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Meso-level contextual patterns of fathers' family leave uptake in Finland

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ABSTRACT

Family leave uptake by fathers represents one pathway to redress the typically unequal division of early childcare, which has been linked to various family outcomes, including the mother's employment and children's schooling. The generous Nordic leave systems are designed around this concept to encourage leave uptake, though the choice to take leave remains an individual one. There is a substantial body of literature on policy and individual-level drivers of leave uptake, but less so for meso-level factors, such as workplace and extended family, despite a possible key role in influencing individual family leave decisions. We used population register data from Finland to examine the demographics of fathers' family leave uptake in 2007–2016. We found that uptake was highest amongst the employed, and that female-dominated industries and workplaces were associated with fathers taking longer periods of leave, particularly in the later years of the study. We also found possible indicators of role model effects, with long leaves of close family and of colleagues associated with longer leaves for new fathers. Our results suggest that meso-level contexts may be an important mediator in decisions surrounding uptake and length of fathers' family leaves.

Keywords: fathers, family leave, workplace, sex ratio, peer effects

1. INTRODUCTION

Fathers' use of paternity or parental leave, here referred to as family leave, is regarded as an important issue to be addressed on the path to equality and wellbeing in families. Evidence based on past family leave reforms shows various positive paternity leave effects on families, including better labour market outcomes for mothers (Dunatchik & Özcan 2021), higher school performance of children (Cools et al. 2015), a higher probability of having a second child (Duvander et al. 2019), lower risk of parental separation (Olafsson & Steingrimsdottir 2020), and a closer relationship between the father and children (Haas & Hwang 2008). These expected effects could be explained by more evenly divided childcare responsibilities in families where fathers take more leave (Eerola et al. 2022; Evertsson et al. 2018). Policy is regarded as an important driver of fathers' family leave uptake, based on the disparities in leave use between countries (Mussino et al. 2017). In the Nordic context, many of the major changes to family leave policies during the 21st century have increased the scope of father leave entitlement (Duvander et al. 2019; Haataja et al. 2016) to encourage fathers to take more leave. As such, much of the literature on leave reforms and the effects of leave-taking come from Nordic countries. Though the Nordic countries are seen as world leaders in reducing disparities in parents' work-care balance (Duvander et al. 2019, Karu & Tremblay 2018), and despite recent updates to family leave legislation (Eriksson 2018, Kellokumpu 2007, Miettinen & Saarikallio-Torp 2020), it is widely acknowledged that there is still a long way to go (e.g. Eerola et al. 2019).

In Finland, fathers can utilise family leaves up to the child's age of two, after which child home care allowance is available for one parent at a time until the age of three. Around 75 % of Finnish fathers take some family leave (Miettinen & Saarikallio-Torp, 2020), which mainly consists of the earmarked leave for fathers only. Approximately 70 % of all fathers take three weeks' leave around the time of the child's birth – the maximum number of days permitted to overlap with the mother's leave – and about 50 % of fathers use the rest of the 'father's quota', a non-transferable independent leave taken without the mother. Compared to other Nordic countries, Finland introduced this solo leave relatively late (Duvander et al. 2019) and until recently the number of available days was slightly lower than in most of the Nordics (see: Appendix A.1).

Leave reforms have generally increased usage of the quota (e.g., in Sweden: Duvander & Johansson 2012), but the 2013 reform in Finland led to greater usage of the extended leave periods, rather than increased the number of users (Saarikallio-Torp & Miettinen 2021). In August 2022, Finland shifted from emphasising individual choice to the Swedish model of an even allocation of leave months between parents, but leave-taking remains facultative and the increased allocation may not increase uptake (Lassen 2020). As such, the drivers of non-uptake amongst men are likely to remain a roadblock to even uptake between partners at the individual level even after the reform.

Identifying which fathers take leave and understanding the levels of uptake of the father quota can help inform policies indirectly associated with leave uptake. Along with individual-level characteristics and country-level cultural factors and legislative differences that are widely acknowledged drivers of fathers' participation in childcare, different meso-level (group-level) social environments and networks, including family and work communities, are important for individuals and can affect opportunities and motivation for taking family leave (den Dulk et al. 2012; Närvi & Salmi 2019). Colleagues' and family members' leave attitudes, expectations, and previous use of leave (Bygren & Duvander 2006; Dahl et al. 2014), as well as workplace characteristics, such as industry and sector (Saarikallio-Torp & Haataja 2016) can all contribute to the use of family leave. Yet, most previous research exploring the predictors of fathers' leave-taking has focused on paternal

and family characteristics or country comparisons and / or it is based on relatively small samples and surveys.

In this paper, we disentangle the role of meso-level social contexts related to work and family in fathers' use of family leave. We examined all fathers of children born between 2007 and 2018 using full population register data from Finland, allowing us reliable and detailed information on workplaces and families. The first main contribution is our analysis on the role of family leaves previously taken by male colleagues and family members. The second main contribution is analysing the leave uptake according to sex ratio of the father's workplace and industry of employment. By deepening knowledge of the associations between the use of leave and the measurable aspects of employment and family, we are better placed to holistically approach the issue of leave-taking and improve policy recommendations that may arise thereof.

1.1. The demographics of fathers' use of family leave

Fathers family leaves have mostly been previously analysed in the context of country-level and individual differences (Figure 1). The observed country-level differences in the use of leave have been mainly related to policy differences, but norms partly seem to explain these differences too (Mussino et al. 2019). Societal discussion around gender equalities has likely affected the general attitudes and thereby policies in the Nordic countries, but there is no clear evidence to what extent attitudes, preferences, or institutions affect fathers' use of family leaves (Saarikallio-Torp & Haataja 2016).

A father's traditional role as a primary breadwinner and a secondary caregiver is closely related to the attitudes and expectations towards paternal leaves both among fathers and in their social environment. Fathers' gendered perceptions about their own parental responsibilities have been found to be important for leave-taking (Närvi & Salmi 2019). One's own parents and siblings, for example, can serve as role models for gender equality and childcare arrangements. However, generally fathers' active participation in parenting has increased over time, while the norms and attitudes towards fathering and fathers in childcare have changed (Doucet 2006; Ranson 2015).

Individual characteristics of Finnish fathers are known to affect uptake: having low education, income, or recent unemployment makes fathers less likely to use family leave and more likely to take only the birth-related leave, although socioeconomic differences in the use of father's quota (non-transferable leave) have been narrowing (Saarikallio-Torp & Miettinen 2021). On average, the leave uptake is positively associated with fathers' earned income, peaking in the 4th income quintile (Miettinen et al. 2020). Whilst Finland is the only Nordic country to not have a ceiling on payments, the allowance covers a lower percentage of income than in the other Nordic countries and supplementation by collective agreement with employers is more limited too (Bungum & Kvande 2020; Duvander & Löfgren 2020; Koslowski et al. 2021; Rostgaard & Ejrnæs 2020). Thus, remuneration is relatively poor when income is very high, only exceeding that of the other Nordics when income is above their payment ceilings.

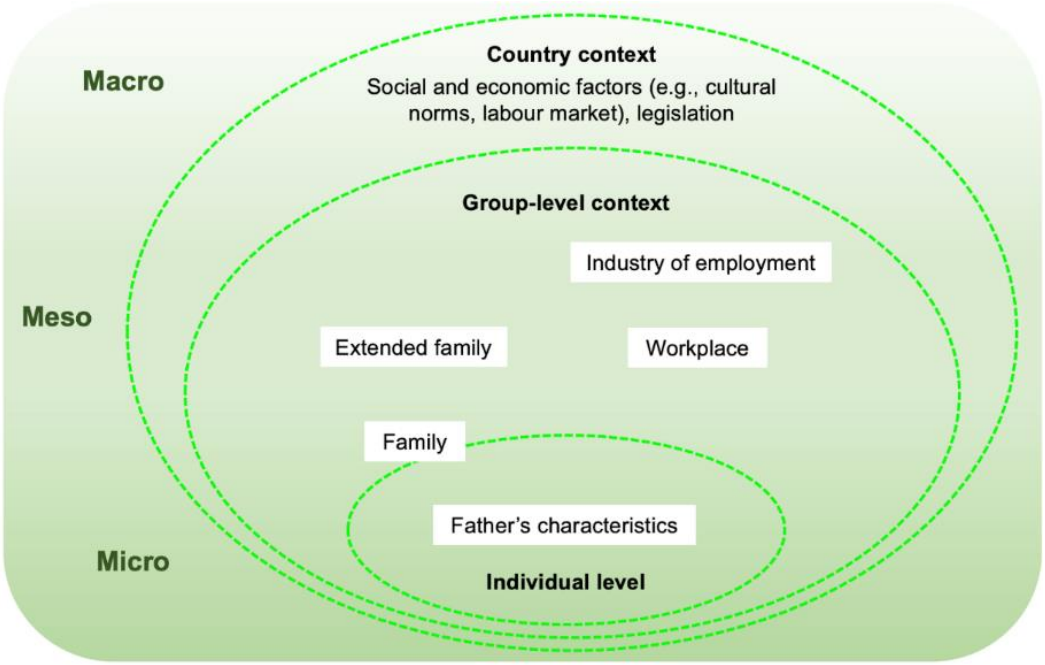

Figure 1. The factors related to fathers' family leave uptake in micro (individuals), meso (groups), and macro (society-level) environments.

Father's leave uptake is also affected by the individual situation of the mother (Närvi & Salmi 2019). Men actively taking leave are more likely to have a partner with high education, high occupational position (Saarikallio-Torp & Haataja 2016), and employment (Miettinen & Saarikallio-Torp 2020). According to fathers, the family's economic situation and expected loss of earnings belong to the most common barriers to taking leave in Finland (Eerola et al. 2019). This is likely caused by men's higher salaries and thus expected negative impacts on family finances; in Sweden, leave uptake was found to be higher among fathers earning less than their partners, compared to those who didn't (Eriksson 2018).

1.2. Meso-level factors and fathers' use of family leave

Whilst there is plenty of evidence of individual-level drivers of leave uptake and of the direct effects of policy reforms, these may be mediated by the less-studied meso-level: group characteristics that may be directly or indirectly influential in for individuals' leave-taking decisions, such as the sex ratio (characteristic) of a workplace (group). Though there are many possible meso-level groupings that individuals could be members of, such as shared-interest clubs, there are only a few that are common across society, such as family, and, for the employed – the overwhelming majority of new fathers – industry and specifically the workplace. It is these groupings that we focus our attention on.

In Finland, there has been some work on leave uptake related to 'higher-level' employment groupings: for example, uptake is higher in the public sector (Saarikallio-Torp & Haataja 2016) – approximately one quarter of the labour force. This may be due to the public sector being less driven by profit, and thus employee absences might be regarded as less threatening than in the private side. Survey evidence also shows that the uptake of leave is higher in professions related to education, social work or health care, in female-dominated fields (Saarikallio-Torp & Haataja 2016), and, in the similar Swedish context, in occupations with a high required skill level (Eriksson 2018). In Sweden,

the use of leaves was much higher in female-dominated fields, though this may also be related to these fields being part of the public sector (Bygren & Duvander 2006).

For workplace groupings, larger size in terms of employee numbers and a high educational level of personnel are associated with higher uptake (Saarikallio-Torp & Haataja 2016). Entrepreneurs and fathers in small workplaces might be more likely to face difficulty in taking family leave, as finding a replacement is harder and the financial costs can get high. Such is the case for women in Denmark (Neergaard & Thrane 2011), where sole entrepreneur mothers need to either forgo maternity leave or close their business for the duration of leave (as leave benefits require the individual not to work). On the other hand, entrepreneurs typically have high flexibility in work and, for fathers at least, family leaves may be easier to arrange. Whether sole entrepreneur fathers use more or less family leave than entrepreneur fathers who have employees has thus far not been studied.

Workplace culture and norms can play a role in who takes a leave and for how long. Fathers tend to shorten the duration of leave if the leave is expected to have high costs for them at work (Bygren & Duvander 2006). Survey evidence shows lower leave uptake if it is objected by the employer and there is higher expected difficulty in taking longer leaves, but obstacles to taking longer leaves might also relate to fathers' ideal of a committed worker (Närvi & Salmi 2019). However, only a small percentage of fathers not taking leave report employer objection as a barrier (Närvi & Salmi 2019). In general, highly gendered work environments, which are common in Finland, may facilitate or deter men from taking leave. However, it has been suggested that career costs, job flexibility, and job insecurity might explain only a small share of fathers' leave-taking (Eriksson 2018).

