Paternity Leave-Taking and Continued Childbearing in Singapore

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Abstract

Parental or paternity leave policies have been implemented to promote a gender-equal division of childcare, encourage fathers' participation at home, and increase fertility. Existing literature examining the relationship between fathers' leave-taking and continued childbearing at the individual level is primarily based on evidence from Nordic countries, with inconsistent findings regarding the varying impact of the length of leave taken and the child's parity. Scant attention has been paid to the Asian context, where the gendered division of domestic labor remains prevalent despite a high level of women's labor force participation and the often limited or absent provision of paternity leave. This study draws data from the Singapore Longitudinal Early Development Study (SG-LEADS), which provides a nationally representative sample of preschool children aged 0 to 6 at the baseline (N=5,005). The analytic sample for this study comprises 2,864 children. Results from event history analysis showed that taking paternity leave was not significantly related to couples' subsequent childbearing on having a second or third birth. Compared to positive findings in Nordic countries, the nonsignificant policy impact may be due to the unique socio-cultural and policy contexts in Singapore, such as the short length of paternity leave (2 weeks), traditional family norms, and patriarchal ideologies. The results of this study have policy implications for fostering gender equality, promoting greater involvement of fathers in family life, and addressing the challenge of low fertility rates in other Asian societies.

Keywords: paternity leave, fertility, gender equality, parenthood, Singapore

Introduction

Parental or paternity leave was first initiated in Europe in the 1960s, which aims to help fathers achieve work-life balance, strengthen the father-child relationship, and increase gender equality both at home and in the workplace (Rostgaard, 2002). In recent two decades, some Asian societies that share ultra-low fertility levels (i.e., South Korea, Japan, Hong Kong, Singapore) have also established paternity or parental leave for fathers as part of their pronatalist policies to boost fertility rates and encourage fathers' participation at home (An & Peng, 2016; Chin et al., 2012; Lee & Zaidi, 2020; Yeung & Li, 2023). Compared to the leave offered in European countries, the length of fathers' leave in Asia is much shorter or absent, with substantial variations due to socio-economic and cultural diversities (see a review by Chung et al., 2021). For example, Indonesia offers 2 days' paternity leave, while Hong Kong and Taiwan provide 5 days and 7 days, respectively. South Korea and Japan, in their most recent reform, now offer up to one year of nontransferable parental leave. It is shown that parental leave has a positive influence on the total fertility rate (TFR) at the macro level across 18 OECD countries, as it provides support for working parents during the child's early years, thus may facilitate parents' choice to have (more) children (Luci-Greulich & Thévenon, 2013). Nevertheless, existing literature examining the relationship between fathers' parental (or paternity) leave-taking and continued fertility at the individual level is primarily limited to Nordic countries. Little is known about the association between fathers' use of leave and couples' continued fertility in Asian societies where women's labor force participation rates are high, but traditional patriarchal values and gendered division of domestic labor remain more prevalent than in the Western context. Moreover, prior research has shown mixed findings on the relationship between fathers' leave-taking and continued fertility, varying based on the

length of leave taken by the father and the child's parity across countries. To fill the lacunas in current research, this study has two main research questions: (1) Does fathers' paternity leave-taking influence couples' likelihood of continued childbearing in Singapore? and (2) Does the relationship between paternity leave-taking and continued childbearing differ based on the length of leave taken by the father and the child's birth order? The results of this study add to international comparative research on paternity or parental leave and have policy implications for countries seeking to improve gender equality and boost low fertility rates, especially in the Asian context.

Background

Parental or Paternity Leave on Continued Fertility in Nordic Countries, U.S., and Australia

Nordic countries have implemented generous parental leave policies for fathers since the 1990s, surpassing those of many other Western societies. Norway first introduced the father's quota in 1993, granting eligible fathers a 4-week individualized, non-transferable leave entitlement. The quota has been expanded gradually to 5 weeks (in 2005), 6 weeks (in 2006), and 15 weeks since 2018 (Duvander et al., 2019; Haas & Rostgaard, 2011). Sweden introduced the non-transferable fathers' quota (4 weeks) following Norway in 1995. The quota was increased to 2 months in 2002, and a third month was added from 2016 (Duvander et al., 2019). Iceland is a latecomer in the Nordic that provides parental leave reserved for fathers; however, it is the leading country in terms of gender equality-oriented regulations. In 2000, Iceland offered each parent a 3 months' nontransferable leave to encourage fathers' use of leave and

involvement in childcare activities (Farstad, 2015; Lister, 2009). As the length of leave varies across these three countries, the take-up rates also differ. Between 1994 and 2007, approximately 45% of Norwegian fathers did not take parental leave within the first 18 months after childbirth. In Sweden (1995–2009) and Iceland (2001–2009), the proportions of fathers who did not take leave during these periods were about 30% and 7%, respectively (Duvander et al., 2019).

