this would make it more difficult to detect the positive earnings effect, or downward bias our estimates of competition effect.

To facilitate subsequent discussion, we now estimate equation (5) so that the coefficient  $\beta$  reflects the average effect for up to 7 years after the child's birth. The OLS estimates indicate that focal fathers have higher post-birth earnings when a larger share of their competitors take paternity leave (Table 2, Panel A). The estimated coefficient is precisely estimated in all specifications 1-3, though it becomes smaller and loses statistical significance when controlling for YSB-by-demographic group FE (column 4). Of course, the OLS estimates will be biased if the competitors' leave-taking is endogenous to the characteristics of the contestants (i.e. focal father and his competitors). For instance, family-oriented and work-oriented types may sort themselves into different sectors or firms, creating homophily among contestants.<sup>26</sup> Therefore, in contests full of family-oriented types, leave-taking of one worker may have little impact on the earnings of others, as all his competitors also take leave. Moreover, leave-taking may be more common in workplaces where there is less scope for relative comparison by the nature of the work. In both these scenarios, the OLS estimate will be biased downward.

To address this issue, we exploit variation in competitors' policy eligibility (driven by their children's birthdates, which is arguably exogenous to the focal father) and show the intention-to-treat (ITT) effect of competitor eligibility on focal fathers (Table 2, Panel B). Estimates in column 4 show that as the share of leave-eligible competitors increases by 0.37 (1 *SD* in the sample)—which is equal to an additional two out of five competitors (the sample average)—a focal father's earnings increase by an average of 0.85 percent ( $0.37 \times 0.0231 \times 100$ ) annually for the 7 years following his child's birth. Accumulated over the seven years, the estimates above compare to

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<sup>26</sup> For instance, Azmat et al. (2022) suggest “job uniqueness” (i.e. jobs with low substitutability and high requirement of workplace presenteeism) as one possible driver of such worker sorting, in particular between genders.

about 40-50% of the earnings increase associated with a promotion from an assistant shop manager to a shop manager or from a carpenter to a head carpenter in Norway.<sup>27</sup>

Panel C of Table 2 presents the IV estimates, which correspond to the local average treatment effect (LATE) of being exposed to a larger share of leave-taking competitors, induced by their reform eligibility. The estimates in column 4 show that as the share of *leave-taking* competitors increases by 0.31 (1 *SD* in the sample), the post-child earnings of a focal father are on average 1.89 percent ( $0.31 \times 0.0609 \times 100$ ) higher than otherwise.<sup>28</sup> Like in any IV analysis, it is important to interpret our IV estimates as the LATE, in this context the causal effect of competitors' leave ( $C_i$ ) on focal fathers in the marginal contests where  $C_i$  is shifted *because of* our instrument (i.e. competitors' policy eligibility,  $S_i$ ). To understand whether and along what dimensions the marginal contests may differ from the average contests, Table A1 compares the observable characteristics of "compliers" with that of average focal fathers in our sample.<sup>29</sup> Compliers are largely similar to the overall sample although they are more likely to be in a smaller competition group compared to the average focal father in the sample. Such characteristics of compliers should thus be considered when interpreting our IV estimates. In contrast, the ITT effect speaks to the overall sample, and hence our discussion will focus on it for the remainder of the paper.

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<sup>27</sup> These back-of-the-envelope calculations are based on the 7-digit occupation codes available in the 2010 data, since data on occupations are not available for our main analysis window (i.e. 1989-2000). We compute the average wage in each occupation based on men aged 25-36 with earnings above one social security basic unit (1G), similar to the sample used in our main analysis. In 2010, the promotion from an assistant shop manager to a shop manager leads to a 12% increase in earnings (NOK 289,559 to NOK 326,474). Similarly, the promotion from a carpenter to a head carpenter would lead to a 15% increase in earnings (NOK 313,625 to NOK 363,000).

<sup>28</sup> The first stage corresponding to column 4, where we predict the share of leave-taking competitors with the share of leave-eligible competitors, shows a coefficient (SE) of 0.379 (0.017).

<sup>29</sup> "Compliers" are defined as focal fathers in contests in which "high  $S$ " (defined as  $S > 0.5$  (median in sample)) results in "high  $C$ " (defined as  $C > 0.32$  (median in the sample with high share of leave-eligible competitors)). Compliers' mean observable characteristics can be estimated by identifying the shares of always-takers and never-takers in the sample and using those shares to weight the observable characteristics of always-takers and compliers combined and that of always-takers alone, respectively (see, e.g. Almond and Doyle 2011 for a more complete description).



As our observation window is symmetric around the policy cutoff date, around half the focal fathers have a child before (after) the cutoff and are thus leave-ineligible (leave-eligible). Because our empirical strategy relies on shifting the focal father’s *competitors* in and out of leave eligibility while fixing the focal father’s own status, the competition effect can be identified for either leave-ineligible or leave-eligible focal fathers. A priori, the competition effects need not be symmetric for leave-ineligible vs. leave-eligible focal fathers. This depends on whether the ranking-to-reward relationship is linear or not. In the example presented in Section 2.2, the gains from “winning” the competition for the leave-ineligible (leave-eligible) focal father amount to  $W_H - W$  ( $W - W_L$ ), see equation (3). To check the possibility that the competition effect may differ for leave-ineligible vs. leave-eligible focal fathers, we estimate a modified version of equation (5) where we interact the share of leave-eligible competitors ( $S_i$ ) with focal father’s own leave eligibility status ( $Z_i = 1$  if leave-eligible; 0 if leave-ineligible). Results, reported in Table 3, show that the competition effect is largely invariant to the focal father’s own leave eligibility status ( $Z_i$ ) in this context.

## 4.2 Robustness, placebo, and heterogeneity analysis

Table 4 presents additional robustness checks for our primary competition effect. Column 1 replicates our main reduced-form estimate from column 4 of panel B in Table 2. Columns 2 to 5 address potential concerns. First, we account for the possibility that focal fathers having a child at different points in time may be on different earnings paths by adding a birth-year-month specific linear trend in event time (i.e. 18 different trends in year-since-birth). The inclusion of these trends barely affects our results, as shown in column 2. Next, because the number of births within the contest (i.e. the size of the competition group) itself may affect the earnings paths of the contestants

involved, 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+). Our estimate is invariant to these controls, as shown in column 3. Then, to address any concerns about the strategic timing of births, e.g. through changes in the timing of induction and cesarean section procedures (see Gans and Leigh 2009), we exclude from our sample the contests in which any birth (to focal father or competitor) occurs in March or April of 1993 (column 4).<sup>30</sup> The competition effect is still present and similar to that identified for our main sample. Finally, to investigate whether firm changes around child's birth are driving our results, we restrict the sample to focal fathers who stay in the same firm in the year after his child's birth (though this amounts to restriction by endogenous outcomes). Column 5 presents the estimate, which shows that the competition effect is not driven by firm changes.<sup>31</sup>

We next perform a placebo analysis that investigates whether the share of leave-eligible competitors for a hypothetical reform enacted on April 1, 1992 (exactly one year before the actual reform date) would have similarly impacted the focal fathers.<sup>32</sup> As Table 5 shows, the share of “leave-eligible” competitors for this placebo reform has no noticeable impact. This confirms that our main findings, reported in Table 2, do indeed result from the 1993 paid paternity leave policy and not from a higher share of competitors having a child in or after April.

So far, we have focused on the average competition effect across all firms. However, the competition effect (operating via paternity leave) is unlikely to be present in every workplace. For instance, in places where wage increases are mechanical and determined based on seniority and education there is little scope for the competition effect to operate. To confirm that we are indeed

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<sup>30</sup> Since the reform was proposed within 6 months prior to its implementation, there is no scope for strategic timing of *conception* (as opposed to birth). Also, Figure 1 displays no notable changes in the frequency of births after April 1993.

<sup>31</sup> We also examined possible competition effects using establishment change as the outcome and find no significant effect (see Appendix Table A2).

<sup>32</sup> The sample of focal fathers for this exercise is constructed similarly to that for our main analysis; that is, male workers having a parity one child born within 9 months on either side of the (placebo) reform date of April 1, 1992.

identifying a competition effect among workers, we test whether the estimated competition effects are stronger in contests and competition groups in with the highest dispersion of expected prizes (the spread between  $W_H$  and  $W_L$  in Section 2.2), as suggested by Lazear and Rosen (1981). To proxy the expected prize relevant to each contest, we use the earnings growth of male workers (aged 25 to 36) in the focal father’s firm from year -2 to 0 since the birth of the focal father’s child (YSB). We then classify the focal fathers into low vs. high dispersion groups based on the standard deviation of the male employees’ earnings growth in their firms. As shown in Table 6 (columns 1 and 2), the estimated competition effects are larger for focal fathers working in firms with more dispersed earnings growth, where the competition aspect is likely to be more relevant.