One likely mechanism for workplace effects on family leaves include role modelling by colleagues, when the previous leave-takers work as examples for the new father, support them, and pass information on employer attitudes and reactions towards leaves (Holter 2007). Attitudes and expectations of the colleagues may also create social pressure that have effects on leave-taking (Allard et al. 2011). In Sweden and Norway, leave uptake was found to be higher in workplaces where the other fathers had previously taken leave (Bygren & Duvander 2006; Dahl et al. 2014), potentially indicating peer effects at the workplace. The length of leaves taken by colleagues might also matter: a German study showed that longer family leaves taken by female co-workers increased the leave length of new mothers (Welteke & Wrohlich 2019). As far as we are able to ascertain, leave length of fathers has not yet been studied in relation to leave length of colleagues in any country.

In addition to the potential meso-level influences at work, fathers may self-select into specific workplaces when selection effects stemming from personal characteristics rather than causal effects of workplace processes show in fathers' leave uptake. Men who plan to utilise family-related flexibility in work may be more likely to choose positions that enable this. Self-selection can also be unintentional, if personal characteristics affect choosing a workplace where employees generally take more or less leave, for example, based on ideals about work commitment. Furthermore, the higher the required skill level is for the occupation, the more fathers take leave (Eriksson 2018).

The role model effect on fathers' family leave uptake may also exist in the family context. In Norway, the effect of brothers on fathers' leave was found to be almost five percentage points (Dahl et al. 2014). Whilst the parents of the new father are often considered as setting the example, they are unlikely to be influential in terms of prior leave experience: before the 2000s, available paternity was short and uptake was lower (Haataja 2009). As such, siblings, particular brothers, are most likely to act as the role model for paternity leave uptake. Siblings can be influential on other aspects of life, such as fertility (Lyngstad & Prskawetz 2010; Büyükkeçeci & Leopold 2021) and transition to marriage (Büyükkeçeci & Leopold 2021), so it stands to reason that their experiences with family leave may also influence decisions of new fathers to take leave and for how long.

1.3. Hypotheses

The majority of fathers will take some family leave, regardless of workplace or industry. We seek an understanding of the demographics of fathers taking family leave, with particular reference to sex ratio of the workplace and of the industry of employment, and to workplace and within-family attitudes to and use of family leave.

First, we expect that the share of fathers taking family leave varies between subpopulations related to a father's employment and ability to arrange leave (expected costs, difficulty to find replacement). Whilst employment status is an individual characteristic rather than a characteristic of a meso-level grouping, it may be an important mediator for exposure to the different aspects of the meso-level we investigate in later hypotheses. We expect that:

> H1.0 *Wage-earning fathers have the highest, entrepreneurs the second highest, and unemployed fathers the lowest leave uptake (employment status hypothesis).*
>
> H1.1 *The share of entrepreneur fathers taking leave is higher, when the father has employees, compared to sole employee fathers (type of entrepreneurship hypothesis).*

Second, the share of fathers taking family leave is likely to vary between subpopulations related to industry (see Appendix A.2) and workplace sex ratio.

> H2.0 *Fathers working in industries and workplaces with balanced or female-dominated employee sex ratios take more days of leave beyond the initial 18 days than those in male-dominated fields (sex ratio hypothesis).*

Third, the use of family leave is likely to be higher among men with examples from the previous uptake of leave by male colleagues and men within the same family.

> H3.0 *Fathers are likely to take more leave if the couple's brothers and brothers-in-law have previously taken leave (family hypothesis).*
>
> H3.1 *Fathers are likely to take more leave if their male colleagues have previously taken leave (colleague hypothesis).*

2. METHODS

2.1. Data and statistical analysis

The data used in this study come from administrative registers collected by a range of different government-affiliated institutions and compiled by Statistics Finland. The data cover the full population (all individuals living in Finland) and are mostly provided at a yearly resolution, but certain variables provide date-level information.

In this study, we focused on men who had at least one child born between 2007 and 2018. Data selection was done with the *data.table* package version 1.13.2 (Dowle and Srinivasan 2020) in R

version 3.6.3 (R Core Team 2020) and 4.0.5 (R Core Team 2021). Some of the used registers were updated only to 2018 and family leave can only be taken up to the 2nd birthday of a child. Therefore, 2016 is the last year for which we could account for the entire family leave taken.

We created separate datasets for each hypothesis. For examining fathers' family leave patterns by employment status (H1.0), we formed a dataset with 524,879 births during 2007–2016, including 453,915 wage-earners, 20,034 entrepreneurs, 27,300 students, and 23,630 unemployed. For analyses on the type of entrepreneurship (H1.1), we selected all individuals in the years 2011–2016 who were classified as employed as their main activity during the year and had greater entrepreneurial income than earnings from employment (N = 9,770). We were unable to assess 2007–2010 as specific information about the main activity for entrepreneurs (e.g. enterprise ID, size of workplace, etc.) are not available in the dataset. To test the sex ratio hypothesis (H2.0), we included all individuals who could be classified into industries (33 industries, 22,465,074 employee years) and workplaces (472,297 unique workplaces; 2,247,094 observations) for the years 2007–2016.

For investigating leave uptake by previous leaves in the extended family by brothers and brothers-in-laws (H3.0), we selected cohabiting couples whose first child was born in 2007–2016, who had information on siblings, and who had no half-siblings (N = 139,655). By selecting the first births only, we avoided any influence from prior experiences with the family leave system. Individuals lacking information on their siblings in the Finnish registers (due to absence of parental information) were excluded, to ensure accurate information on brothers and brothers-in-law and to minimise related errors in our results. Overall, 51,821 fathers (27 % of the eligible sample) or their partners had half-siblings, with 28,340 of them (20.3 %) having nieces and / or nephews via half-siblings. For robustness purposes, we repeated the descriptive analyses and treated half-siblings as full siblings. Our conclusions here did not differ from the sample excluding half-siblings (Appendix A.3 Fig S1), and therefore, only results based on the original sample are reported for simplicity.

To compare leave uptake and length according to colleagues' previous leaves (H3.1), we included all individuals who were i) in workplaces that were present in our workplace dataset for at least four consecutive years and had at least three eligible father years, and ii) had their first birth in the study period (N = 77,534 across 17,464 workplaces; 2010–2016).

2.2. Variables

Dependent variable

Number of family leave days were estimated using the family leave allowance calculated and paid out by the Social Insurance Institution of Finland (2021) (KELA) using publicly viewable formulas. The data do not contain records of the number of days taken nor do they distinguish between maternity leave (mother-only allocation), parental leave (shared allocation to be divided by partners), or paternity leave (father-only allocation). As the amount of leave benefit is, after a social security deduction, based on the previously paid taxed salary, we used the KELA formulas to calculate the daily allowances (further details and code available in Appendix, A.4) and divided the received benefit by the daily allowance to get the number of family leave days. The leave benefit is paid 6 days of the week (Monday–Saturday), hence 18 days refers to three weeks of leave.

Independent variables

Industry was defined according to Finland's Standard Industrial Classification TOL 2008, based on the European Union's classification of economic activities (NACE). We slightly modified the classification scheme for our research purposes to separate out groupings we thought were not particularly cohesive and to create new groupings where necessary (for the modified classification, see Appendix A.2). There are five hierarchical levels: a character (21 different industries, plus a code for unknown), then up to 5-digit levels, with each digit adding greater specificity into the classification. For example, "Driving school activities" have the specific classification 8553, which is within 855 ("Other education), 85 ("Education"), and P ("Education"). Each company is registered with a single classification from TOL 2008, based on what the primary activity of the entity is, and all staff, regardless of whether their own duties would fall under a different classification, are part of the same industry. For example, the University of Turku – the institution of the authors – is classed as 85420 Tertiary education, even though non-teaching staff may be more suited to a different industry.

Workplace was defined using the enterprise (a legal unit with its own autonomy) and establishment (a particular workplace) code. For example, a restaurant enterprise may have one or more establishments.

Industry sex ratio was calculated by dividing the number of men by the number of employees in each industry in a given year. A value of 1 indicates an industry with only male employees, a value of 0.5 would indicate an even share of males and females, and 0 indicates an industry including only females.

Workplace sex ratio was calculated using the same logic as the industry sex ratios: male employees were divided by the total number of employees in a workplace, giving a maximum value of 1 and a minimum value of 0.

Employment status was based on yearly information on whether the father was mostly a wage-earner, an entrepreneur, a student, or unemployed in the year the child was born. The registers only provide information on the main activity within a year, so an unemployed individual could also be employed in the same year, as long as the total time in employment was less than the total time unemployed. Individuals were classed as entrepreneurs if their entrepreneurial income was greater than wage income. We did not include pensioners, those on an unemployment pension, or "other inactive" (individuals who did not fall into any other employment category). We also excluded those classed as conscripts / on community service (compulsory in Finland for men after turning 18), as this group accounted for less than 100 births per year.

Number of employees was calculated for workplace and enterprise identification codes (IDs). We created a number of dummy variables for each row to allow us to aggregate by enterprise, establishment, industry, and year (a value of 1 if it were true). For example, all rows had a value of 1 in the 'number of employees' column, as this allowed us to get the total number of employees by workplace. A male employee would then have a 1 in the 'number of men' column and a 0 in the 'number of women' column. These two columns summed up were thus equal to the 'number of employees'. We removed individuals whose enterprise ID was unknown and the number of employees could not be calculated, which affected the sample size for H1.1.

Leave uptake of the couple's brothers and brothers-in-law, was calculated as described above for fathers (see: Dependent variable). In our sample, only 1.5 % of the fathers had no brothers or brothers-in-law, and 26.1 % of the fathers had no nieces or nephews before they had their first child. Of those fathers with nieces and / or nephews, 19.8 % had nieces and / or nephews from brothers only and 23.7 % from both brothers and sisters. We grouped brothers of the couple (i.e. father's brothers and mother's brothers) together, as they are direct relatives of the father and the mother and their leave-taking history may have a stronger influence than non-blood relatives (e.g. brothers-in-law via sisters). We counted brothers-in-law if they were currently partnered with a sister of the couple, with the assumption that the ex-brothers-in-law were not influential in the leave-taking decision.

Leave uptake of colleagues was measured in two ways: i) proportion of eligible fathers taking leave in the past three years, and ii) mean length of leave by leave-takers in the last three years. A father was considered eligible in any given year if they had a child under two and had not yet taken the full paternity leave for that child, and the proportion was therefore calculated as the number of father years of leave divided by number of eligible father years. Mean length of leave-taking was calculated as the sum of all days of father leave taken in the past three years by colleagues divided by the number of father years of leave.

3. RESULTS

3.1. Family leave uptake by employment status (H1.0)

The overall share of fathers who took any leave for their children born during the period 2007–2016 was fairly high at 74.4 %. This was largely driven by a high uptake of leave amongst wage-earning fathers (80.3 %; Figure 2), who made up the majority of fathers (86.5 % of the sample). Of other labour market statuses with >100 births each year, leave uptake was also fairly high for entrepreneurs (65.2 %), but much lower for the unemployed (24.8 %) and for students (26.2 %). Figure 2 shows the trends in leave uptake over time, and it can be seen that there was relatively little change in the level of uptake across all of these labour statuses. About 77.7 % of wage-earning men who had a child in 2007 and 81.7 % of fathers of children born in 2016 took family leave. There was a similar increase for entrepreneurs (2007 62.4 %, 2016 66.3 %). Student fathers saw little change across the study period: 2007 (24.3 %) to 2016 (23.7 %). In 2007, only 19.6 % of unemployed fathers took any leave, rising to 25.8 % by 2016.