Most previous studies showed a positive association between fathers' leave-taking and having a second birth. Some earlier studies used the income replacement rate as a proxy for fathers' use of parental leave due to the unavailable data on the actual length of leave taken. In Sweden, fathers' uptake of parental leave, except for taking a very long leave (defined as leave benefits equivalent to over 25% of his earnings), is positively related to couples' second birth compared to fathers who did not take leave after the birth of the first child (Duvander et al., 2010; Duvander & Andersson, 2006; Oláh, 2003). In Norway, fathers' use of parental leave, and even very long leave, was positively related to having a second child (Duvander et al., 2010). A later study adopted a more accurate measurement of the length of leave using the father's quota (i.e., no use, use up to the quota, use longer than the quota) and showed that fathers taking leave up to quota or more than the quota[1] was positively associated with the risk of having a second child in both Sweden and Norway (Duvander et al., 2019). This aligns with a previous study in Norway, which found that fathers utilizing a quota of 4 weeks or more increased the likelihood of couples having a second child by approximately 16–17% compared

[1] This study includes three Nordic countries across different time spans: Sweden (1995-2009), Norway (1994-2007), and Iceland (2001-2009). The duration of the fathers' quota varies by country and across these periods, generally ranging from six weeks to three months.

to couples where only the mother took parental leave (Lappegård, 2010). The positive association between the use of fathers' quota (3 months) and having a second birth was also identified in Iceland (Duvander et al., 2019).

Unlike the consistent positive policy impact on having a second birth, the association between fathers' parental leave-taking and having a third birth is mixed. Using the income replacement of the parental leave system as an approximate measure of leave use, studies have shown that fathers' uptake of parental leave, except for taking a very long leave (leave benefits equivalent to over 25% of his earnings), was positively related to couples' continued fertility for the third birth in Norway and Sweden based on population registers covering 1993-2003 and 1988-1999 in two countries, respectively (Duvander et al., 2010; Duvander & Andersson, 2006). However, opposite results were found when researchers adopted an explicit measurement of leave duration using the length of father's quota. Despite the differences in time coverage of population registers, research revealed that fathers who took their full paternal leave quota—4 or 6 weeks in Norway[2], 2 months in Sweden, and 3 months in Iceland—or exceeded it after the birth of a second child were less likely to have a third child compared to those who did not take leave in Norway and Sweden. However, in Iceland, this association was not statistically significant (Duvander et al., 2019; Lappegård, 2010).

Although a positive policy impact was identified with the accurate measure of leave use, results from previous studies cannot be interpreted as causal due to selection issues on fathers' leave use. More recently, using the difference-in-differences (DID) method, Duvander et al. (2020) identified a positive causal effect of the father's quota on the likelihood of having a third

[2] 4-week fathers' quota in 1993, 6-week fathers' quota in 2006.

child among low-income fathers in Sweden. This could be attributed to the fact that these fathers started using parental leave only after the reform, making them the group most directly impacted by the policy in terms of fertility decisions (Duvander et al., 2020). To sum up, the inconsistent findings for having a second or third birth may result from the measurement of the length of leave (i.e., using income replacement rate as a proxy or using the exact measurement of the father's quota), the period covered by each study, and the varied socio-cultural and policy contexts among Nordic countries. For example, fathers who exceeded the parental leave quota were more likely to have a second child than those who only used up to the quota. This highlights a stronger connection between gender-equal sharing of parental leave and second-birth fertility, reflecting Iceland's more progressive and radically gender-equal parental leave system compared to those in Norway and Sweden (Duvander et al., 2019).