To further capture the intensity of competition, we also consider additional dimensions of firm heterogeneity: firm size growth and availability of “high-level” jobs. We define firm size growth as percentage change in employment from YSB = -2 to YSB = 0. Following Bianchi et al. (*forthcoming*), we measure the availability of high-level jobs as the share of “top earners” within the focal father’s firm, where the top earners are defined as workers with an above-median wage on a wage distribution calculated within county by two-digit industry by firm-size category cells. As expected, the competition effect is stronger in slower-growing firms (columns 3 and 4) or firms with a lower share of high-level jobs (columns 5 and 6), where promotion slots must be relatively scarce (see Lazear et al. 2018; Bianchi et al. *forthcoming*).<sup>33</sup>

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<sup>33</sup> In another heterogeneity analysis presented in Appendix Table A3, we show that the competition effect is driven by focal fathers in smaller (i.e. below-median-sized) firms, where the variation in leave-eligible competitors is larger and the contestants we identify are more likely to compete with one another.

### 4.3 The scope of competition

Our analysis primarily focuses on male-to-male comparisons among fathers having a child within the same pre-specified window, to stress the mechanics of the competition effect operating along the paternity leave margin (conditional on child's birth). Given our objective, comparing workers with and without fathering a child within the same window will be problematic as child's birth itself may impact career trajectories, irrespective of (parental) leave. Moreover, the timing of child's birth is unlikely to be random to a worker's lifecycle and career stages, making it difficult to establish comparability between workers with and without children. Despite these, we explore the impact of paternity leave eligibility on other types of co-workers in the firm, to shed light on the scope of paternity leave's competition effect (e.g. all workers in the firm vs. male workers fathering a child).

In order to investigate how paternity leave affects non-father co-workers, we focus on firms with at least two births among male employees during the 18-month window around the policy cutoff date, i.e. firms comparable to those in our main analysis. Within these firms, we define “focal workers” as men and women aged 25 to 36 as of 1992 with stable employment in the specific firm.<sup>34</sup> We compute, for each focal worker, the share of leave-eligible fathers among male co-workers who fathered a child during the 18-month period and who meet the criteria for being a competitor of the focal worker.<sup>35</sup> We then examine—in a specification similar to equation (5)—how the share of leave-eligible father competitors affects the earnings development of different

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<sup>34</sup> Stable employment here is defined as consecutive employment in the firm during 1990-1993.

<sup>35</sup> These competitor criteria are defined similarly as before, as having similar age ( $\pm 4$  years) and education level to the focal worker and overlapping with the focal worker in the firm in the period 1990 to 1993.

groups of non-father co-workers from the pre-reform (1990-1993) to the post-reform (1994-1999) periods.<sup>36</sup>

The effects of male competitors' paternity leave (eligibility) on the earnings of different types of co-workers inside the firm are reported in Table 7. Panel A shows the effect on non-fathers, who like the focal fathers in our main sample, experience an increase in post-1993 earnings when the share of leave-eligible male competitors is larger. The effect size is smaller (and less statistically significant), which would be expected if workers with and without children's births in the 18-month window are *ex ante* on less comparable stages of their careers.

Turning to the effect on female workers, Panel B of Table 7 shows a similar-sized effect on female focal workers who also mothered a child in the narrow window around the reform, however, with large standard errors that span zero. Panel C reveals no effect on female focal workers who are non-mothers. The null effect of male competitors' leave eligibility on female focal workers is consistent with the idea of gender-specific within-firm comparisons of workers. Moreover, due to gender differences in fields of study and occupational choices, our approximation of competitors based on age and education level here may be less suited to identifying relevant co-workers when it comes to comparison between genders.<sup>37</sup> Furthermore, the fact that paternity leave (4-5 weeks) here is far shorter than maternity leave (41 weeks on average) may be yet another reason why new fathers' paternity leave does not advance the earnings of their female competitors who are new mothers.

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<sup>36</sup> We also restrict our attention to workers with annual earnings above one social security basic unit (1G) during the analysis window.

<sup>37</sup> Unfortunately, we do not have data on occupations for the period studied here.

## 5. Total Effect of Own Leave

Our design exploits variation in the leave eligibility of competitors only, and not that of the focal father. However, one implication of the competition effect is that within contests (and all else equal), leave-ineligible workers should do better than leave-eligible workers due to their higher relative rank and the potential direct consequences of their own absolute leave (e.g. skill depreciation).<sup>38</sup> To test this implication, we compare leave-ineligibles with leave-eligibles, at both the market level (as in the literature, see e.g. Rege and Solli 2013; Dahl et al. 2014) and within firms (by including plant-by-YSB FE). To allow for within-firm comparisons, our sample is limited to firms with at least two focal fathers (or contests). We then estimate a variant of equation (5), replacing the share of leave-eligible competitors ( $S_i$ ) with the focal father's own leave eligibility ( $Z_i$ ).

The results of this comparison between leave-ineligible and leave-eligible focal fathers are presented in Table 8. Column 1 re-estimates equation (5) based on this sub-sample, using the same specification as column 4 of Panel B in Table 2. It again shows the positive effect of competitors' leave eligibility ( $C_i$ ) on the earnings of focal fathers. Column 2 shows that, at the market level, the effect of the focal father's own leave eligibility ( $Z_i$ ) on own earnings is around -1.57 percent. This *total* effect is similar in magnitude to that reported in previous studies of the Norwegian paternity leave reform. For instance, Rege and Solli (2013) report ITT estimates on earnings of -1 to -3 percent based on a DID design whereas Dahl et al. (2014) show a statistically insignificant effect size of -1.8 percent in an RD approach.

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<sup>38</sup> That leave-ineligibles do better than leave-eligibles inside the contest is a necessary but not a sufficient condition for the presence of the competition effect.

To shed light on the driver of the total effect, we repeat the analysis in column 2 while conditioning on  $Rank_i$ , defined as the difference between the share of leave eligible competitors and the focal father's own leave eligibility (i.e.  $S_i - Z_i$ ).<sup>39</sup> As illustrated in Figure A3, this  $Rank_i$  variable is centered at zero and distributed between -1 (focal father ranked lowest) and 1 (focal father ranked highest), where 0 indicates symmetric eligibility for the focal father and his competitors. When  $Rank_i$  is added to the regression,  $Post_{\tau(it)} \times Z_i$  measures the effect of own leave while holding the focal father's ranking in the contest fixed. As column 3 of Table 8 shows, once the competition channel is shut down, the effect of own leave eligibility converges to zero, suggesting that the competition effect is the main driver of the observed total effect in this setting. In columns 4-6, we allow for firm-by-YSB FE, thereby comparing the earnings evolution of leave-eligibles with that of leave-ineligibles inside the same firm. The patterns are largely similar to that found at the market level (columns 1-3). Moreover, the total effect measuring the difference between leave-eligible focal fathers and leave-ineligible focal fathers becomes larger and statistically significant when conditioning on firm-by-YSB FE and thereby exploiting within-firm variations only (column 5 vs. column 2).<sup>40</sup>

Taken together, the above results confirm prior research on the 1993 reform that the total effect of the new father's own leave on his earnings is negative. More importantly, however, our results provide the novel insight that, in this context, the total effect on earnings is driven by the competition (rank) effect rather than any direct (absolute) effect stemming from one's own leave.

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<sup>39</sup> More precisely, we condition on  $Post_{\tau(it)} \times Rank_i$ . The level effect of  $Rank_i$  is subsumed in the individual fixed effect  $\phi_i$ .

<sup>40</sup> In Table A4, we also provide evidence that the results in Table 8 are robust to using birth windows narrower than 2x9 months used in our baseline. Unlike the competition effect, where we invoke conditional independence assumption (CIA) with respect to *competitors'* policy eligibility (i.e. competitors' children being born after the policy cutoff date), analysis of total effect here necessitates CIA with respect to *own* policy eligibility. This is a stricter requirement since there may be some scope for influencing the birthdate of one's own child even when the worker cannot influence the birthdates of his competitors' children.

## 6. Conclusions

In this paper, we propose the idea of implicit tournaments to shed light on the prevalence of workplace rat races that require the presence or visibility of workers in the firm. While informal and implicit, this type of competition can nevertheless create winners and losers and lead to collectively undesirable outcomes for the employees such as excessive working hours, low uptake of statutory leave, and presenteeism.