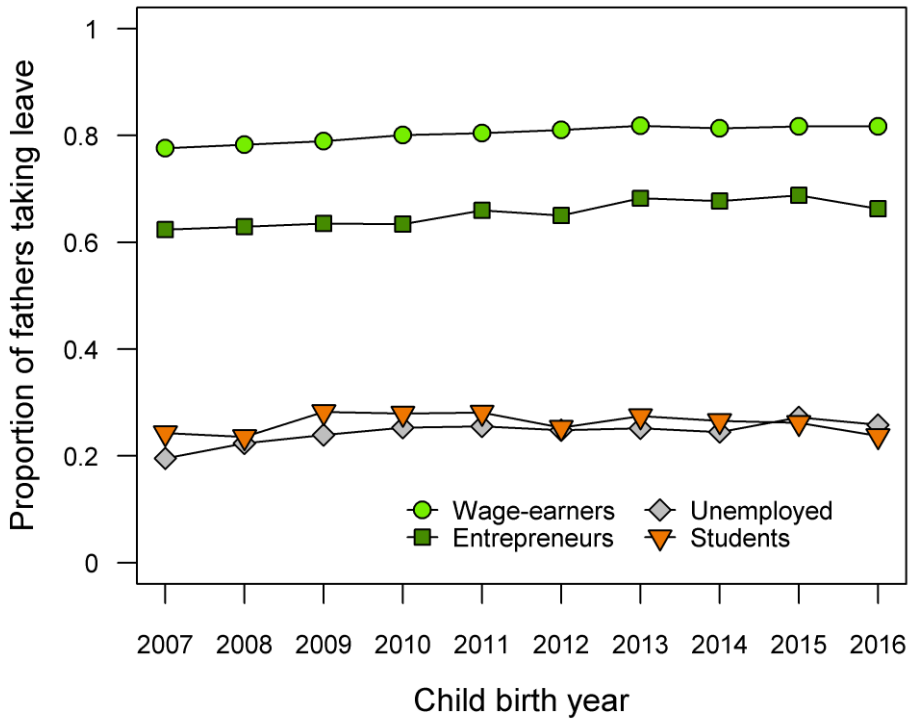

Figure 2. The proportion of men on family (paternity and / or parental) leave of all wage-earners, entrepreneurs, students, and unemployed fathers entitled to leave by the child's year of birth. The labour market situation is measured in the same year as the child was born.

In terms of amount of leave taken, there was an increase in the percentage of men taking more than the 18 days allowed immediately after the birth of a child. In 2007, 18.3 percent of men took more than 18 days in the permitted two-year period, rising to 39.5 percent for fathers of children born in 2013 (the last major reform), remaining around this level through to 2016 (39.7 %). The different labour market statuses were all similar in their increases, with the exception of student fathers, for whom the percentage taking more than 18 days remained low (4.6 % in 2007 to 11.5 % in 2016). Wage-earners once again had the highest uptake, with an increase from 19.8 percent in 2007 to 43.9 percent in 2016. Despite an increasing proportion of entrepreneurs taking more than 18 days, they still appeared to favour shorter leaves (11 % in 2007, 25.4 % in 2016), as did unemployed fathers (5.7 % in 2007 to 13.6 % in 2016).

3.2. Entrepreneur family leave uptake relative to employee number (H1.1)

Overall, from 2011–2016 69.8 percent of entrepreneurial fathers in workplaces of size one (i.e. sole employees, N = 5,184) took some family leave. This was similar to the yearly values, which ranged from 68.8 percent (2016) to 72.2 percent (2014). Contrary to our prediction, uptake among sole employees was higher than among entrepreneurs with employees (65.8 % in the same period, N = 4,586). The highest uptake was amongst sole employees, followed by small workplaces at 68 percent (2–5 employees, including the entrepreneur, N = 3,002). Entrepreneurs in workplaces with more than 5 employees (N = 1,584) had slightly lower uptake, at 61.7 percent.

3.3. Family leave uptake by industry and workplace sex ratio (H2.0)

As with the overall descriptive statistics for leave uptake of wage-earning men (see 3.1), the majority of industries saw an increase in the percentage of new fathers taking any leave from 2007 to 2016 (Table 2). There was a great deal of variation between industries: lowest for those doing "sports activities" (only 57.1 % taking leave in 2016), highest for those provisioning public services (i.e. police, judicial, fire services; 91.3 %), in the defence sector (94.7 %), and for those working in human health (91.6 %). Across all industries, there was also an increase in the proportion of leave-taking men who took more than the 18 days permitted following birth. In 2007, no industries had more than half of men on leave taking more than 18 days, though uptake was much lower for the majority of industries. By 2016, two-thirds of industries had more than half of their leave-taking men away for more than 18 days. The lowest value was 43.4 % for "skilled labourers" (e.g. electricians, plumbers etc.), which was still a higher percentage than the highest industry value in 2007 (41.9 %, for scientific and research development).

Table 2. The share of fathers taken leave at any time for a child born in the focal year of all fathers eligible for a leave by industry overall and in 2007 and 2016. $\%_{18}$ is the share (%) of those who took 18 days or less of those who took any leave. SR is sex ratio (% of all employees in industry who are male). Industries available in Appendix table A.2. Industry 22 - "Veterinary activities" is not included here as there were five or fewer observations in each year.

Industry	Overall				2007				2016			
	%	N	$\%_{18}$	SR	%	N	$\%_{18}$	SR	%	N	$\%_{18}$	SR
1. Agric.	73.7	10832	63.3	70.4	70.1	494	85.6	69.8	74.5	1067	50.5	71.0
2. Mining	80.1	1970	62.3	88.2	74.3	104	82.7	88.2	83.2	149	52.4	88.2
3. Manuf..	86.0	100713	57.3	74.3	84.9	10406	74.6	73.3	86.9	6738	45.0	75.3
4. Utilities	89.2	3499	46.6	73.7	89.7	235	71.9	74.2	88.6	333	36.9	73.5
5. Water	84.0	3105	64.0	81.5	82.2	227	80.2	83.4	84.8	262	55.0	79.9
6. Construct.	79.3	49835	66.8	91.2	77.2	3389	82.6	91.1	80.3	4359	55.9	91.2
7. Home labour.	79.5	5096	69.3	88.7	76.6	373	87.1	88.9	80.9	475	56.6	88.5
8. Trade	77.8	48785	59.5	48.2	74.4	4038	78.7	47.3	80.1	3887	50.2	49.4
9. Freight	81.9	25843	64.2	78.8	80.0	2169	81.7	76.5	83.1	1987	51.1	80.6
10. Transp.	83.5	7798	56.3	75.0	83.3	614	73.3	73.1	83.4	623	45.9	76.1
11. Accomm.	81.4	1495	57.3	29.6	78.1	125	72.8	29.0	80.0	120	47.5	30.6
12. Food	68.5	6585	61.0	27.8	69.6	446	79.4	25.3	69.1	647	52.4	30.0
13. Information	78.0	26305	41.7	64.9	72.5	2072	58.7	61.3	79.7	2082	39.1	67.3
14. Finance	82.2	7311	44.0	34.1	74.5	478	65.5	30.1	84.1	572	39.9	36.8
15. Real Estate	71.6	2312	59.9	50.5	66.2	182	74.2	50.5	70.2	193	50.3	50.5
16. Legal	68.2	2194	43.8	28.9	60.7	136	63.2	27.2	72.5	190	36.3	30.1
17. Head Offices	70.3	2856	49.4	53.0	61.3	144	73.6	50.7	72.3	266	46.2	54.1

18. Archit.	83.6	15335	47.1	70.2	81.2	1210	66.3	68.9	84.5	1236	37.8	71.3
19. Science	83.5	3179	40.5	49.8	83.6	260	58.1	46.5	77.8	210	31.4	50.7
20. Advert.	69.3	2158	51.0	50.6	54.0	141	73.1	46.6	78.9	206	43.2	52.3
21. Other Pro	66.7	1606	54.9	50.0	66.9	107	66.4	53.2	70.5	148	56.1	49.5
23. Admin.	74.5	22707	63.2	47.6	68.8	1355	81.7	44.4	77.6	2227	54.5	49.7
24. State	86.9	5993	40.5	27.9	83.4	503	63.4	28.1	88.7	479	32.4	28.6
25. Community	90.8	11876	45.7	65.0	88.1	1014	68.9	67.0	91.3	798	31.3	64.5
26. Defence	93.9	6085	44.2	79.2	93.9	603	61.7	75.7	94.7	411	36.0	81.5
27. Educ.	80.3	19096	53.0	32.8	79.3	1786	73.8	33.3	81.7	1320	40.3	32.3
28. Health	90.6	11555	41.2	14.0	89.7	834	59.2	12.6	91.6	1025	35.6	15.1
29. Social	80.3	7150	49.6	9.7	76.1	437	66.9	9.2	82.9	696	42.4	10.4
30. Arts	69.0	1398	49.1	51.1	60.5	75	66.7	50.1	63.2	117	33.3	51.1
31. Culture	83.2	602	41.9	26.9	84.9	45	64.4	25.0	83.1	49	32.7	27.2
32. Sports	56.9	1726	55.5	46.6	56.0	112	75.9	47.5	57.1	177	42.9	47.0
33. Other	69.9	5620	52.5	31.4	68.4	451	65.9	34.0	70.5	462	47.4	30.6

1 Agriculture, forestry and fishing, 2 Mining and quarrying, 3 Manufacturing, 4 Electricity, gas, steam and air con supply, 5 Water supply; sewerage, waste management and remediation activities, 6 Construction, 7 "Home labourers", 8 Wholesale and retail trade, 9 Transportation (freight), 10 Transportation (passenger), 11 Accommodation, 12 Food service activities, 13 Information and publishing, 14 Financial and insurance activities, 15 Real estate activities, 16 Legal and accounting, 17 Activities of head offices, 18 Architecture and engineering, 19 Scientific research and development, 20 Advertising and market research, 21 Other professional activities, 23 Administrative and support service activities, 24 Administration of state, 25 Provision of services to the community, 26 Defence activities, 27 Education, 28 Human health activities, 29 Social work activities, 30 Creative, arts and entertainment, 31 Libraries, archives, museums and other cultural attractions, 32 Sports activities, 33 Other

Table 2 also shows the sex ratio of each industry. The most male-dominated industries were construction (91.2 %), "home labourers" (e.g. plumbers, electricians; 88.7 %), and mining and quarrying (88.2 %). Leave uptake in these industries was similar to the overall leave uptake of wage-earners (79.3 %, 79.5 %, and 80.1 % respectively, cf. 80.3 % for all employed fathers), whilst the percentage of fathers taking more than 18 days was among the lowest for all three industries. Social work activities was the most female-dominated industry, with less than 10 % of the workforce male - leave uptake was 80.3 %, whilst more than 50 % of all leave-taking fathers took over 18 days. There was no correlation between industry leave uptake and sex ratio in the overall sample ($\rho = 0.207$, $p = 0.256$), nor in 2007 or 2016 specifically ($\rho = 0.164$, $p = 0.369$; $\rho = 0.247$, $p = 0.173$). There was, however, a slight negative correlation between industry sex ratio and leave uptake over 18 days (overall $\rho = -0.471$, $p = 0.007$; 2007 $\rho = -0.492$, $p = 0.004$; 2016 $\rho = -0.348$, $p = 0.051$). In other words, industry was unrelated to whether fathers took leave or not, but it may have some influence on taking long leaves.

Only a minority of workplaces (8–14 %, depending on the given year) had any new fathers and even fewer had more than one new father (2–4.2 %), although these small shares are driven by a high number of very small workplaces (fewer than 5 employees) in the sample (67.9–83.3 % of workplaces). In the vast majority of workplaces with five or more men having children, a high proportion of the eligible fathers took leave at some point by the child's age of 2 years (Figure 3A), especially in 2016. When including workplaces with at least three eligible fathers, the distribution

shifts slightly to the left, but the same pattern holds (Figure 3B), again with more workplaces with high uptake in 2016 compared to 2007. When including any workplace with at least one eligible father, it can be seen that the densities are driven by these smaller workplaces - the extremes are exacerbated (Figure 3C) as either the father took leave (and therefore is at 1) or did not (and therefore at 0).