In the U.S., California first implemented paid family leave (replacement ratio of 55% of the worker's earnings) for both male and female workers to take care of newborns or family members who are ill. Using restricted data from the National Vital Statistics System (1999-2008) and DID method, Golightly and Meyerhofer (2002) found that the 6 weeks of paid family leave had a causal effect on increasing the overall fertility rate by 2.8% and had an increase of 2.4 second or higher-order births per 1,000 women aged 30-39. In addition to the duration of leave, the generosity of leave benefits also makes an impact on fertility. In 2004, Estonia reformed its parental leave policy, replacing low flat-rate benefits with earnings-related benefits till 11 months after the childbirth. This reform also entitled parents to retain their previous level of benefits for subsequent children born within a 30-month period, which allowed parents to avoid benefits reduction caused by lower earned income between births

(Puur et al., 2023; Puur & Klesment, 2011). Using a mixture cure model, Puur and colleagues (2023) showed that this policy reform led to an increase in the probability of having a second and a third birth by 5.5 and 3.7 percentage points and shortened the time of having a second and a third birth by 12% and 15%, respectively. In Australia, the 18-week parental leave policy led to a roughly 16% increase in the intended number of children, primarily among highly educated women. This effect was observed among women who intended to have at least one or more children, regardless of their employment status or sector (Bassford & Fisher, 2020).

As fathers with more preferences for children may have self-selected to take parental (or paternity) leave after the birth of the first child, the positive associations between leave-taking and continued childbearing may not be interpreted as causal. Several studies using (quasi) experimental designs and causal inference methods revealed either no or negative effect of parental leave on fertility. Cools et al. (2015), using the DID method, found no evidence of a positive effect between paternity leave reform in 1993 (4 weeks) and subsequent fertility in Norway. This was supported by a recent study revealing that this 4-week father's quota reform in Norway showed no causal effect on continued fertility for either one-child or two-child couples in 10 years (Duvander et al., 2020). Using the Regression Discontinuity (RD) design, Hart and colleagues (2019) further pointed out that Norway's father's quota reform in 2009 (extending from 6 to 10 weeks) did not have a significant impact on subsequent fertility measured by the number of younger siblings and the probability of having at least one sibling five years younger than the target child.

Parental or Paternity Leave on Continued Fertility in European and Asian Contexts

In general, longer and income-related parental leave policies are associated with higher fertility rates; nevertheless, the effect of the parental or paternity leave policy is much influenced by the socioeconomic, cultural, and institutional settings of a local context (Bergsvik et al., 2021; Thomas et al., 2022). Compared to Nordic countries, studies in Southern European and Asian countries have also revealed inconsistent results, with most of them finding no or even a negative impact of parental leave on fertility, indicating the role of idiosyncratic characteristics on the effectiveness of policies (Luci-Greulich & Thévenon, 2013).

In Germany, the 2007 parental leave reform showed a positive impact on fertility over a long period using DID method. This reform introduced a two-month "daddy quota" and replaced means-tested income replacement with earnings-dependent benefits[3]. Initially, it reduced the likelihood of having a subsequent child by approximately 3.9 percentage points within the first 32 months and delayed the timing of the next birth by an average of 0.7 months within the first four years after the most recent birth. These effects were largely driven by non-working mothers and those with the lowest income. For the less-advantaged mothers, this reform did not affect their behavior significantly as the cost of childbearing was higher than the short-term benefit from the reform (Cygan-Rehm, 2016). However, mothers, except those from economically disadvantaged families, started to compensate for the initial losses by the end of the third year, and the negative effects on the probability of having a subsequent birth became nonsignificant after 45 months. Moreover, the average birth spacing was also nonsignificant across the entire 57-month period of analysis (Cygan-Rehm, 2016). Stichnoth (2020) later found that this 2007 reform significantly increased the number of births by about

[3] The payment lasts for 12 months if only one parent applies, and up to 14 months if both parents apply or a single parent takes up leave.

4% for families with only one child, using data from the German Socio-Economic Panel. This estimated fertility effect was consistent with other quasi-experimental research (e.g., Raute, 2017) and supported the findings from Cygan-Rehm's (2016) study that shows the fertility reaction was more pronounced among higher-income families from third and fourth quartiles of income distribution.