To illustrate the significance of implicit tournaments, we focused on the case of paternity leave among new fathers exploiting a 1993 policy reform in Norway that exogenously shifted the relative leave status of otherwise comparable workers within a firm. Our findings show that a focal worker is put on a better earnings trajectory when a larger share of his competitors take leave because of the reform, attesting to the competition effect. In contrast, the focal worker's own leave has no negative impact on his earnings as long as his competitors also take leave. This suggests that the *total* effect of own leave on own earnings is mainly driven by the *competition* effect (activated by the asymmetric leave status of the contestants) rather than any *direct* effect resulting from own leave (e.g. skill depreciation or changes in work-family priorities). With effective coordination, it should thus be possible to avoid unproductive competition and eliminate unwarranted career consequences of taking paternity leave.

Although we focused on male-to-male comparison to “de-gender” the mechanism and facilitate clean identification of the hypothesized competition effect, the logic of the competition effect also speaks to policies aimed at promoting gender equality, e.g. the European Council's adoption of the *Directive on work-life balance for parents and carers* (EU Council Directive 2019/1158) which mandates 2 months of paid, non-transferable parental leave for the father. Our analysis suggests that while such policies—to the extent that they normalize leave-taking among



all fathers—may be effective in eliminating the earnings penalty for leave-taking men, as long as the length of parental leave remains skewed towards women, the playing field is unlikely to be leveled for female and male workers competing in promotions and career advancement. Therefore, the duration of paternity leave needed for equal progression of women and men on the firm hierarchy will be a question worth investigating in future research.

Our findings also have implications for the increasingly important debate on alternative and flexible work arrangements. In particular, to suppress the competition (rank) effect while accommodating workers' increasing demand for flexible work arrangements, it is crucial to maintain symmetry between (otherwise comparable) employees. Otherwise, workers who opt for more remote work days or on different days of the week than the manager, for instance, may be unduly disadvantaged in promotion. A similar argument should apply for 4-day workweek, a policy being actively debated in many businesses. These implications highlight the importance of considering how alternative work arrangements can be structured to avoid creating unintended consequences for workers.

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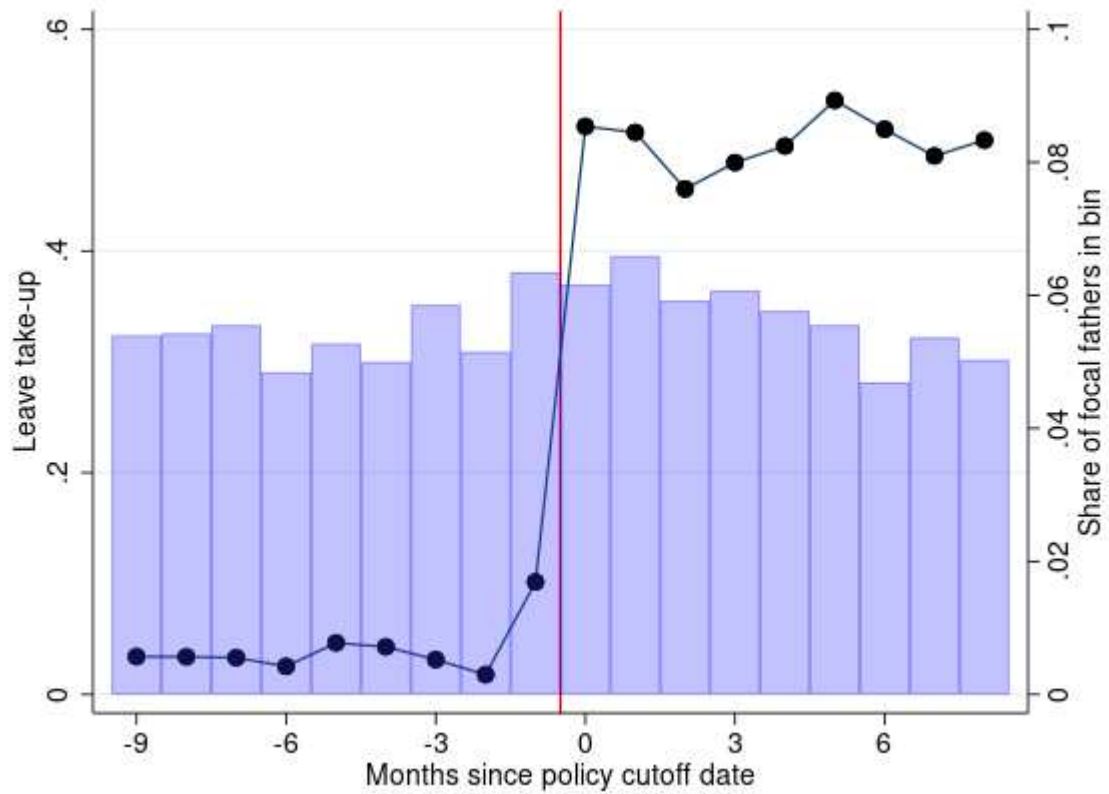
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Figure 1. The new paid paternity leave quota and parental leave take-up among focal fathers



*Notes:* The connected dots in the figure plots the share of leave-taking focal fathers (measured on the left axis) by calendar month relative to the implementation month of the new paternity leave policy (April 1993). Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota. The bars in the figure represent the distribution of focal fathers in our sample (measured on the right axis) by child birth month.

*Data source:* Norwegian birth register and social security records.

Figure 2. Illustration of research design

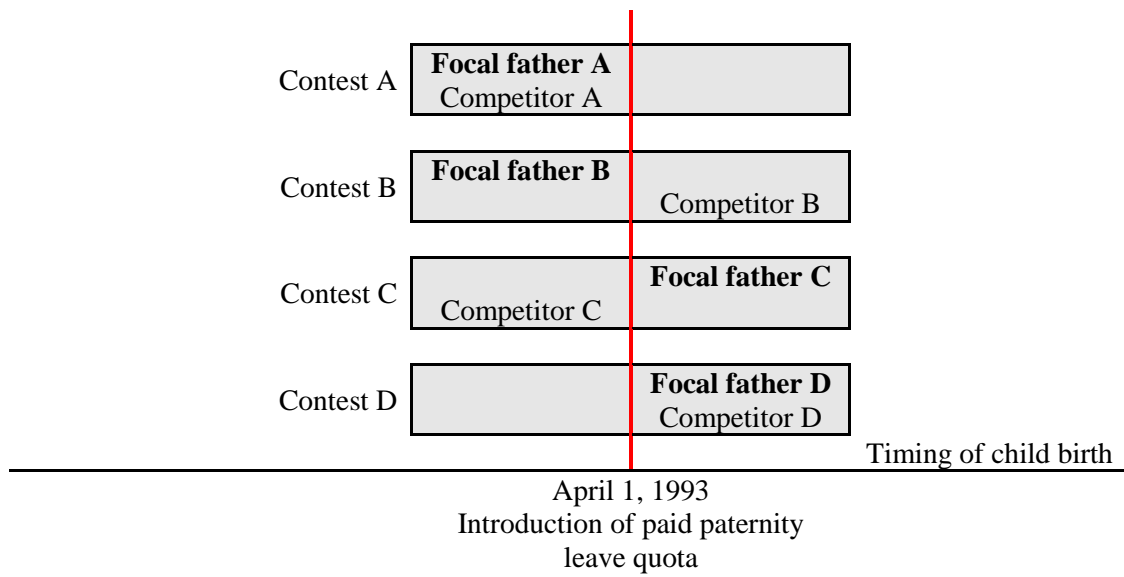
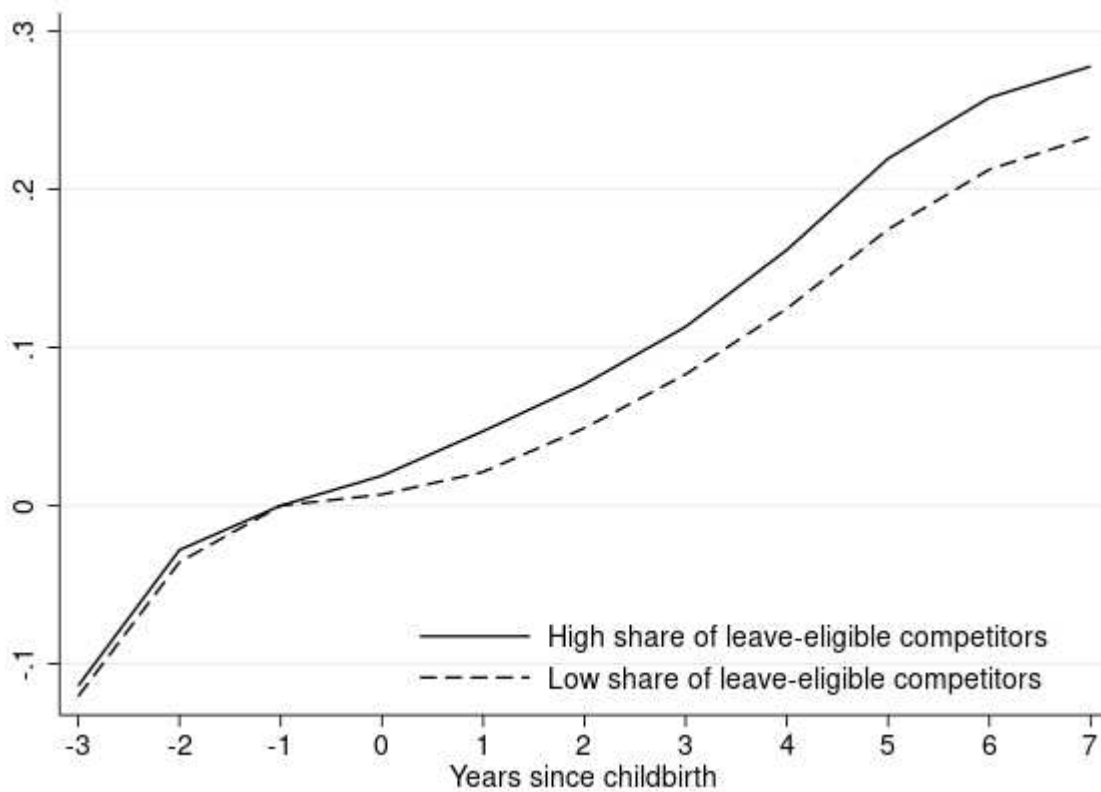