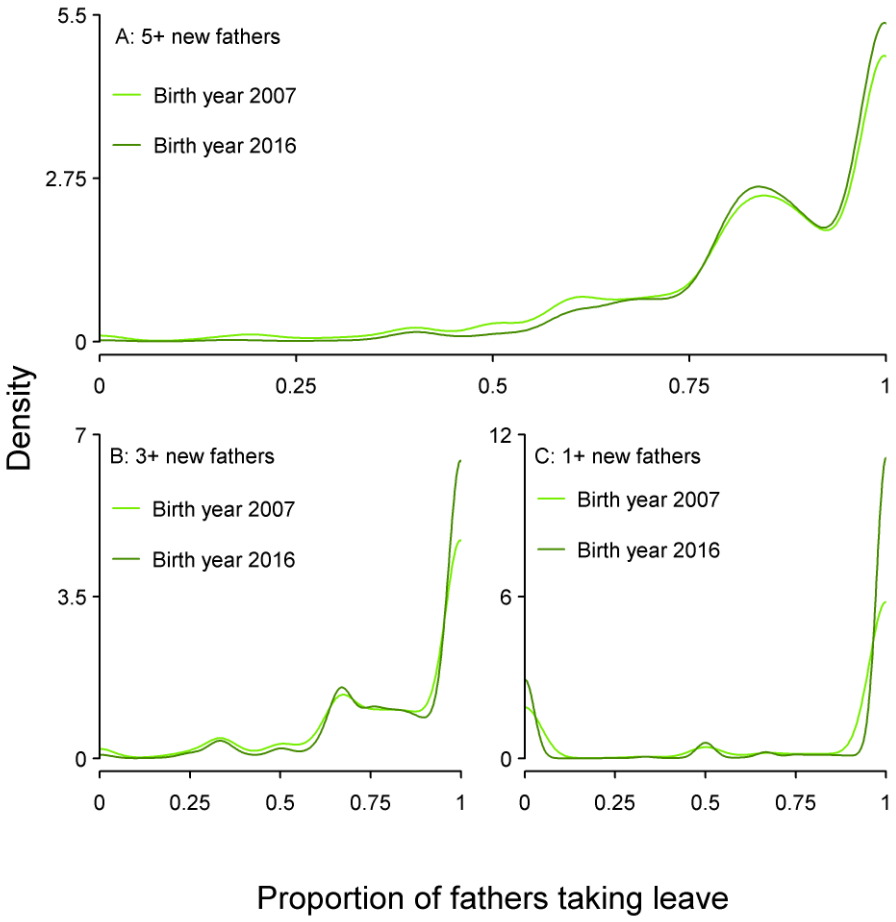

Figure 3. Density distributions of the proportion of fathers who took family leave for children born in 2007 and 2016 by workplace. Men in workplaces A) with at least five men entitled to family leave; B) with at least 3+ new fathers; C) with at least one new father. A value of 0 indicates no men in a workplace took leave for a child, a value of 1 indicates all men who had a child took at least some leave up to the child's second birthday.

We observed differences in the fathers' use of leave by the sex ratio (male- or female-dominance) in the workplace (Figure 4). Uptake of fathers working in female-dominated workplaces (less than 20 % of employees were male) was higher than that of other fathers; only 15.2 % had not taken family leave in 2007 and 12.5 % in 2016 (13.4 % across all years). The lowest uptake was for those working in entirely male workplaces (28.9 % in 2007, 25.5 % in 2016, 26.7 % across all years). Somewhat surprisingly, uptake was lower in workplaces where the sex ratio was fairly even (40–60 % men) than when the clearer majority (but not exclusively) were men.

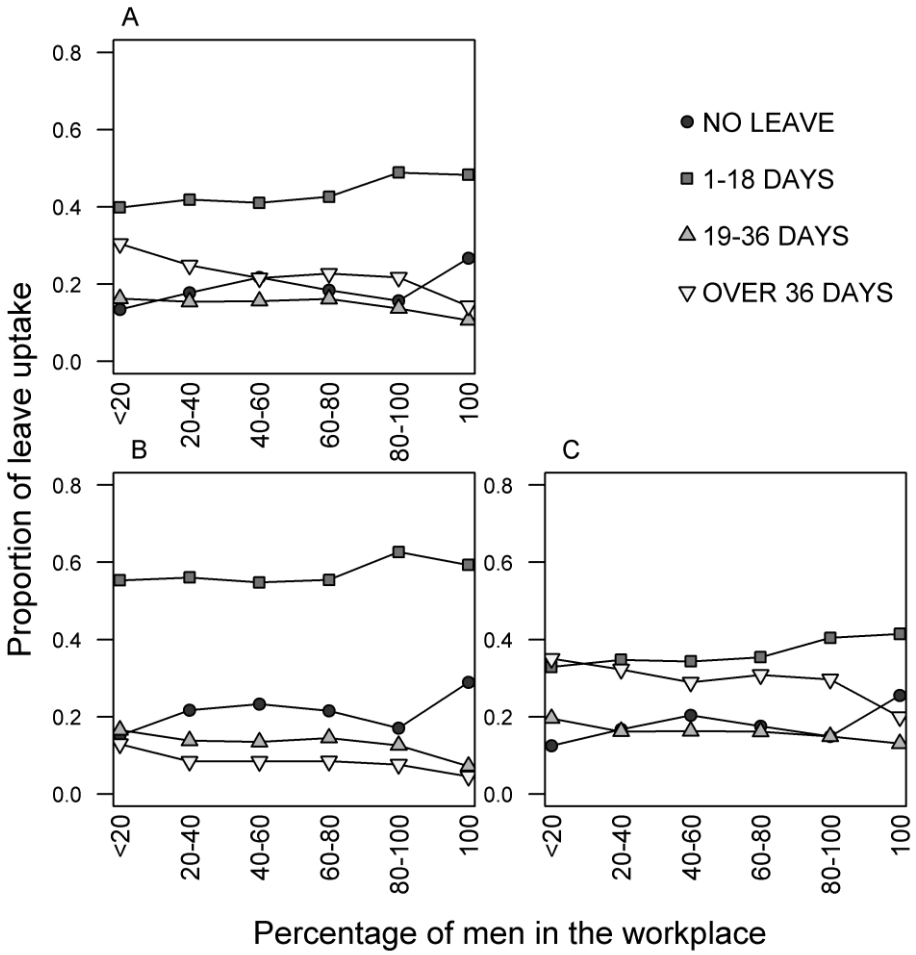

Figure 4. Leave-length of fathers by sex ratio (male-dominance) in the workplace (100 % = all employees male). A) proportions across all years, B) proportions in 2007, C) proportions in 2016. Categories are inclusive of the left number and exclusive of the right. No leave indicated by circles, 1–18 days indicated by squares, 19–36 days indicated by triangles, and over 36 days indicated by inverted triangles.

In 2007, the vast majority of those taking leave, regardless of workplace sex ratio, only took 18 days or less (Figure 4), though higher proportion of men in heavily female-dominated workplaces took longer leaves than when the sex ratio was male-dominated. By 2016, over half of leave-taking men in almost all sex-ratio categories took more than 18 days – the only category where this was not the case was when the workplace was exclusively men.

3.4. Family leave uptake relative to the previous use of family leave by the couple's brothers and brothers-in-law (H3.0)

Non-uptake was highest for those with no brothers (via the focal father or his partner) with kids taking leave (25.5 %), followed by all brothers with kids taking leave for at least one kid (18.3 %), and all brothers with kids taking more than 18 days for at least one of the children (16.4 %). The percentages of non-uptake were similar for brothers-in-law (via the couple's sisters): no brothers-in-law taking leave 23.2 %, all brothers-in-law taking leave 18.2 %, all brothers-in-law taking more than 18 days of leave 16.5 %.

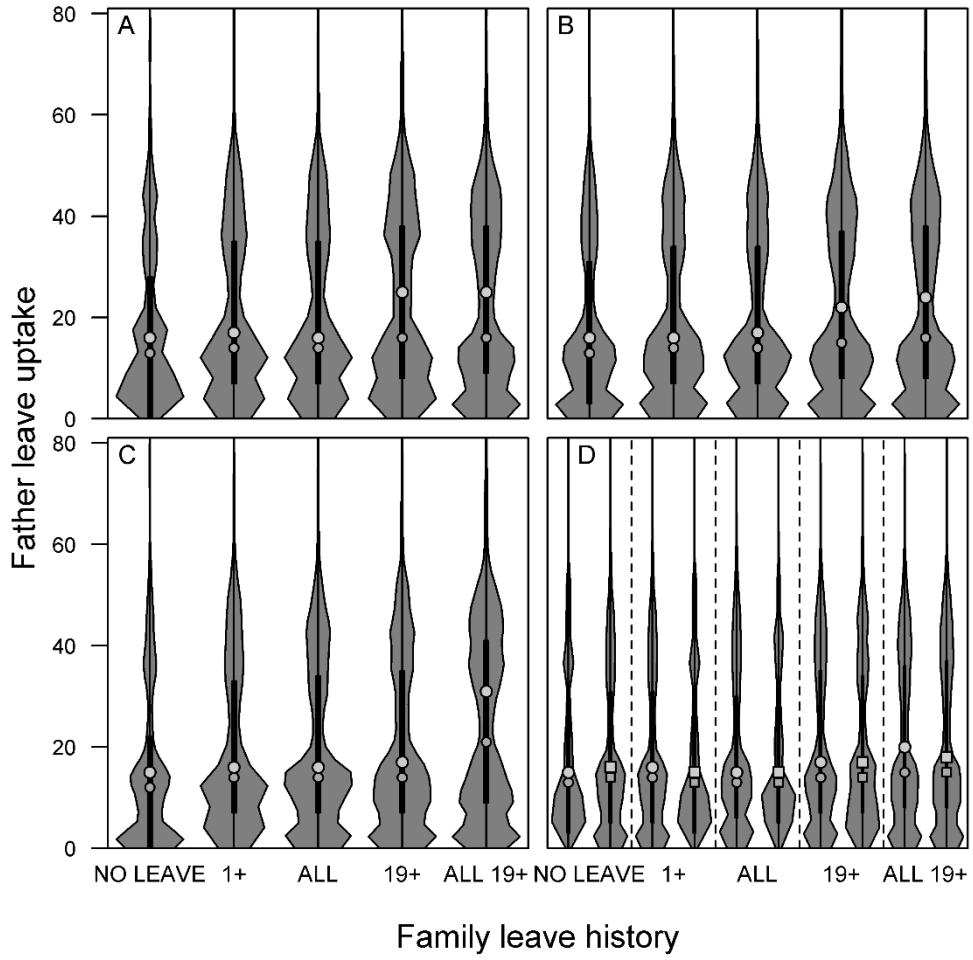

Figure 5. Density distributions (bandwidth = 2) of father leave uptake by the couple's family leave history. Panels A–D: individuals with A) only brothers with children, B) only brothers-in-law with children, C) both brothers and brothers-in-law with children with each condition met by both sides, D) both brothers and brothers-in-law with children, but conditions met only by brothers (circular medians) or brothers-in-law (square medians). The conditions are: no leave, leave taken by at least one fraternal relation with children, leave taken by all fraternal relations with children, more than 18 days of leave taken by at least one fraternal relation with children, more than 18 days of leave taken by all fraternal relations with children. Dark grey median symbols (circles / squares) indicate median when fathers taking no leave are included, light grey symbols indicate median when only fathers who took leave are included. For visualisation and privacy purposes, values over 80 are not presented and maximum values are not reported. Violin plots made with vioplot package v0.3.7 (Adler & Kelly 2020).

The distribution of leave uptake was similar between groupings (Figure 5, panels A–D), with median uptake below 20 for those who had i) no brothers / brothers-in-law with children taking leave, ii) at least one brother / brother-in-law with children taking leave, and iii) all brothers / brothers-in-law with a child taking leave. Median uptake was higher when at least one brother / brother-in-law took more than 18 days of leave, and consistently highest when all eligible brothers / brothers-in-law took more than 18 days of leave. Median leave length was slightly higher for those without nieces and nephews via sisters than for those without nieces and nephews via brothers, though the difference was not extreme enough to suggest that there may be a stronger influence of brothers (direct blood relatives of the couple) than of brothers-in-law (related via sisters). Though leave uptake was not higher for most conditions when both brothers and brothers-in-law had children, the highest uptake was amongst those whose brothers and brothers-in-law with children had all taken more than 18 days of leave for at least one child. In 2007, there do not appear to be family peer effects (Appendix A.3

Figure S2), even if all brothers / brothers-in-law with children took leave over 18 days; median leaves were all less than 18 days. By 2016, median leaves were much higher, non-uptake was lower, and the overall distributions show more men took longer leaves in nearly all cases (Appendix A.3 Figure S3).

3.5. Family leave uptake relative to the previous use of family leave by male colleagues (H3.1)

The leave-taking decisions of colleagues may also be of importance for influencing an individual's decision to take leave and how long to take leave for. When most new fathers in the recent history of a workplace did not take any leave, the density distribution of total leave men take is highly skewed to the left (Figure 6), with the highest density not taking any leave. As the proportion of new fathers taking leave increases, the distribution alters, so that there are clearer peaks under 18 days and over 40 days. In other words, more men take leave and take longer leaves if more of their eligible male colleagues in the last three years took leave.