In Hungary, the child-care policies (parental leave and public childcare) during the period from 1983-1993 had no significant impact on men's second-birth intention but a negative impact on women's intention to have a second birth, compared to the period from the late 1960s to the early 1980s (Oláh, 2003). In Spain, the implementation of a 13-day paternity leave resulted in delays in having additional children among eligible families and reduced the likelihood of having another child within two years by 7–15%. The effect was especially pronounced among mothers over 30, whose fertility rates dropped by 11–22% during the first two years after the policy was introduced (Farré & González, 2019). The negative impact of the policy can be attributed to several interrelated factors. Increased mothers' labor force participation and paternal involvement in childcare may have heightened the opportunity costs of having additional children, making the decision to have another child more challenging. Furthermore, as fathers spend more time with their children, their preferences may have shifted from prioritizing the number of children to focusing on their upbringing quality (Farré & González, 2019). This greater fathers' involvement may also have deepened paternal awareness of the substantial financial, emotional, and time investments required for raising children (ibid.). Findings from these two countries indicate that the negative impact of paternity leave on continued childbearing is contingent on the gender and cultural norms of a local context. Unlike

the Nordic countries where gender equality has been widely accepted in both public and private spheres, traditional gender role attitudes remain dominant in Hungary and Spain, emphasizing women's responsibilities in housework and childcare (Farré & González, 2019; Oláh, 2003).

So far, only one study has been conducted in the Asian context, examining the impact of parental leave on fertility intentions in South Korea, where around 16% of fathers took about 6.8 months (out of 12 months) of nontransferable parental leave on average in 2018 (Lee, 2022). This study adopted a mixed method approach, and the quantitative data was based on a convenient sample from an online survey measuring couples' intention to have another child rather than their fertility behavior. Lee's (2022) study only captured fathers' parental leave uptake experience (*"currently on leave," "have taken leave in the past," "have never taken leave yet, but plan to in the near future"*) with no information on the length of leave taken by the father. Moreover, the multinomial logistic regression only captured whether the couple intends to have an additional child but did not provide information on the tempo of subsequent childbearing. Results revealed that couples in which fathers are currently taking or have previously taken parental leave exhibited significantly lower intentions of having another child, especially when they already have two children. The identified negative impact of leave-taking by fathers on fertility, as seen in Southern European countries and South Korea, may reflect the short length of parental or paternity leave for fathers and the incompatibility of the leave policy with traditional gender norms and insufficient public childcare support at the societal level (Farré & González, 2019; Lee, 2022).

Theoretical Perspectives of Parental Leave and Fertility

The idea that parental leave policies can enhance fertility is rooted in economic theory and the gender equality perspective, which together provides a framework for understanding the factors that shape a family's decision about the number of children they choose to have. Family policies are theorized to promote micro-level fertility by mitigating the negative trade-off between women's employment and fertility and reducing the costs of childbearing and childrearing (Apps & Rees, 2004; Del Boca et al., 2003; Farré, 2016). The neoclassic economic theory of fertility posits that the decision to have a child is an economically rational choice considering the economic costs and benefits of raising children (Gauthier, 2007). The number of children that a couple choose to have depends on their financial capability, the anticipated resources required for raising children, and parents' preferences for having (more) children and allocating these resources to their children as opposed to other expenditures (Becker, 1981; Cigno, 1991). A trade-off exists between the quantity and quality of children, indicating that as the number of children increases, the resources available for each child diminish. This limits parents' ability to invest in each child's upbringing, education, and overall development (Becker & Lewis, 1973; Schultz, 1973). Parental leave policies with generous income-related compensation help mitigate the economic costs of taking time off to care for newborns, thereby reducing the financial burden of childbearing. Moreover, parental leave reduces the risk of long-term career interruptions, especially for women, as it supports or secures parents to return to work after the leave.

The gender revolution framework and gender equality theory help to understand childbearing decisions from a sociological perspective. The first stage of the gender revolution marks a transformative shift from the traditional male-breadwinner model to a variety of dual-

earner family arrangements, propelled by a significant and sustained increase in women's participation in the labor force over recent decades (Goldscheider et al., 2015). However, scholars have observed that this shift represents an "uneven and stalled" gender revolution. The second stage of this transformation remains unrealized, as men have not sufficiently increased their participation in domestic responsibilities within the private sphere, even as women have assumed greater economic roles alongside men in the public sphere (Hochschild & Machung, 1989). Under the incomplete gender revolution, women bear the bulk of the housework and childcare burden and often opt out from (additional) childbirths as their family responsibilities are incompatible with their career aspirations, thus increasing the opportunity cost of giving birth (Esping-Andersen & Billari, 2015; Goldscheider et al., 2015; McDonald, 2000). Therefore, one possible way to help increase the fertility rate is for men to share more family responsibilities and relieve wives' work-life conflicts (Esping-Andersen & Billari, 2015; Kan & Hertog, 2017). The introduction of parental or paternity leave for fathers, coupled with their active participation in utilizing this leave, supports couples in achieving their fertility aspirations through the following two mechanisms.