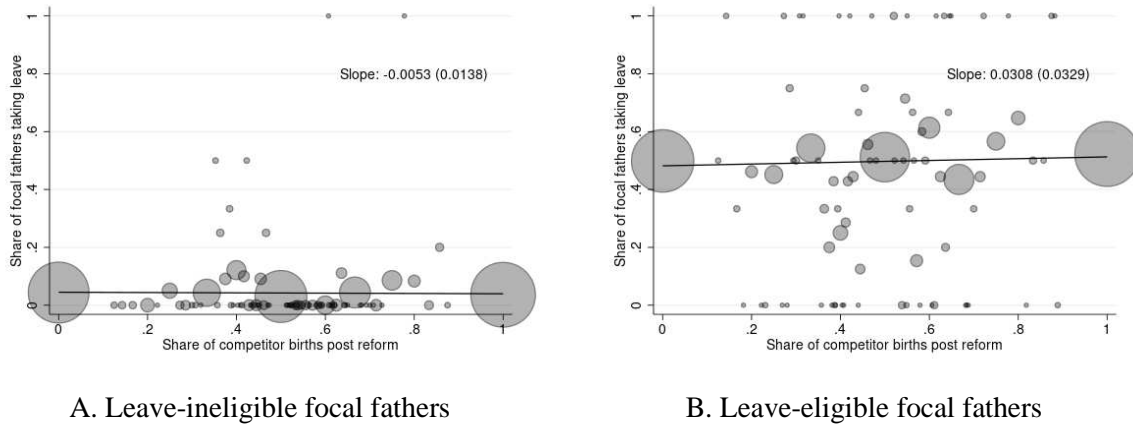
Figure 3. Raw trends in focal fathers' log earnings: High versus low share of leave-eligible competitors



*Notes:* The figure presents average log earnings of focal fathers relative to the year before childbirth (i.e. year-since-birth = -1). The solid line represents focal fathers with a high share of leave-eligible competitors (i.e. share of leave-eligible competitors being higher than 0.5). The dashed line represents focal fathers with a low share of leave-eligible competitors (i.e. share of leave-eligible competitors being at most 0.5). Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father.

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.

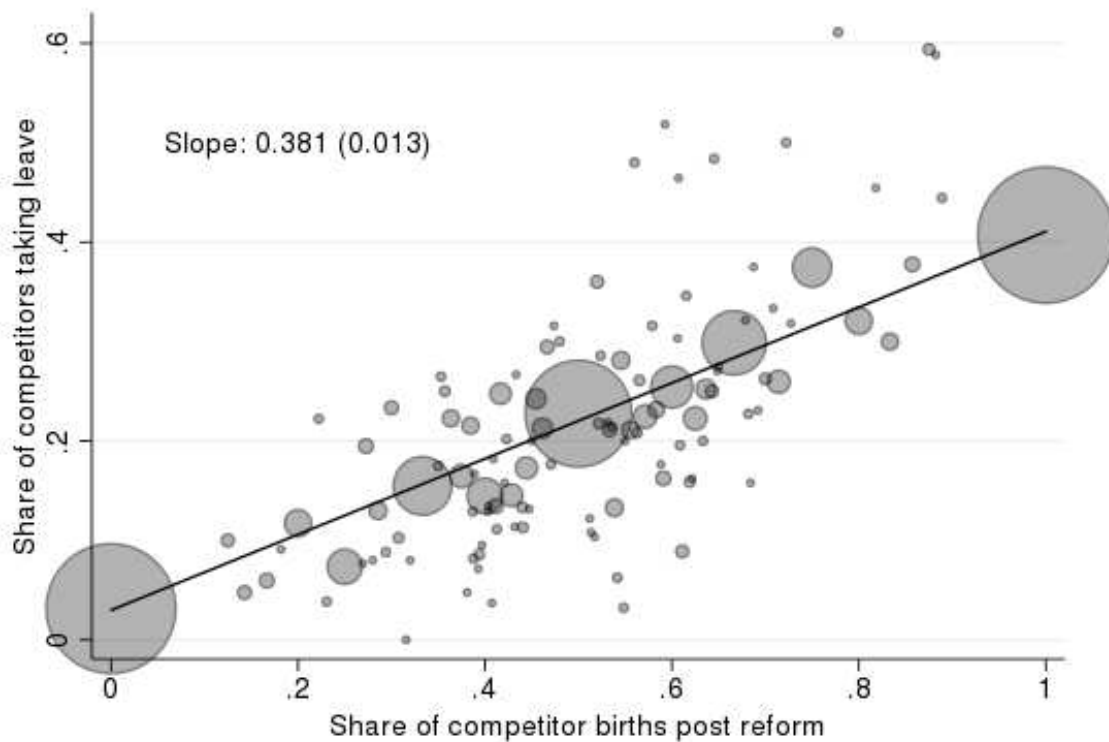
Figure 4. Focal father's leave uptake is orthogonal to the leave eligibility of his competitors



*Notes:* The figure plots the share of focal fathers taking parental leave against the share of competitors eligible for the paid paternity leave quota, separately by focal fathers' own eligibility status. The size of each circle is proportional to the number of focal fathers with the given share of leave-eligible competitors. The separate panels also report the slope of the best-fit (weighted) line along with the standard error of the estimate (in parentheses). The figure is based on our main sample of focal fathers and their competitors. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father.

*Data source:* Norwegian birth register, social security records, and matched employer-employee data.

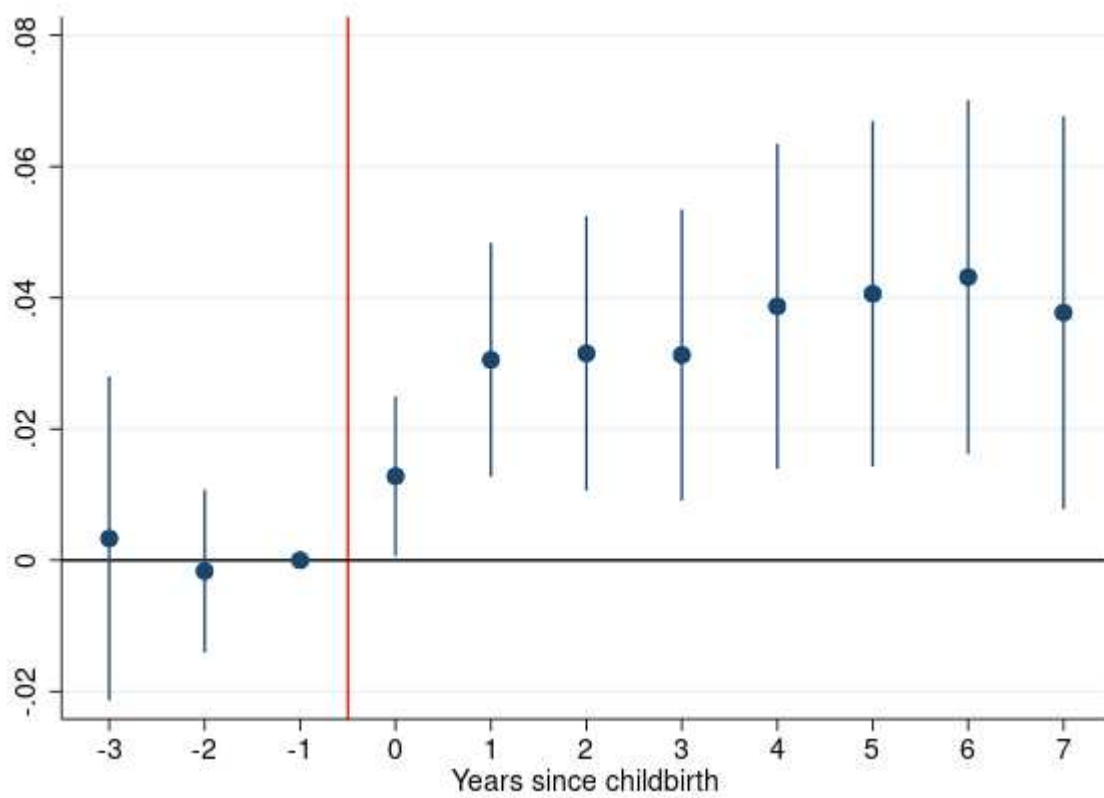
Figure 5. Share of *leave-eligible* competitors predicts share of *leave-taking* competitors