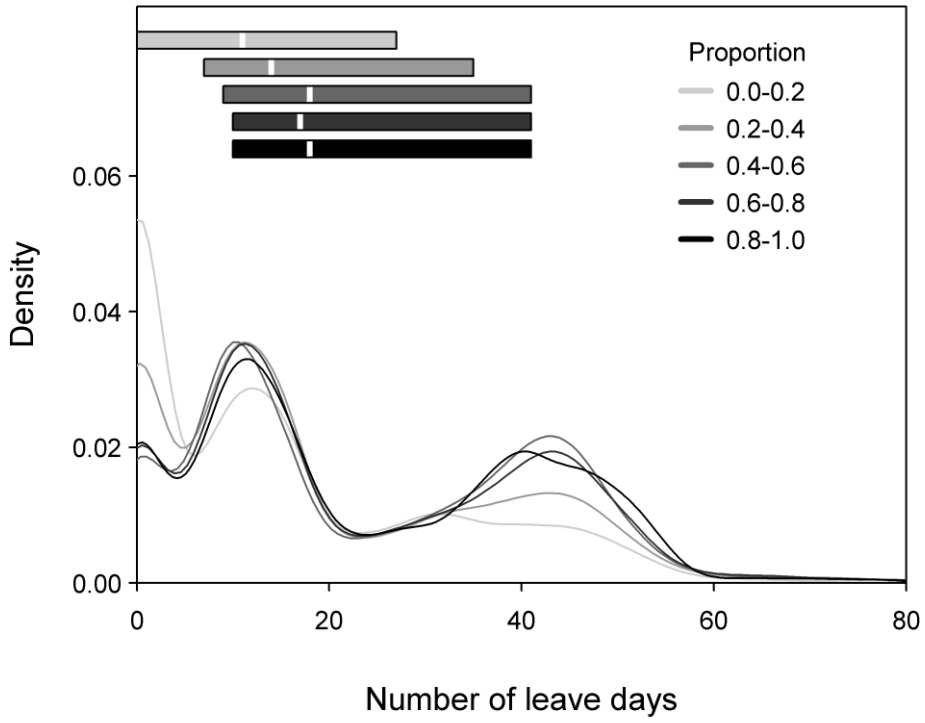

Figure 6. Density distributions of number of leave days taken by the proportion of eligible male colleagues taking any leave in the previous three years. The darker the line, the higher the proportion of colleagues who took leave. Bandwidth = 2.5. Boxplots show the quartiles of number of leave days, with colour indicating the associated grouping. For visualisation and privacy purposes, values over 80 days are not shown in the figure.

The length of leave recently taken by colleagues appears to be associated with the length of leave taken by new fathers (Figure 7). When the mean leave uptake in the previous three years was below 5, the density distribution of leave days suggests that most took shorter leaves than in all categories where the mean uptake was over 5. However, few individuals were in this category (N = 108). When mean leave was at its highest (>15), a greater proportion of men took long leaves than when average leave was under 15: median leave was 21 days for this group.

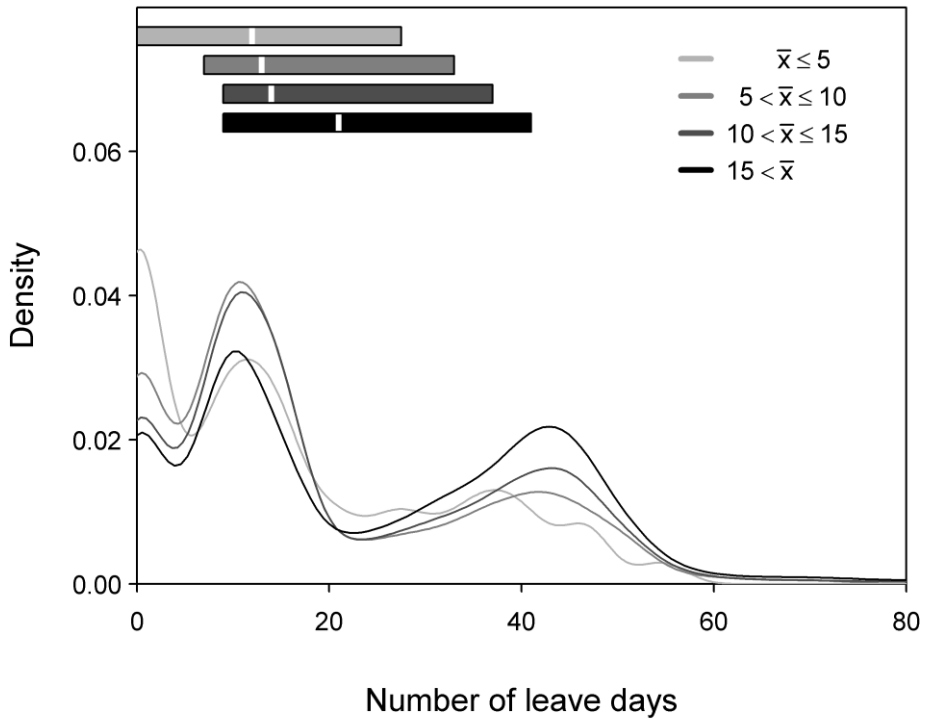

Figure 7. Density distributions of number of leave days taken by the mean leave taken by male colleagues in the previous three years. Values were calculated as the number of leave days taken divided by the number of leave instances (minimum three). The darker the line, the higher the mean uptake. Bandwidth = 2.5. Boxplots show the quartiles of number of leave days, with colour indicating the associated grouping. For visualisation and privacy purposes, values over 80 days are not shown in the figure.

4. DISCUSSION

Family leave taken by fathers has been shown to have various potential implications for families in both the short- and long-term (Cools et al. 2015; Dunatchik & Özcan 2021; Duvander et al. 2019). In this study, we disentangled the demographics of family leaves in 2007–2016 and examined how workplace and family as meso-level factors are linked to fathers' leave decisions in Finland, a Nordic country with relatively generous entitlements and recompense for taking leave. We also provide R code for calculation of parental leave length from Statistics Finland's annual data, which only provides the monetary amount of benefits (Appendix A.4).

First, we found the highest leave uptake among wage-earner fathers, second highest in entrepreneurs, and the lowest in unemployed fathers and students, supporting the H1.0. As most new fathers are employed, they are in employment-related meso-level groupings and therefore their leave-taking decisions are able to be affected by characteristics of workplaces and industries. Leave uptake may be low amongst the unemployed as basic unemployment allowance is higher than the lowest paternity leave allowance; whilst financial considerations are not the only driver of uptake, they are still important, and this may especially be the case for those on unemployment. Unstable finances may be a deterrent to childbirth generally (Boivin et al. 2020; Miettinen & Jalovaara 2020); unemployed individuals and students had a much lower rate of fertility than wage-earners and the self-employed. Indeed, the prevailing attitude of younger adults in the Nordics is that stability (in employment,

relationships, etc.) is an important prerequisite to parenthood (reviewed in Lammi-Taskula 2022). However, whilst reported attitudes to the timing of family formation can help explain fertility patterns, they are less informative about why those who had children took leave or (as we found to be more common for students and the unemployed) not. Though there is some literature on barriers to uptake (Bygren & Duvander 2006; Kaufman 2018; Närvi & Salmi 2019; Eerola et al. 2019; Morosow & Cooke 2022), these often focus on those in employment. Therefore, it is vital that future work is directed towards these underrepresented groups and understanding motivations and barriers to leave beyond short-term financial concerns. It may be the case that the unemployed and students are better able to take part in childcare due to not working (and therefore would not need to take leave to spend time with their child), but whether active involvement in childcare is high amongst these groups needs to be quantified.

We expected to observe less taken leave by sole entrepreneurs than entrepreneurs with colleagues (H1.1), as periods of leave may mean suspending of operations for the sole-employee businesses. However, in contrast with this prediction, leave uptake was actually highest among sole entrepreneurs, giving no support for the hypothesis. We urge some caution in this interpretation, however, as many individuals classified as entrepreneurs in the data (or on the basis of having greater entrepreneurial income than earnings) were not associated with an enterprise ID, thus workplace size was unavailable and these individuals could not be included in this sample. Regardless, as with the unemployed and students, this is a group that requires a greater focus to understand the decisions to take leave and how these might differ from wage-earners.

Businesses in female-dominated industries may be better structured around accommodating leave for employees (though all parents have the right to take leave enshrined in law in Finland), and this may lower the threshold for fathers to take paternity leave. In line with H2.0, uptake of longer leaves was higher in female-dominated industries than in male-dominated ones. The same pattern was found for workplaces, where uptake of fathers working in female-dominated workplaces was higher than that of other fathers and the lowest uptake emerged in entirely male workplaces. This is in line with previous research in the Nordic context that has shown men in male-dominated workplaces to be less likely to take leave (Bygren & Duvander 2006; Närvi & Salmi 2019). Taking more leave than just the days concurrent with the mother may be viewed as a signal of future work-life priorities (Evertsson 2016; Weisshaar 2018; Morosow & Cooke 2022), and this may result in penalties for men "less committed" to their work, even under the progressive Swedish system (Evertsson 2016). Even though a low percentage of fathers expected negative consequences of taking family leave in Finland (Närvi & Salmi 2019), this may considerably differ between workplaces and industries. For example, in the same study, those working at the ICT company felt that too much leave may indicate a lower commitment to the job. Somewhat counterintuitively, workplaces (typically knowledge work) with more flexible hours may be a hindrance to family life (Kvande 2009), as the onus is on the employee to provide results rather than put in a set shift. This isn't reflected in our results though: we found that the industries most associated with knowledge work tend to have a higher percentage of fathers taking long leaves. This may indicate that the expected pressure on work-life balance (Kvande 2009) comes later in Finland and is more relevant for male uptake of child care duties rather than uptake and duration of leave, as has been found in Sweden (Evertsson 2016).

We urge caution in over-interpretation of these results as our study design does not allow us to causally assess how much these results reflect the self-selection of fathers into certain types of industries, jobs, and workplaces because of personal characteristics rather than causal effects of workplace processes and industries on the use of leave. For example, a prospective father may work for a company specifically because of their family-friendly workplace practices. Self-selection can

also be unintentional, if personal characteristics affect choosing a workplace where employees generally take more leave for reasons unrelated to family, such as potential for career progression.

Peer groups may be an important influence on uptake of welfare programs (Bygren & Duvander 2006, Dahl et al. 2014, Welteke & Wrohlich 2019), as witnessing others in a social network make use of governmental aid may encourage others to follow the social norms of their peer group (whilst also challenging prevailing wider-scale social norms) and lead to higher leave uptake. We investigated the family leave patterns according to the previous leave uptake of male family members (H3.0) and colleagues (H3.1), while peers outside family and work had to be excluded from the scope of this study as the registers cannot be used to construct other social networks. We found that taking family leave of any length was only slightly different according to familial (only brothers, only brothers-in-law, both) leave history. Non-uptake was a few percentage points higher when no relatives took leave, but the median length of leave taken was the same. This suggests that family role model effects, viewed through a binary leave / no leave lens, exist in fathers' use of leave. This is in line with Norway, where the effect of brothers on uptake of paid leave was almost five percentage points (Dahl et al. 2014).

We also found that the length of previous family leaves were important: when relatives took leave more than 18 days, the distribution of leave length shifted towards longer leaves, and the median leave length was far higher than when family leave history was viewed dichotomously, i.e., took leave vs. did not take leave. The median and distribution was skewed towards longer leaves the most when all brothers and brothers-in-law took family leaves of over 18 days, suggesting that the role model effect from family could be additive and that greater exposure to close men who have taken long leaves may encourage taking a long leave. In Norway and Sweden, the family leave uptake of male colleagues did affect fathers' leave uptake (Bygren & Duvander 2006; Dahl et al. 2014). Our results pointed to the same direction, suggesting potential peer effects in the leave lengths.

When accounting for the length of leaves taken by colleagues, our findings were relatively the same as for family: longer leaves of colleagues were associated with longer leaves of focal individuals. In Germany, another European country with progressive leave policies, this effect related to leave lengths has been previously shown for mothers and female co-workers, using causal methodology (Welteke & Wrohlich 2019). If this possible role model effect is a real phenomenon in the workplace, then incentivising longer leaves in male-dominated workplaces with traditionally low uptake could be a pathway to increasing uptake of long leaves as new fathers gain more long-leave-taking role models and the family-unfriendly norms are displaced by family-friendly ones.