First, a father's use of parental leave means they are more likely to share household and childcare responsibilities, signaling a more equitable partnership. This more equitable sharing of family duties reduces the opportunity cost of having a child, thus can increase the likelihood of the couple having another child, compared to couples where the mother bears the majority of domestic and caregiving responsibilities (Duvander & Andersson, 2006; Golightly & Meyerhofer, 2022; Luci-Greulich & Thévenon, 2013; Oláh, 2003). Second, fathers' use of parental or paternity leave would strengthen their fatherhood identity through daily interactions

with the child and the partner (Duvander & Andersson, 2006; Knoester et al., 2019; Petts et al., 2020), and the positive leave experience caring for a small child may increase fathers' fertility desire. Alternatively, the increased fathers' involvement and intensive caregiving may also bring negative experiences to fathers and increase their work-family conflicts, which may lead to a decline in the desire for more children (Duvander et al., 2019; Lee, 2022; Okun & Raz-Yurovich, 2019).

Singaporean Context

Low Fertility and Paternity Leave Policy

Singapore has witnessed one of the most rapid declines in fertility rates since the 1970s, with the TFR falling from 3.1 in 1970 to 0.97 births in 2023 (Singapore Department of Statistics, 2024). Moreover, Singapore has also experienced an uneven and stalled gender revolution (England, 2010). Despite high levels of women's participation in the labor force, the traditional gendered division of domestic labor remains deeply entrenched, with mothers still bearing the primary responsibility for caring for young children. Regarding the cultural context, Singapore has always stressed familism as a core national ideology (Yeung & Hu, 2018). Despite the continued decline of TFR, fertility preferences have stabilized at about two children per family (Yap & Gee, 2018). There has been a growing concern about the importance of the father's role in early childhood development in the past decade. To further boost the fertility rate and increase fathers' involvement in the family, Singapore first introduced the fully paid paternity leave policy in 2013 as part of the Government's enhanced Marriage and Parenthood Package.

Eligible (biological or adoptive) fathers[4] with babies who are Singaporean citizens born on or after 1 May 2013 were entitled to take one week of Government-Paid Paternity Leave ("*paternity leave*" thereafter) plus one week of the Government-Paid Shared Parental Leave from the mother's 16 weeks of paid maternity entitlement, subject to eligibility and the mother's agreement (Ministry of Social and Family Development, 2013). Since 1 January 2017, paternity leave has been doubled to 2 weeks[5], and eligible fathers can also take up to 4 weeks of shared parental leave (Ministry of Manpower, 2023).

The take-up rate of paternity leave has gradually increased in the past few years, and 53% of eligible fathers took paternity leave in 2022 (Ang, 2024). Nevertheless, only about 40% of eligible fathers took the full 2 weeks' leave from 2018 to 2020 (MSF, 2023). Factors such as fathers' lack of awareness of their entitlements, traditional gender roles within the family, and unsupportive workplace culture may hinder fathers from taking leave (Baker, 2022; Lai & Zhuo, 2019; A. Tan, 2021). Nonetheless, the proportion of fathers taking paternity leave in Singapore exceeds that in Japan and South Korea, where recent statistics show that only about 17% and 28% of eligible fathers have taken parental leave in these two countries, respectively (Sim, 2023; Yoon, 2024).

Other Family-friendly Policies for Childbearing and Childrearing

[4] According to the Ministry of Manpower (MOM), the criteria of a working father to take Government-Paid Paternity Leave include: the child is a Singapore citizen; the father should be lawfully married to the child's mother between conception and birth (only for biological fathers); and fathers should have served their employers for a continuous period of at least 3 months before the birth of the child. For self-employed fathers, they should have been engaged in their work for a continuous period of at least 3 months before the birth of the child and have lost income during the paternity leave period.

[5] According to MOM, the maximum number of working days per week is 6 days, so the length of 2 weeks is capped at 12 days.