*Notes:* The figure plots the share of focal fathers' competitors taking parental leave against the share of competitors eligible for the paid paternity leave quota. The size of each circle is proportional to the number of focal fathers with the given share of leave-eligible competitors. The figure also reports the slope of the best-fit (weighted) line along with the standard error of the estimate (in parentheses). The figure is based on our main sample of focal fathers and their competitors. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father.

*Data source:* Norwegian birth register, social security records, and matched employer-employee data.

Figure 6. Effect of competitors' leave eligibility on focal fathers' log earnings: Event study



*Notes:* This figure displays the event year specific effects of the share of leave-eligible competitors on log earnings of focal fathers, estimated from a variant of equation (4), where the share of competitors taking leave is replaced with the share of competitors eligible for leave. All effects are relative to the year before childbirth (i.e. year-since-birth = -1). The vertical lines indicate 95 percent confidence intervals, clustered at the initial firm level. The regression includes individual FE and event time FEs. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father.

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.

Table 1. Characteristics of focal fathers

	Overall		By share of <i>leave-eligible</i> competitors				t-test p-value (7)
			Low share ( $\leq 0.5$ )		High share ( $> 0.5$ )		
	Mean (1)	SD (2)	Mean (3)	SD (4)	Mean (5)	SD (6)	
<i>Focal father</i>							
Birth year of child	1992.7	0.5	1992.7	0.5	1992.7	0.5	0.99
Male child	0.53	0.50	0.53	0.50	0.52	0.50	0.85
Post-reform birth	0.51	0.50	0.51	0.50	0.51	0.50	1.00
Take-up of parental leave	0.28	0.45	0.27	0.44	0.28	0.45	0.60
Leave duration (days)	37.7	42.0	38.8	47.2	36.3	34.7	0.39
Age at birth of child	29.7	3.0	29.8	3.0	29.7	3.1	0.19
Earnings (in 1,000 NOK)	247	96	248	94	247	99	0.76
Education							
$\leq 2$ years of high school	0.21	0.41	0.22	0.41	0.21	0.41	0.41
High school diploma	0.69	0.46	0.69	0.46	0.69	0.46	0.86
$\leq 4$ year college degree	0.05	0.22	0.05	0.21	0.06	0.23	0.36
$> 4$ years of college	0.05	0.21	0.04	0.21	0.05	0.22	0.32
<i>Focal father's competitors</i>							
Number of competitors	4.77	7.14	4.85	7.60	4.68	6.51	0.50
Share of leave-eligible competitors <sup>a)</sup>	0.52	0.37	0.24	0.22	0.86	0.17	$<0.01$
Share of leave-taking competitors <sup>a)</sup>	0.23	0.31	0.12	0.20	0.36	0.38	$<0.01$
Number of focal fathers	3261		1820		1441		
<i>Focal father's firm</i>							
Contests per firm	2.03	2.16	2.33	2.50	2.45	2.65	0.30
Firm size	201	391	236	444	240	466	0.84
$1(\text{firm size}<10)$	0.04	0.21	0.03	0.18	0.05	0.21	0.10
$1(10\leq\text{firm size}<50)$	0.31	0.46	0.27	0.45	0.28	0.45	0.70
$1(50\leq\text{firm size}<250)$	0.44	0.50	0.45	0.50	0.42	0.49	0.21
Public sector	0.12	0.33	0.13	0.33	0.11	0.32	0.38
Mean earnings in firm	235	87	235	70	235	94	0.93
Mean age in firm	38.8	4.2	39.0	4.1	38.8	4.2	0.17
Mean share of male employees	0.74	0.19	0.74	0.19	0.75	0.19	0.71
Mean share of HS educated empl.	0.58	0.21	0.58	0.20	0.58	0.21	0.71
Mean years of education in firm	11.30	1.29	11.30	1.27	11.27	1.29	0.69
Number of firms	1610		1082		895		

*Notes:* The table presents summary statistics for our main sample of focal fathers, both overall (columns 1 and 2) and by low (columns 3 and 4) vs. high (columns 5 and 6) share of leave-eligible competitors. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are within-plant co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. Eligibility for the paid paternity leave quota is based on having a child after the introduction of the policy on April 1<sup>st</sup>, 1993. All variables are measured at the birth year of the focal father's child.

<sup>a)</sup> Note that for these variables, column 3 and column 5 differ by construction. *Data source:* Data on father's age at the birth of his child plus birth year and gender of the child comes from the Norwegian birth register. Data on take-up and duration of parental leave comes from social security registers. Data on earnings comes from tax registers. Earnings are deflated to 1993 Norwegian kroner using the CPI. Education data comes from national education registers. Firm data comes from employer-employee registers which we also use to link focal fathers to their competitors and to calculate average characteristics of competitors.

Table 2. Effect of *competitors'* leave on focal fathers' log earnings

Dependent variable: Focal father's log earnings				
	(1)	(2)	(3)	(4)
<b>A. OLS</b>				
Post × Share of <i>leave-taking</i> competitors	0.0312** (0.012)	0.0310** (0.012)	0.0328*** (0.012)	0.0139 (0.011)
<b>B. Reduced form</b>				
Post × Share of <i>leave-eligible</i> competitors	0.0327*** (0.010)	0.0328*** (0.010)	0.0301*** (0.010)	0.0231** (0.009)
<b>C. IV</b>				
Post × Share of <i>leave-taking</i> competitors	0.0860*** (0.027)	0.0860*** (0.027)	0.0788*** (0.026)	0.0609** (0.025)
Individual FE	Y	Y	Y	Y
Years-since-birth (YSB) FE	Y			
YSB-by-birth year FE		Y	Y	Y
Quadratic polynomial in age			Y	Y
YSB-by-demographic group FE				Y
Observations	35871			

*Notes:* This table reports estimates of equation (5) based on our main sample of focal fathers, covering year-since-birth (YSB) from -3 to 7. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. Demographic group is defined as education-by-age at child birth cell. Panel A reports OLS estimates of equation (5). Panel B reports reduced-form estimates of equation (5), replacing share of leave-taking competitors with share of leave-eligible competitors as the explanatory variable. Panel C reports IV estimates of equation (5), where the share of leave-taking competitors is instrumented by the share of leave-eligible competitors. The first stage corresponding to column 4 shows a coefficient (SE) of 0.379 (0.017). Standard errors are clustered at initial the firm level, within which the competition group for each focal father is defined. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, social security records, and matched employer-employee data.



Table 3. Competition effect by focal father's *own* leave eligibility

Dependent variable: Focal father's log earnings				
	(1)	(2)	(3)	(4)
Post $\times$ Share of leave-eligible competitors ( <i>S</i> )	0.0291*** (0.011)	0.0310*** (0.011)	0.0298*** (0.011)	0.0264** (0.011)
Post $\times S \times$ Focal father is leave eligible	0.0070 (0.013)	0.0034 (0.015)	0.0005 (0.015)	-0.0064 (0.014)
Individual FE	Y	Y	Y	Y
Years-since-birth (YSB) FE	Y			
YSB-by-birth year FE		Y	Y	Y
Quadratic polynomial in age			Y	Y
YSB-by-demographic group FE				Y
Observations	35871			

*Notes:* This table reports reduced-form estimates of a variant of equation (5) in which we interact the share of leave-eligible *competitors* with a dummy indicating focal father's *own* leave-eligibility. The analysis is based on our main sample of focal fathers, covering year-since-birth (YSB) from -3 to 7. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. Demographic group is defined as education-by-age at child birth cell. Standard errors are clustered at the initial firm level. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, social security records, and matched employer-employee data.