The meso-level influences on father uptake of leave investigated here are not the only possible external influences. One major possible driver of leave uptake is income, as leave will always cause a short-term reduction in finances (as benefits cover less than 100% of salary). In Finland, there is little long-term financial penalty to leave taking *per se*, but the short-term penalty differentially affects families across the income distribution (Morosow & Cooke 2022). Additionally, taking solo leave (i.e. days not at the same time as the mother) may affect father wages in the longer-term, particularly for those on the lower end of the wage distribution (Morosow & Cooke 2022), which could act as a deterrent to long leave uptake. Missing from this line of thinking though is the role of household finances; whilst a perceived or real penalty for individual finances may act as a deterrent, partner income can help act as a buffer to reduce the strain on overall family income. Family economy has been cited by respondents in some studies as a barrier (Närvi & Salmi 2019; Eerola et al. 2019), so how household finances are directly affected by periods of leave (versus the counterfactual of no leave) warrants further study.

In this article, we identified numerous meso-level patterns in fathers' family leave uptake in Finland. Understanding the demography and contextual factors behind leave-taking is an important step towards causal analysis techniques that enable deeper understanding of individual leave decisions. We found that most new fathers over the study period were employed, and that uptake of leave was highest for this employment status. Unemployed fathers and students had much lower uptake, meriting their further study in the context of family leave. We also found that male-dominated industries and workplaces had lower uptake and shorter leave periods than female-dominated ones, which may signal the importance of social norms and peer effects in these environments. Finally, we found that new fathers took longer leaves when they had role models in the family or workplace taking long leaves. As fathers' family leaves are generally linked to many favourable family outcomes, further investigating these patterns within a causal framework may allow better targeting of interventions at groups not taking leave or only taking short leaves.

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APPENDICES

A.1. The Nordic family leave scheme

Finnish policy surrounding father leave has developed greatly since it was first introduced in 1978. Initially, fathers were entitled to two weeks paid leave (12 days; Sundays excluded), which was subtracted from the number of weeks available to the mother. In 1982, a shared period of family leave was added (100 days), which could be split between the parents, though maternal consent was required for the father to use any of these days whilst the reverse was not true. In 1985 the shared period was upped to 146 days, and there was a further 24 day increase in 1991. The 1993 reform reduced shared leave back to 158 days, but increased paternity leave to 3 working weeks (18 days). Paternity leave was extended in 2003 by two weeks, but this was conditional on the father taking the last two weeks of the shared family leave period. From 2007 this could be delayed by up to 6 months after the end of family leave, and was extended by an additional two weeks in 2010. This two week condition of the father month was finally abolished in 2013, permitting fathers to take their full paternity allocation without preventing the mother from taking all the shared period of leave. This reform brought about additional flexibility by allowing the initial 18-day paternity period to be taken after the maternity leave. In August 2022, the leave system was reformed again, with an allocation of 97 non-transferable working days (Monday-Saturday) to fathers, and an additional 63 days that can be transferred to the mother. The mother also has 63 transferable days, and thus a new father (with the permission of the mother) take up to 223 days (97 + 63 + 63).

Finland is similar to Iceland in that leave must be taken before the child's second birthday (Eydal & Gíslason 2020), whilst leave must be taken before the child's third birthday in Norway (Bungum & Kvande 2020). Sweden allows fathers to take family leave anytime before the child's 12th birthday (post-2016 reform; 8th birthday before this point), as long as no more than 96 days are deferred past the 4th birthday (Duvander & Löfgren 2020). Iceland allows four months of paternity leave and two months of parental leave, to be taken within two years of birth (Eydal & Gíslason 2020); the quota for fathers in Iceland is around twice as long as the pre-2022 quota for fathers in Finland, though the shared leave period is substantially shorter in Iceland. Norway also has a longer father quota than pre-2022 reform Finland, but has stricter requirements for eligibility, e.g. if the mother is ineligible for leave for being unemployed or a student, then the father is not allowed to take the father quota (Bungum & Kvande, 2020). Sweden provides 90 non-transferable days for the father, and paid transferable leave totals a further 210 days (Duvander & Löfgren, 2020). Denmark grants the shortest period of paternity – only two weeks – though both parents are entitled to a further 32 weeks of leave. However, despite a possible 64 weeks of family leave, each family can only claim cash benefit for 32 of these (Rostgaard & Ejrnæs, 2020). In terms of timing of paternity, Denmark is least flexible, with paternity needing to be taken within the first 14 weeks, though some of the shared leave can be deferred to a time before the child turns nine (Rostgaard & Ejrnæs, 2020).

A.2. Modified classification of industries

Whilst the TOL 2008 classification scheme is useful for cross-country comparisons, some of the classifications are inappropriate groupings for our study question. As such we used the following reclassification, where characters and numbers in square brackets correspond to the original TOL 2008 values:

1 - Agriculture, forestry and fishing [A]
2 - Mining and quarrying [B]
3 - Manufacturing [C]
4 - Electricity, gas, steam and air con supply [D]
5 - Water supply; sewerage, waste management and remediation activities [E]
6 - Construction [F; excluding 432, 433, 4391 (see 7 for details)]
7 - "Home labourers", containing electrical, plumbing and other construction installation activities [432], building completion and finishing [433], and roofing activities [4391]. These were separated from construction as they are the fields that homeowners can make use of.
8 - Wholesale and retail trade [G]
9 - Transportation (freight) and storage [H, excluding 491, 493, 501, 503, and 511 (see 10)]
10 - Transportation (passenger), containing train [491], other land [493], sea/coast [501], inland water [503], and air [511]. Freight and passenger transportation were separated as the nature of the work differs substantially. Whilst some occupations will be similar across the same type of transport (e.g. train), there are also occupations that are found in passenger but not freight and vice versa.
11 - Accommodation [55]. Separated from I - Accommodation and food service activities.
12 - Food service activities [56]. Separated from I - Accommodation and food service activities.
13 - Information and publishing [J]
14 - Financial and insurance activities [K]
15 - Real estate activities [L]
16 - Legal and accounting [69]. Separated from M - Professional, scientific and technical activities.
17 - Activities of head offices; management consultancy [70]. Separated from M - Professional, scientific and technical activities.
18 - Architecture and engineering [71]. Separated from M - Professional, scientific and technical activities.

19 - Scientific research and development [72]. Separated from M - Professional, scientific and technical activities.
20 - Advertising and market research [73]. Separated from M - Professional, scientific and technical activities.
21 - Other professional activities [74]. Separated from M - Professional, scientific and technical activities. This category is still broad and encompasses professional activities that don't group together particularly well but also are too specific to be standalone industries, such as specialised design, photography (ranging from taking photographs to processing in a red room), translation and interpretation, and weather forecasting, among many others.
22 - Veterinary activities [75]. Separated from M - Professional, scientific and technical activities.
23 - Administrative and support service activities [N]
24 - Administration of state, including administration of the State and the economic and social policy of the community [841], foreign affairs [8421], and compulsory social security activities [843]. Separated from O - Public administration and defence.
25 - Provision of services to the community as a whole [842], excluding 8421 (see 24) and 8422 (see 26). Separated from O - Public administration and defence. This category includes frontline services such as police and border guard, fire services, and judicial services.
26 - Defence activities [8422]. Separated from O - Public administration and defence.
27 - Education [P]
28 - Human health activities [86]. Separated from Q – Human health and social work activities.
29 - Social work activities, including residential care activities [87] and social work activities without accommodation [88]. Separated from Q - Human health and social work activities.
30 - Creative, arts and entertainment [90]. Separated from R – Arts, entertainment and recreation.
31 - Libraries, archives, museums and other cultural attractions [91]. Separated from R – Arts, entertainment and recreation.
32 - Sports activities [931]. Separated from R - Arts, entertainment and recreation.
33 - Other, including other service activities [S], amusement and recreation [932, separated from R - Arts, entertainment and recreation], gambling and betting [92, separated from R - Arts, entertainment and recreation], activities of households as employers and undifferentiated goods and services providers [T], and activities of extraterritorial organisations [U]. This 'industry' is very broad, encompassing all subclassifications that are not large enough to be considered as separate industries for the purposes of this study, but are also not suited to being included within other industries.

A.3. Supplemental figures

H3.0 Half-siblings
For robustness purposes, we re-ran the analyses for H3.0 with half-siblings and their family leave histories included, increasing the sample size to n = 191,476. We treated half-siblings the same as full siblings i.e. a half-brother or partner of a half-sister taking leave were considered as influential as a brother or brother-in-law taking leave. As with Figure 4, violin plots were created with the *vioplot* R package.

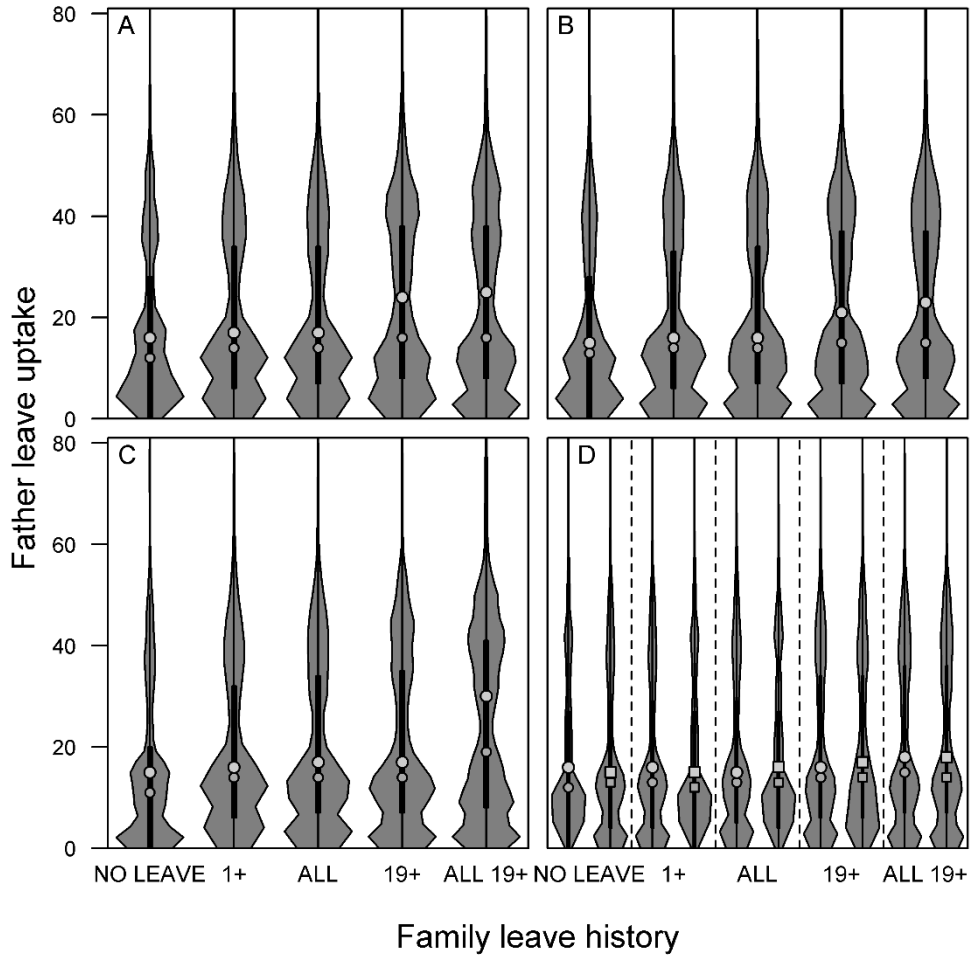

Figure S1. Density distributions (bandwidth = 2) of father leave uptake by family leave history with half-siblings included (n = 191,476). Panels show family conditions for individuals with A) only brothers with children, B) only brothers-in-law with children, C) both brothers and brothers-in-law with children with each condition met by both sides, D) both brothers and brothers-in-law with children, but conditions met only by brothers (circular medians) or brothers-in-law (square medians). The conditions are as follows: no leave, leave taken by at least one fraternal relation with children, leave taken by all fraternal relations with children, more than 18 days of leave taken by at least one fraternal relation with children, more than 18 days of leave taken by all fraternal relations with children. Dark grey median symbols (circles/squares) indicate median when fathers taking no leave are included, light grey symbols indicate median when only fathers who took leave are included. For visualisation and privacy purposes, values over 80 are not presented in the figure and maximum values are not reported.

.

There were no major differences between the results excluding or including half-siblings. When half-siblings were included, median days of leave were lower, but only by a few days. The same patterns as in the main text, such as highest median leave when all eligible families took 19 or more days of leave, were still apparent here.

H3.0 Change over time

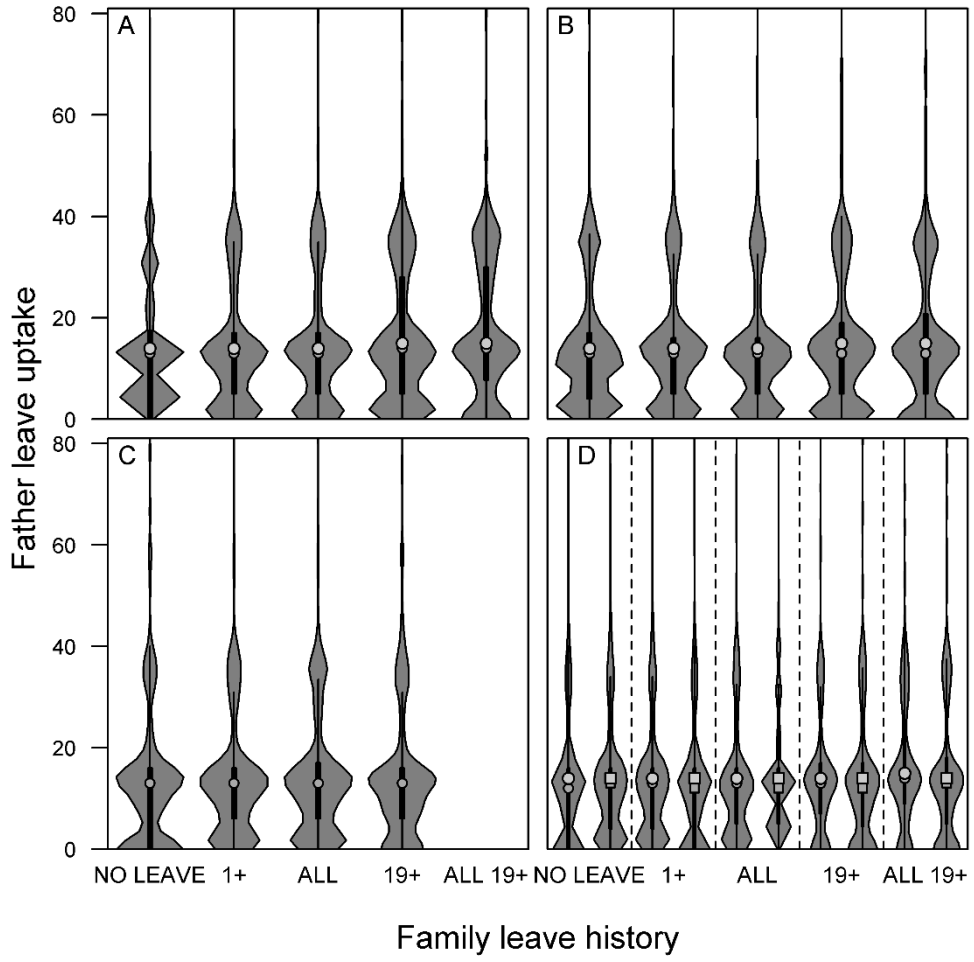

Figure S2. Density distributions (bandwidth = 2) of father leave uptake by family leave history in 2007 (n = 15499). Panels show family conditions for individuals with A) only brothers with children, B) only brothers-in-law with children, C) both brothers and brothers-in-law with children with each condition met by both sides, D) both brothers and brothers-in-law with children, but conditions met only by brothers (circular medians) or brothers-in-law (square medians). The conditions are as follows: no leave, leave taken by at least one fraternal relation with children, leave taken by all fraternal relations with children, more than 18 days of leave taken by at least one fraternal relation with children, more than 18 days of leave taken by all fraternal relations with children. Dark grey median symbols (circles/squares) indicate median when fathers taking no leave are included, light grey symbols indicate median when only fathers who took leave are included. For visualisation and privacy purposes, values over 80 are not presented in the figure and maximum values are not reported. Panel C is missing the final violin as the sample size was low (n = 34), and could not be displayed whilst adhering to Statistics Finland's reporting guidelines.

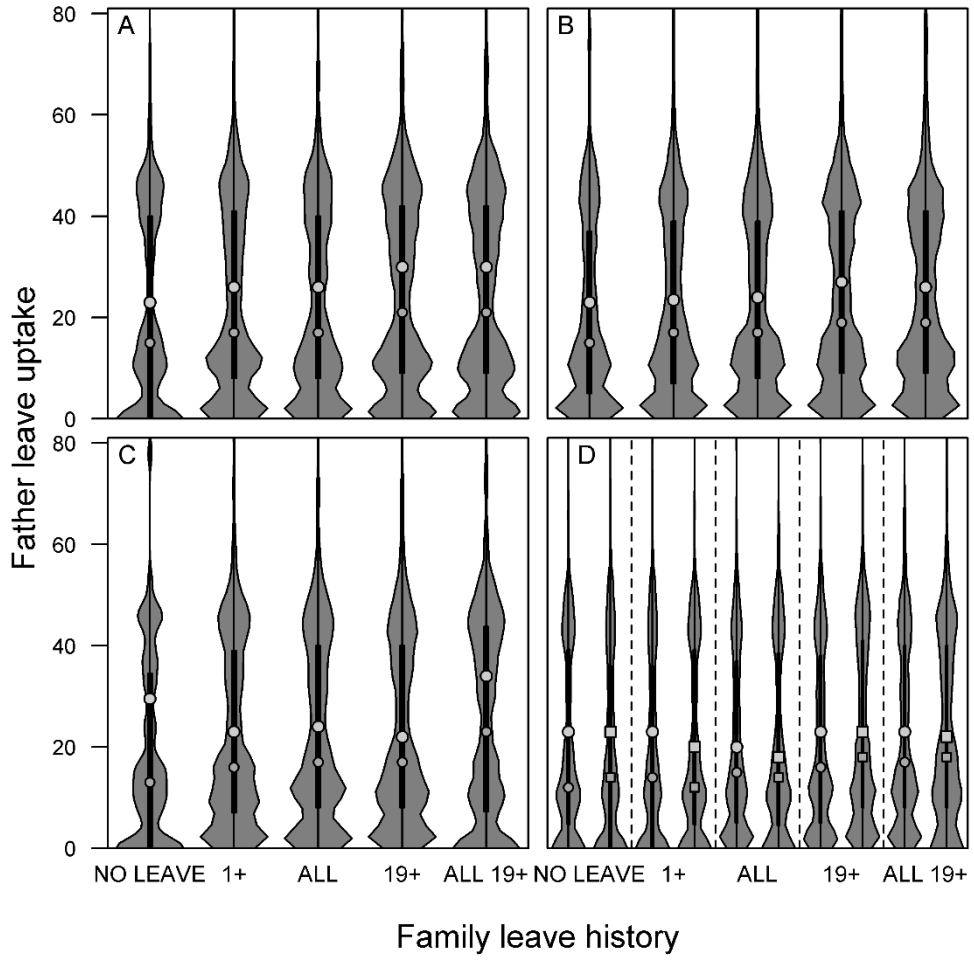

Figure S3. Density distributions (bandwidth = 2) of father leave uptake by family leave history in 2016 (n = 11453). Panels show family conditions for individuals with A) only brothers with children, B) only brothers-in-law with children, C) both brothers and brothers-in-law with children with each condition met by both sides, D) both brothers and brothers-in-law with children, but conditions met only by brothers (circular medians) or brothers-in-law (square medians). The conditions are as follows: no leave, leave taken by at least one fraternal relation with children, leave taken by all fraternal relations with children, more than 18 days of leave taken by at least one fraternal relation with children, more than 18 days of leave taken by all fraternal relations with children. Dark grey median symbols (circles/squares) indicate median when fathers taking no leave are included, light grey symbols indicate median when only fathers who took leave are included. For visualisation and privacy purposes, values over 80 are not presented in the figure and maximum values are not reported.

A.4. Information on calculating the family leave days based on previous income and paid parental allowance.

Family leave benefits are calculated using income over a 12 month period (henceforth, reference period). Currently, the reference period begins 13 months and ends 1 month before the start of the leave period. For those taking leave before January 2020, the reference period was the last full tax year, though big increases in income in the six months preceding the start of leave could be selected instead. As the resolution of the register data is yearly, we could not accurately map the reference income for individuals. Instead, we approximated the reference period by selecting the highest income year from the year in which leave was taken, and the two preceding years. This highest income was then used in the calculation of a daily allowance.

When leave is taken for the same child but in multiple periods (e.g. 18 days of paternity around birth and then the remaining 36 paternity days after the mother has stopped being on leave), the reference period for the second part of leave is taken to be the reference period for the initial leave. If a previous child is under 3 years of age, the reference period used for family leave calculations (after modification by the wage coefficient) can be the same as the reference period used for taking leave for the previous child, if it is higher than the reference period for the newborn. This prevents those who have taken family leave before from being penalised for taking leave, as their income may otherwise be lower than if they had not taken leave.

The formula itself has more-or-less retained its structure across time. After a social security deduction from income (in the region of 3.5–5%, depending on the year), the daily allowance is calculated. Those earning under a minimum payment threshold (6514 € in 2007, rising each year by the wage coefficient to 10562 € in 2018) in are paid a basic allowance of less than 30 € / day, and over the threshold, payment is at 70 % of normal salary, until the next threshold (29392 € in 2007, rising each year to 37167 € in 2018), which reduces the repayment to 40 %, and then again to 25 % at the final threshold (€ 45221 in 2007, rising each year to 57183 € in 2018) (Social Insurance Institution of Finland 2021). Unlike other Nordic countries, there is no ceiling on the allowance. Additionally, up to 2015, the first 30 days of the father's leave was paid at a higher rate.