Table 4. Robustness of the competition effect

Dependent variable: Focal father's log earnings					
	Specification				
	(1)	(2)	(3)	(4)	(5)
Post $\times$ Share of leave-eligible competitors	0.0231** (0.009)	0.0223** (0.009)	0.0228** (0.009)	0.0249** (0.011)	0.0264*** (0.009)
Individual FE	Y	Y	Y	Y	Y
YSB-by-birth year FE	Y	Y	Y	Y	Y
Quadratic polynomial in age	Y	Y	Y	Y	Y
YSB-by-demographic group FE	Y	Y	Y	Y	Y
Linear trend by birth year-month		Y			
Linear trend by number of competitor births			Y		
Drop March and April 1993				Y	
Focal father same firm in YSB=1					Y
Observations	35871	35871	35871	20768	30965

*Notes:* This table reports reduced-form estimates of equation (5) based on our main sample of focal fathers, covering year-since-birth (YSB) from -3 to 7. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. Column 1 replicates our main specification (column 4 of Table 2). Column 2 adds birth year-month specific linear trend in event time (YSB). Column 3 adds number of births among competitors (1, 2, 3, 4, 5+) specific linear trend in event time (YSB). Column 4 is a donut specification dropping contests that include any births (to focal father or to competitor) occurring in March or April 1993. Column 5 restricts the sample to focal father who remain in the same firm at least one year post child birth. Standard errors are clustered at the initial firm level. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.

Table 5. Competition effect from a placebo reform

Dependent variable: Focal father's log earnings				
	(1)	(2)	(3)	(4)
Post × Share of “leave-eligible” competitors	-0.000 (0.009)	-0.0015 (0.009)	-0.0042 (0.009)	-0.0116 (0.009)
Individual FE	Y	Y	Y	Y
Years-since-birth (YSB) FE	Y			
YSB-by-birth year FE		Y	Y	Y
Quadratic polynomial in age			Y	Y
YSB-by-demographic group FE				Y
Observations	39721			

*Notes:* This table reports reduced-form estimates of equation (5), in which leave-eligibility is based on a placebo reform date of April 1<sup>st</sup>, 1992 (as opposed to the actual reform date of April 1<sup>st</sup>, 1993 in our main analysis). For this analysis, focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the placebo reform on April 1<sup>st</sup>, 1992. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. Share of “leave-eligible” competitors is the share of competitors with child birth on or after April 1, 1992. *Post* is 1 for (focal father's) year-since-birth (YSB) of 0 to 7, and 0 for YSB of -3 to -1. Standard errors are clustered at the initial firm level. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.

Table 6. Effect heterogeneity: Effect is stronger in settings where competition matters more

	Dependent variable: Focal father's log earnings					
	<i>Expected prizes in the contest</i>		<i>By firm size growth</i>		<i>By firm-level availability of high-level jobs</i>	
	Low dispersion ( $\leq$ median) (1)	High dispersion ( $>$ median) (2)	Low growth ( $\leq$ median) (3)	High growth ( $>$ median) (4)	Low availability ( $\leq$ median) (5)	High availability ( $>$ median) (6)
Post $\times$ Share of leave-eligible <i>competitors</i> ( <i>S</i> )	0.0120 (0.011)	0.0320** (0.016)	0.0364*** (0.013)	0.0087 (0.013)	0.0266** (0.012)	0.0153 (0.014)
Individual FE	Y	Y	Y	Y	Y	Y
YSB-by-birth year FE	Y	Y	Y	Y	Y	Y
Quadratic polynomial in age	Y	Y	Y	Y	Y	Y
YSB-by-demographic group FE	Y	Y	Y	Y	Y	Y
Observations	18029	17666	18458	17413	19514	16357

*Notes:* This table reports heterogenous effects of implicit competition for our main sample of focal fathers, covering year-since-birth (YSB) from -3 to 7. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. Expected prizes in the contest are defined as the standard deviation of earnings growth from (focal father's) YSB -2 to 0 of male workers aged 25 to 36 who are employed in the same plant as the focal father (results are robust to measuring dispersion as P90/P50 instead of SD). The observations from columns 1 and 2 do not add up to 35871, since for 16 (out of 3261) focal fathers, there are no male workers aged 25 to 36 to calculate the earnings growth from focal father's YSB -2 to 0. Firm size growth is defined as percentage growth in firm size of focal father's firm from (focal father's) YSB-2 to 0. Firms growing at  $\leq$  the median rate on average contracted by 14.7% over the defined period, while firms growing at  $>$  the median rate on average grew by 19.0%. Firm level availability of high-level jobs is defined as share of top earners within the focal father's firm, with top earners defined as workers with an above-median wage, relative to a wage distribution calculated within a county by two-digit industry sector by firm-size category cell (following Bianchi et al. forthcoming). We control for individual FEs, YSB-by-birth year FE, YSB-by-education-by-age at child birth cell FE, and a quadratic polynomial in focal father's age. Standard errors are clustered at the initial firm level. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.

Table 7. Effect of *competitors'* leave on different types of focal workers

Dependent variable: Focal worker's log earnings				
	(1)	(2)	(3)	(4)
<b>A. Focal worker = male, non-father</b>				
Post × Share of <i>leave-eligible</i> competitors	0.0136*	0.0136*	0.0120*	0.0129*
	(0.007)	(0.007)	(0.007)	(0.007)
N	140720			
<b>B. Focal worker = female, mother</b>				
Post × Share of <i>leave-eligible</i> competitors	0.0068	0.0068	0.0074	0.0135
	(0.037)	(0.037)	(0.037)	(0.033)
N	10580			
<b>C. Focal worker = female, non-mother</b>				
Post × Share of <i>leave-eligible</i> competitors	-0.0098	-0.0098	-0.0054	-0.0053
	(0.015)	(0.015)	(0.014)	(0.013)
N	59390			
Individual FE	Y	Y	Y	Y
Years-since-birth (YSB) FE	Y			
YSB-by-birth year FE		Y	Y	Y
Quadratic polynomial in age			Y	Y
YSB-by-demographic group FE				Y

*Notes:* This table reports estimates of equation (5) based on a sample of focal workers covering calendar years 1990 to 1999. Focal workers are defined as workers in plants with at least two births among male competitors in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. We define competitors as those with same education level as We calculate share of leave-eligible competitors among co-workers who fathered a child in the 18-month window and have similar age and education as the focal father. Demographic group is defined as education-by-age in 1992 cell. Post = 1 if calendar year > 1993. Standard errors are clustered at initial the firm level, within which the competition group for each focal non-father is defined. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, social security records, and matched employer-employee data.

Table 8. Effect of focal father's *own* leave eligibility on his log earnings

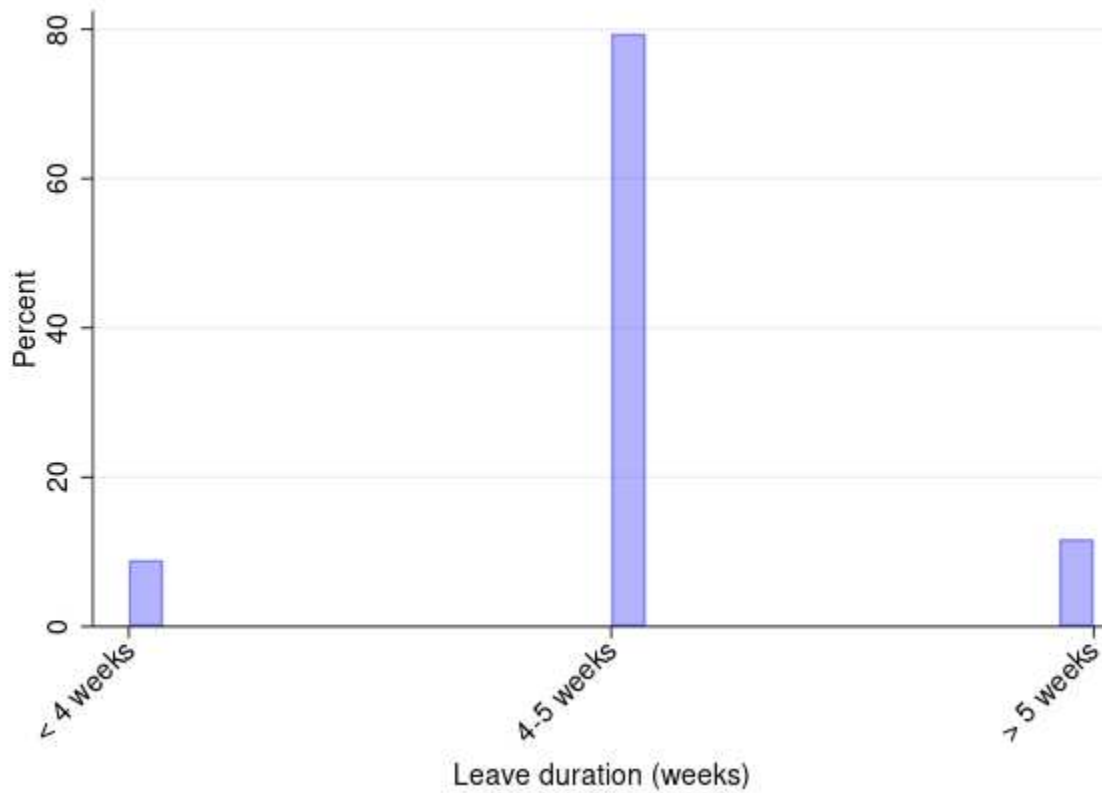
	Dependent variable: Focal father's log earnings					
	Specification					
	(1)	(2)	(3)	(4)	(5)	(6)
Post $\times$ Share of leave-eligible <i>competitors</i> ( <i>S</i> )	0.0250** (0.013)			0.0415** (0.018)		
Post $\times$ <i>Own</i> leave-eligibility ( <i>Z</i> )		-0.0157 (0.012)	0.0093 (0.019)		-0.0326*** (0.012)	0.0060 (0.028)
Post $\times$ <i>Rank</i> ( <i>S</i> – <i>Z</i> )			0.0249** (0.013)			0.0313 (0.019)
Individual FE	Y	Y	Y	Y	Y	Y
YSB-by-birth year FE	Y	Y	Y	Y	Y	Y
Quadratic polynomial in age	Y	Y	Y	Y	Y	Y
YSB-by-demographic group FE	Y	Y	Y	Y	Y	Y
Plant-by-YSB FE				Y	Y	Y
Observations	25960					

*Notes:* This table reports reduced-form estimates of equation (5), based on a subsample of focal fathers who have at least one other focal father in the same firm, covering year-since-birth (YSB) from -3 to 7. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. We define *Rank* as focal father's share of leave-eligible competitors minus the focal father's own eligibility status. *Rank* is centred at zero and distributed between -1 (focal father ranked lowest) and 1 (focal father ranked highest), where 0 indicates symmetric eligibility for the focal father and his competitors. Demographic group is defined as education-by-age at child birth cell. Column (1) reports reduced-form estimates of equation (5) for the above-mentioned subsample of focal fathers using our main specification (column 4 of Table 2). Column 2 estimates a variant of equation (5) where the share of leave-eligible competitors is replaced with the focal father's own leave eligibility. Column 3 adds Post  $\times$  Rank change to the specification in column 2. Columns 4 through 6 adds Plant-by-YSB FEs to the specifications in columns 1 through 3, respectively. Standard errors are clustered at the initial firm level. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.

## Appendix A

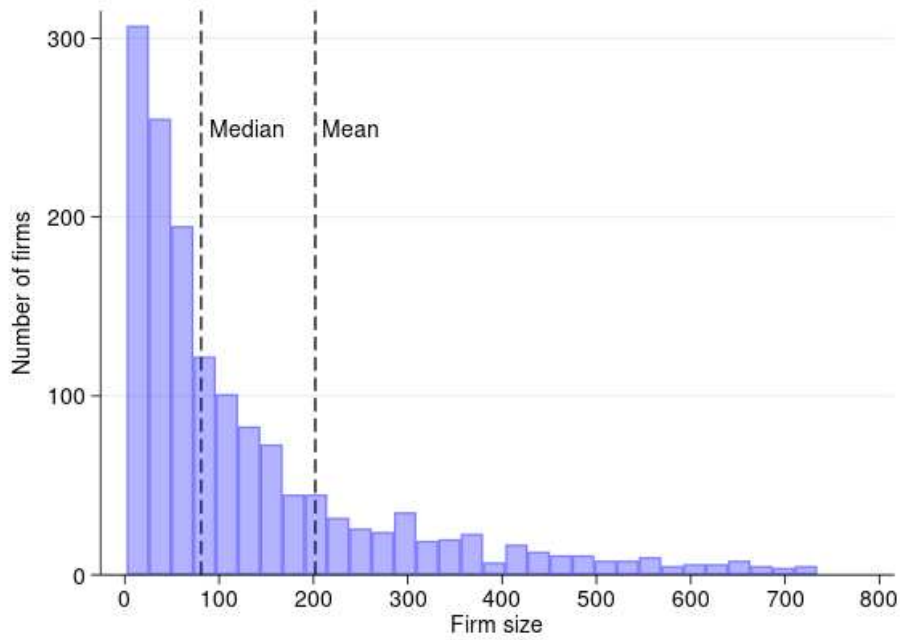
Figure A1. Distribution of paternity leave duration for leave-taking focal fathers



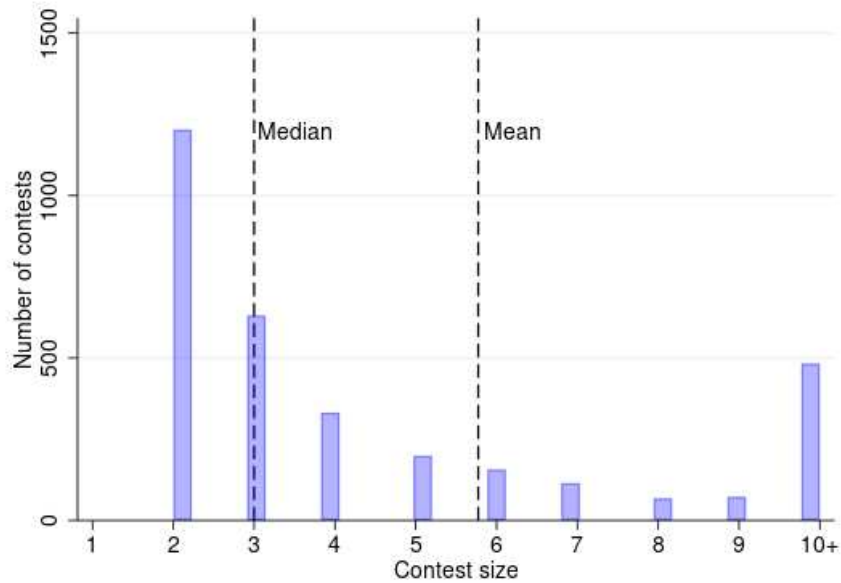
*Notes:* This figure shows the distribution of paternity leave duration for leave-eligible focal fathers who take up leave. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993.

*Data source:* Norwegian birth register and social security records.

Figure A2. Distribution of firm and contest sizes in the sample



(A) Firm size

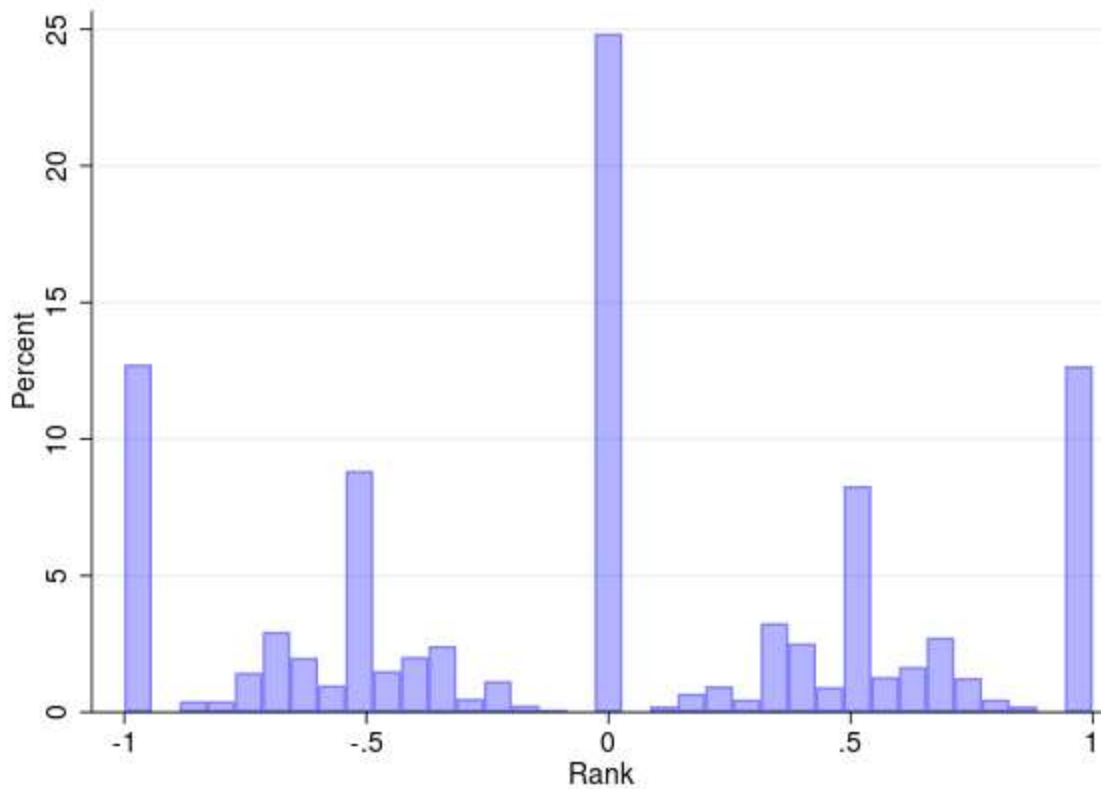


(B) Contest size

Note: For expositional reasons, the horizontal axis in Panel A is capped at P95 of within-sample firm size (737). The mean firm size is 201, while the median is 81. A contest is defined as the focal father plus the number of his competitors. The mean contest size is 5.8 while the median is 3.