Below is the R code for the functions used to calculate the leave days, based on these formulas:

```
#Function for calculating daily parental allowance from income for years 1996-2019####
#Note: pre-2001 formulas used Finnish Marks - converted to euros by dividing by rate of
5.9463
#Note 2: does not include modification of formula for higher rate days at start of leave
- this is covered in the second function

#arguments: x is income (numeric), y is year (numeric)

kelaDailyAllow <- function(x, y){

  #create matrix defining yearly values
 #row 1 = year, row 2 = % of year income removed (social security deduction), row 3 =
minimum payment (euros), row 4 = threshold 1, row 5 = threshold 2, row 6 = threshold 3

  mat1 = matrix(c(
    1996, 0.045, 10.09, 4324, 21862, 33634,
    1997, 0.045, 10.09, 4324, 22246, 34228,
    1998, 0.050, 10.09, 4324, 22670, 34875,
    1999, 0.050, 10.09, 4324, 23203, 35698,
    2000, 0.050, 10.09, 4324, 23638, 36367,
    2001, 0.050, 10.09, 4324, 24609, 37861,
    2002, 0.048, 10.09, 4324, 25515, 39256,
    2003, 0.048, 11.45, 4907, 26124, 40192,
    2004, 0.0485, 11.45, 4907, 26720, 41110,
    2005, 0.051, 15.2, 6514, 27468, 42261,
    2006, 0.0488, 15.2, 6514, 28403, 43699,
    2007, 0.0488, 15.2, 6514, 29392, 45221,
    2008, 0.0444, 15.2, 6514, 30033, 46207,
    2009, 0.045, 22.04, 9446, 31850, 49003,
    2010, 0.035, 22.04, 9446, 32892, 50606,
    2011, 0.0367, 22.13, 9484, 33479, 51510,
    2012, 0.0394, 22.96, 9840, 34495, 53072,
    2013, 0.0389, 23.77, 10187, 35457, 54552,
    2014, 0.0413, 23.92, 10252, 36071, 55498,
    2015, 0.0428, 24.02, 10294, 36419, 56032,
    2016, 0.046, 23.93, 10256, 36686, 56443,
    2017, 0.0464, 23.73, 10172, 37133, 57101,
    2018, 0.0448, 26.64, 10562, 37167, 57183,
    2019, 0.0424, 27.86, 11942, 37861, 58252),
    nrow = 6, ncol = 24)

  #to select correct year:
  y2 = ifelse(y <= 1995, 1, y - 1995)
```

```
 #years before 1996 set to 1 so code runs correctly (otherwise issues with displacement
of final output)
  #these are dealt with in the ifelse() call assigned to dailyAllow

  #KELA formulas first minus a % of income - row2 in matrix (social security deduction)
  income = x - (x * mat1[2,y2])

  #minimum daily allowance is row3 of matrix
  minAllow = mat1[3,y2]

  #formula for allowance if above minimum threshold (row4)
  thresh1_Allow = (0.7 * income)/300
  #maximum value within the threshold bracket
  thresh1_Upper = (0.7 * mat1[5, y2])/300

  #formula for allowance if above next threshold (row5)
  #max value of threshold bracket 1 is part of formula
  thresh2_Allow = thresh1_Upper + ((0.4 * (income - mat1[5,y2]))/300)
  thresh2_Upper = thresh1_Upper + ((0.4 * (mat1[6,y2] - mat1[5,y2]))/300)

  #formula for allowance if above maximum threshold, includes max value of threshold
bracket 2
  thresh3_Allow = thresh2_Upper + ((0.25 + (income - mat1[6,y2]))/300)

  #daily allowance set based on (adjusted) income; return NA if year is before 1996
  dailyAllow = ifelse(y <= 1995, NA,
                      ifelse(income < mat1[4,y2], minAllow,
                             ifelse(income <= mat1[5,y2], thresh1_Allow,
                                    ifelse(income    <=    mat1[6,y2],    thresh2_Allow,
thresh3_Allow))))

  #return value of daily allowance
  return(dailyAllow)

}

#Function for calculating daily EXTRA father allowance (first 30 days) for years 2007-2015
or mother allowance (first 56 days) for years 2007-2019 from income####

#arguments: x is income (numeric), y is year (numeric), z is sex (coded as 1 = male, 2 =
female)

kelaExtraParAllow <- function(x,y,z){

  #create matrix defining yearly values
  #row 1 = year, row 2 = social security deduction, row 3 = minimum payment, row 4 = normal
minimum pay threshold, row 5 = upper threshold for extra pay

  mat1 = matrix(c(
    2007, 0.0488, 15.2, 6514, 45221,
    2008, 0.0444, 15.2, 6514, 46207,
    2009, 0.045, 22.04, 9446, 49003,
    2010, 0.035, 22.04, 9446, 50606,
    2011, 0.0367, 22.13, 9484, 51510,
    2012, 0.0394, 22.96, 9840, 53072,
    2013, 0.0389, 23.77, 10187, 54552,
    2014, 0.0413, 23.92, 10252, 55498,
    2015, 0.0428, 24.02, 10294, 56032,
    2016, 0.046, 23.93, 10256, 56443,
    2017, 0.0464, 23.73, 10172, 57101,
    2018, 0.0448, 26.64, 10562, 57183,
    2019, 0.0424, 27.86, 11942, 58252),
    nrow = 5, ncol = 13)

  #to select correct year:
  y2 = ifelse(y <= 2006, 1, y - 2006)
  #years before 2007 set to 1 so code runs correctly. Dealt with in the call to ifelse()
assigned to extraAllow

  #KELA formula social security deduction
  income = x - (x * mat1[2,y2])

  #minimum daily allowance (row3)
  minAllow = mat1[3,y2]

  #changes to minimum threshold
  minThresh = ifelse(z == 1, (0.7 * mat1[4,y2])/0.75, (0.7 * mat1[4,y2])/0.9)
```

```
  #formula for allowance if below threshold (row 5) for men
  thresh1_AllowMen = (0.75 * income)/300
  #maximum value within bracket
  thresh1_UpperMen = (0.75 * mat1[5,y2])/300

  #formula for allowance if below threshold (row 5) for women
  thresh1_AllowWomen = (0.9 * income)/300
  #maximum value within bracket
  thresh1_UpperWomen = (0.9 * mat1[5,y2])/300

  thresh1_Allow = ifelse(z == 1, thresh1_AllowMen, thresh1_AllowWomen)

  #formula for allowance if above threshold, includes max value
  thresh2_Allow = ifelse(z == 1, thresh1_UpperMen + ((0.325 * (income - mat1[5,y2]))/300),
thresh1_UpperWomen + ((0.325 * (income - mat1[5,y2]))/300))

  extraAllow = ifelse(y <= 2006 | (y > 2015 & z == 1), NA,
                      ifelse(income < minThresh, minAllow,
                             ifelse(income <= mat1[5,y2], thresh1_Allow, thresh2_Allow)))

  #return value of extra allowance
  return(extraAllow)
}

#Function for combining kelaDailyAllow and kelaExtraParAllow to calculate number of leave
days taken####

#arguments: a = family leave payment (numeric), b = daily allowance (numeric), c = extra
allowance (numeric), d = sex (coded as 1 for men and 2 for women)

LeaveDays <- function(a,b,c,d){

  #calculate number of days if only using extra payment
  extradays = ifelse(is.na(c), 0, a/c) #accounts or no extra allowance for fathers after
2015

#calculate maximum 'extra' family leave
maxDaysMen = ifelse(is.na(c), 0, 30 * c)
maxDaysWomen = 56 * c

#sex-specific value for leave payment that is paid at the 'normal' rate
daysMin = ifelse(d == 1, a - maxDaysMen, a - maxDaysWomen)

#calculate number of days paid at the 'normal' rate
daysRemain = daysMin/b

#leave days calculated
ldays = round(ifelse(daysMin <= 0, extradays,
                     ifelse(d == 2, daysRemain + 56, ifelse(extradays == 0, daysRemain,
daysRemain + 30))))

return (ldays)
}
```

Code for getting income for use with the calculations (see above for why using income as is will not be correct):

```
#Requires data.table package and appropriate dataset - henceforth referred to as “df”
#note: formulas won’t work for years after 2019 until function updated with more recent
KELA codes
library(data.table)

#First lag income to get income from t-1 and t-2
df[, incomeT1 := shift(income, 1), by = .(shnro)]
df[, incomeT2 := shift(income, 2), by = .(shnro)]

#create a variable to distinguish between all children. In the datasets provided by
Statistics Finland, we use the ‘penulaika’ variable as a basis (age of youngest in
household) and get the cumulative sum of penulaika == 0 by ID (variable named ‘shnro’) -
as long as years are ordered, first child will be designated 1, second 2 and so on
df[is.na(penulaika) == FALSE, childVar := cumsum(penulaika == 0), by = .(shnro)]
```

```
df[childVar == 0, childVar := NA]

#if leave benefits are greater than 0 in a year, mark individual as having taken leave
in that year
df[aiprva > 0, takenLeave := 1]

#create a reference year - the year the benefit is first taken. This sets the income
used for calculations even if the leave is split into multiple periods and income
increases in the meantime
#for each child, create a variable that indicates the number of occasions leave had been
taken #requires takenLeave that isn't 1 to be 0, as cumsum will make anything after NA
another NA
df[is.na(takenLeave) == TRUE, takenLeave := 0]
df[, yearNo := cumsum(takenLeave), by = .(shnro, childVar)]

#we do not want merging after the child is too old (penulaika >= 3), nor is there a
point merging when takenLeave != 1, nor if year is already the reference year
df[penulaika < 3 & yearNo > 1 & takenLeave == 1, refYear := (vuosi - (yearNo +
(penulaika - yearNo)))]

#shift yearNo and takenLeave by 1 within the childVar and ID
df[, c("yearNo2", "TL2") := .(shift(yearNo, 1), shift(takenLeave, 1)), by = .(shnro,
childVar)]

#if leave taken in year 2 and yearNo != 0, then normal calculation applies for refYear
only if TL2 == 0 and yearNo2 == 1
df[penulaika == 2 & takenLeave == 1 & TL2 == 1 & yearNo2 == 1, refYear := (vuosi - 1)]

#merge, matching childVar and shnro, and refYear to year - brings the income info from a
previous year to the current year
df[df[childVar >= 1], on = .(shnro = shnro, childVar = childVar, refYear = vuosi),
c("x.income", "x.incomeT1", "x.incomeT2") := .(i.income, i.incomeT1, i.incomeT2)]

#will need to use the x. variables in the KELA functions if these variables are not NA
#get highest income from t, t-1, and t-2, and the same for x.income variables
df[, incomeMax := pmax(income, incomeT1, incomeT2, na.rm = TRUE)]
df[, x.incomeMax := pmax(x.income, x.incomeT1, x.incomeT2, na.rm = TRUE)]

#If previous child is younger than 3, then the income used can be the same for the
previous child, and this can chain: "when earnings used to calculate previous allowance
are used to determine new allowance, earnings adjusted by wage coefficients for the year
in which the entitlement for the allowance begins and the preceding year. This may mean
a change in the rate of the allowance, even if the earnings used as the basis for
calculating the allowances are the same"

#shift penulaika by 1 to be able to see if previous child was 2 or under
df[, recentKid := shift(penulaika, 1), by = .(shnro)]
#if yes, set new indicator variable "delayedInc" as 1
df[penulaika == 0 & recentKid <= 2, delayedInc := 1]
#otherwise 0 - needed for cumsum to work as we want
df[is.na(delayedInc) == TRUE, delayedInc := 0]
#take cumulative sum of delayedInc
df[, delayedInc := cumsum(delayedInc), by = .(shnro)]

#create second indicator "delayedInc2" that is 1 if the previous child was NOT 2 or
under
df[penulaika == 0 & recentKid > 2, delayedInc2 := 1]
df[is.na(delayedInc2) == TRUE, delayedInc2 := 0]

#third indicator - cumsum of delayedInc2 - this is how we "chain" the children
df[, delayedInc3 := cumsum(delayedInc2), by = .(shnro)]

df[delayedInc2 != 0, childVarRef := childVar - (delayedInc - delayedInc3)]

#merging economic variables from the first instance of child X where takenLeave == 1 and
yearNo == 1 (i.e. reference year for income)
df[df[takenLeave == 1 & yearNo == 1], on = .(shnro = shnro, childVarRef = childVar),
c("old.incomeMax", "old.x.incomeMax") := (i.incomeMax, i.x.incomeMax)]

#Function for adjusting wages by wage coefficient
#arguments: current year, income
wageAdjust <- function(x, y){

       wageCoef = matrix(c(
```

```
            2004, 1.000,
            2005, 1.028,
            2006, 1.063,
            2007, 1.100,
            2008, 1.124,
            2009, 1.192,
            2010, 1.231,
            2011, 1.253,
            2012, 1.327,
            2013, 1.350,
            2014, 1.363,
            2015, 1.373,
            2016, 1.389,
            2017, 1.391,
            2018, 1.417,
            2019, 1.446), nrow = 2)
      #set t0 to be col number for the year unless it is less than 2005, in which case
set as 2 (addressed later; set as 2 to allow later line to run)
      t0 = ifelse(x < 2005, 2, x - 2003
      t1 = t0 - 1

      #work out adjustment - current year index/previous year index
      adjIndex = wageCoef[2, t0]/wageCoef[2, t1]

      #adjusted income set; return NA if year is before 2005, otherwise multiply income
by adjIndex
      adjIncome = ifelse(x <= 2004, NA, y * adjIndex)

      #return value of adjusted income
      return(adjIncome)

      }

#adjust wage (using x. measure if it exists)
df[, adjustWage := wageAdjust(vuosi, old.x.incomeMax)]
df[is.na(old.x.incomeMax) == TRUE, adjustWage := wageAdjust(vuosi, old.incomeMax)]

#select highest value - if wages increased since previous leave, should be able to
increase the benefit
#overwrite x.incomeMax and incomeMax to account for adjustWage
df[is.na(x.incomeMax) == FALSE, x.incomeMax := pmax(x.income, x.incomeT1, x.incomeT2,
adjustWage, na.rm = TRUE)]
df[is.na(x.incomeMax) == TRUE, incomeMax := pmax(income, incomeT1, incomeT2, adjustWage,
na.rm = TRUE)]

#Then, use parental leave calculations:
#calculate daily allowance. Use x.incomeMax if it is not NA
df[is.na(x.incomeMax) == FALSE, dailyAllow := kelaDailyAllow(x.incomeMax, vuosi)]
df[is.na(x.incomeMax) == TRUE, dailyAllow := kelaDailyAllow(incomeMax, vuosi)]

#calculate extra allowance - here, sukup is sex
df[is.na(x.incomeMax) == FALSE, extraAllow := kelaExtraParAllow(x.incomeMax, vuosi,
sukup)]
df[is.na(x.incomeMax) == TRUE, extraAllow := kelaExtraParAllow(incomeMax, vuosi, sukup)]

#calculate leave days
df[, leaveDays := LeaveDays(aiprva, dailyAllow, extraAllow, sukup)]
df[is.na(leaveDays) == TRUE, leaveDays := 0]
```