Figure A3. Distribution of focal fathers' rank, based on focal fathers' and competitors' eligibility for the paid paternity leave quota.



*Notes:* This figure shows the distribution of focal father's *Rank* within the contest. We define *Rank* as  $S - Z$ , where  $S$  is the share of focal father's competitors eligible for the paid paternity leave quota and  $Z$  is the focal father's own eligibility status. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Rank* is centred at zero and distributed between -1 (focal father ranked lowest) and 1 (focal father ranked highest), where 0 indicates symmetric eligibility for the focal father and his competitors.

*Data source:* Norwegian birth register, social security records, and matched employer-employee data.

Table A1. Characteristics of compliers

	Complier Mean	Overall Mean
<i>Focal father</i>		
Birth year of child	1992.7	1992.7
Male child	0.54	0.53
Post-reform birth	0.54	0.51
Take-up of parental leave	0.31	0.28
Leave duration (days)	37.3	37.7
Age at birth of child	29.7	29.7
Earnings (in 1,000 NOK)	250	247
Education		
≤ 2 years of HS	0.16	0.21
HS diploma	0.69	0.69
≤ 4 yr college degree	0.10	0.05
>4 yrs of college	0.05	0.05
<i>Focal father's competitors</i>		
# competitors	4.18	4.77
Share of leave-eligible competitors <sup>a)</sup>	1.15	0.52
Share of leave-taking competitors <sup>a)</sup>	0.82	0.23
<i>Focal father's firm</i>		
Contests per firm	4.94	4.34
Firm size	534	442
1(firm size<10)	0.05	0.03
1(10≤firm size<50)	0.20	0.20
1(50≤firm size<250)	0.32	0.37
Public sector	0.23	0.14
Mean earnings in firm	236	239
Mean age in firm	39.3	39.2
Mean share of male employees	0.71	0.75
Mean share of HS educated empl.	0.60	0.58
Mean years of education in firm	11.54	11.32

*Notes:* The table shows average characteristics for “compliers” and the overall sample of focal fathers. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. “Compliers” are defined as focal fathers in contests in which “high share of leave-eligible competitors” (defined as > 0.5 (median in sample)) results in “high share of leave-taking competitors” (defined as > 0.32 (median in the sample with high share of leave-eligible competitors)). Compliers’ mean observable characteristics are estimated following the procedure described in Almond and Doyle (2011), where we first identify the shares of always-takers and never-takers in the sample and then use those shares to weight the observable characteristics of always-takers and compliers combined and that of always-takers alone, respectively.

<sup>a)</sup> Note that for these variables, complier mean and overall mean differ by construction.

*Data source:* Data on father’s age at the birth of his child plus birth year and gender of the child comes from the Norwegian birth register. Data on take-up and duration of parental leave comes from social security registers. All variables are measured at the birth year of the focal father’s child. Data on earnings comes from tax registers. Earnings are deflated to 1993 Norwegian kroner using the CPI. Education data comes from national education registers. Firm data comes from employer-employee registers which we also use to link focal fathers to their competitors and competitors’ characteristics.

Table A2. Reduced form effect of *competitors'* leave on focal fathers' likelihood of changing plants

Dependent variable: Indicator for moving plant after birth ( $plant_{YSB=t} \neq plant_{YSB=-1}$ )				
	(1)	(2)	(3)	(4)
Post $\times$ Share of <i>leave-eligible</i> competitors	-0.0119 (0.017)	-0.0117 (0.017)	-0.0105 (0.017)	-0.0118 (0.017)
Individual FE	Y	Y	Y	Y
Years-since-birth (YSB) FE	Y			
YSB-by-birth year FE		Y	Y	Y
Quadratic polynomial in age			Y	Y
YSB-by-demographic group FE				Y
Observations	35871			

*Notes:* This table reports reduced-form estimates of equation (5), replacing the share of leave-taking competitors with the share of leave-eligible competitors as the explanatory variable, based on our main sample of focal fathers. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. The demographic group is defined as education-by-age at childbirth cell. The mean of the indicator variable for changing establishments is 0.286. Standard errors are clustered at the initial firm level, within which the competition group for each focal father is defined. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, social security records, and matched employer-employee data.

Table A3. Competition effect by firm size

Dependent variable: Focal father's log earnings		
	Firm size $\leq$ median	Firm size $>$ median
Post $\times$ Share of leave-eligible competitors ( <i>S</i> )	0.0287*** (0.011)	0.0126 (0.018)
Within-sample SD of <i>S</i>	0.43	0.29
Earnings effect of +1SD of <i>S</i>	+1.23%	+0.37%
Individual FE	Y	Y
YSB-by-birth year FE	Y	Y
Quadratic polynomial in age	Y	Y
YSB-by-demographic group FE	Y	Y
Observations	17963	17908

*Notes:* This table reports reduced-form estimates of equation (5) by firm size, based on our main sample of focal fathers, covering year-since-birth (YSB) from -3 to 7. Focal fathers are defined as men who fathered their first child in the 18-month window around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the 18-month window and have similar age and education as the focal father. *Post* is 1 for YSB of 0 to 7, and 0 for YSB of -3 to -1. The demographic group is defined as education-by-age at childbirth cell. Standard errors are clustered at the initial firm level. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

*Data source:* Norwegian birth register, tax records, social security records, and matched employer-employee data.

Table A4. Effect of focal father's *own* leave eligibility on his log earnings: Robustness

Dependent variable: Focal father's log earnings						
	Specification					
	(1)	(2)	(3)	(4)	(5)	(6)
<b>A. 2×9 months window</b>						
Post × Share of leave-eligible competitors	0.0250** (0.013)			0.0415** (0.018)		
Post × Own leave-eligibility		-0.0157 (0.012)	0.0093 (0.019)		-0.0326*** (0.012)	0.0060 (0.028)
Post × Rank			0.0249** (0.013)			0.0313 (0.019)
Observations	25960					
<b>B. 2×8 months window</b>						
Post × Share of leave-eligible competitors	0.0249* (0.014)			0.0459** (0.019)		
Post × Own leave-eligibility		-0.0159 (0.012)	0.0089 (0.020)		-0.0296** (0.013)	0.0151 (0.029)
Post × Rank			0.0250* (0.014)			0.0366* (0.021)
Observations	22495					
<b>C. 2×7 months window</b>						
Post × Share of leave-eligible competitors	0.0275* (0.015)			0.0518*** (0.020)		
Post × Own leave-eligibility		-0.0225* (0.013)	0.0050 (0.021)		-0.0332** (0.013)	0.0163 (0.030)
Post × Rank			0.0279* (0.015)			0.0408* (0.021)
Observations	18810					
<b>D. 2×6 months window</b>						
Post × Share of leave-eligible competitors	0.0266 (0.016)			0.0586*** (0.022)		
Post × Own leave-eligibility		-0.0260** (0.013)	0.0008 (0.023)		-0.0380*** (0.013)	0.0160 (0.031)
Post × Rank			0.0272* (0.016)			0.0449* (0.023)
Observations	15664					

*Notes:* Panel A replicates Table 8, using the same birth window as in our baseline (18 months around the introduction of the reform). Panels B, C, and D use window size of 16, 14, and 12 months, respectively. Focal fathers are defined as men who fathered their first child around the introduction of the paid paternity leave quota on April 1<sup>st</sup>, 1993. Competitors are co-workers who also fathered a child in the same window and have similar age and education as the focal father. *Post* is 1 for year-since-birth (YSB) of 0 to 7, and 0 for YSB of -3 to -1. We define *Rank* as focal father's share of leave-eligible competitors minus the focal father's own eligibility status. All columns control for individual FEs, YSB-by-birth year FE, YSB-by-education-by age at child birth cell FE, and a quadratic polynomial in focal father's age. Columns 4 through 6 also control for plant-by-YSB FEs. Standard errors are clustered at the firm level. \*p<0.10, \*\*p<0.05, \*\*\*p<0.01.

*Data source:* Norwegian birth register, tax records, and matched employer-employee data.