The effect of fathers' leave-taking on continued fertility is not exerted in a vacuum but is much influenced by the social and institutional support from the local society (Lee, 2022). Comprehensive pronatalist policies and public childcare support could boost the effect of paternity leave-taking and encourage parents to have (more) children. Since the 1980s, the Singapore government has implemented a variety of family-friendly policies to encourage marriage and childbearing, which focus on providing financial assistance, facilitating access to caregiving resources, and ensuring workplace support for caregivers.

Financial incentives such as the Baby Bonus Scheme and Parenthood Tax Rebate (PTR) have been established to promote fertility by offsetting the costs of raising children. Singaporean children who were born on or after 14 Feb 2023 were entitled to the enhanced Baby Bonus, with cash gifts of SGD$11,000 for the first and second birth and SGD$13,000 for the third or subsequent births (Made For Families, 2023), while parents can claim up to SGD$20,000 per child under the PTR based on the child's birth order (Inland Revenue Authority of Singapore (IRAS), 2024). To encourage working mothers to rejoin the workforce after childbirth, the government introduced the Working Mother's Child Relief (WMCR), offering income tax relief of SGD$8,000 to SGD$12,000 based on the birth order, along with the Grandparent Caregiver Relief (GCR), which provides an additional SGD$3,000 annual tax relief for mothers whose non-working parents care for their children (IRAS, 2024). All these family support measures help to reduce the economic barriers to childbearing, which may help to enhance the impact of paternity leave-taking on fertility, particularly when parenthood is more economically viable in Singapore.

The government has also made an effort to provide more affordable and high-quality

preschools, with a target of reaching 80% of full-day government-supported preschool places by around 2025(N. Tan, 2024). The provision and enhancement of public childcare services alleviate childcare responsibilities for mothers, particularly in dual-earner families. Last but not least, Singapore has also promoted flexible work arrangements (FWAs) in the past two decades to assist employees in achieving work-family reconciliation. The Work-Life Grant is one example that incentivizes companies to implement FWAs for employees (MOM, 2018). In 2020, about 93% of companies provided some forms of FWAs (i.e., ad-hoc flexi-time and teleworking), covering over 97% of employees in Singapore (MRSD & MOM, 2021). The Tripartite Guidelines on FWAs further encourage employers to continue offering FWAs in the post-COVID-19 period, including a four-day work week (MOM, 2024; Seow, 2024). Alongside the paternity leave policy following the birth of a child, fathers can benefit more from FWAs, which enables them to devote more time to household and childcare responsibilities over an extended period during early childhood. This, in turn, may foster stronger marital relationships and encourage couples' fertility intentions.

Hypotheses

We propose the following research hypotheses based on the current literature, theoretical perspectives, and socio-cultural context in Singapore.

Hypothesis 1a: Taking paternity leave and a longer leave is positively related to having a second birth among parental couples.

Hypothesis 1b: Taking paternity leave and a longer leave is positively related to having a third birth among parental couples.

Hypothesis 2: The positive relationship between paternity leave-taking and continued childbearing is stronger for the second birth than the third birth, considering the general fertility intention of having two children in Singapore.

Data and Methods

Data and Sample

This study uses data from the Singapore Longitudinal Early Development Study (SG-LEADS) (Yeung & Chen, 2024). This study adopted multi-stage stratified probability sampling and oversampled low-income groups. The first wave (W1) of SG-LEADS collected data in 2018/2019 from a nationally representative sample of 5,005 Singaporean children (citizens and permanent residents) under the age of 7 and their primary caregivers (PCGs) in 3,476 households. The PCGs are the survey respondents, and about 95% of PCGs are mothers in SG-LEADS. The second wave (W2) was conducted in 2021 with 4,352 children in 3,017 households, and the response rate at the child level is 87.0%.

The analytic sample includes children who participate in both waves, have no twin siblings, and live in two-parent intact families where the PCGs are mothers. As the paid paternity leave was first initiated in Singapore on 1 May 2013, we limit our sample to children born on or after 1 May 2013. We also restrict the sample to only mothers younger than 45 and fathers younger than 70 years old due to declining fertility for older age groups. Moreover, we only consider first-marriage couples in this study and exclude children whose mothers remarried to a new partner by the W2 interview. Therefore, the final sample size for this study was 2,864 children living with either biological or adoptive parents in 1,835 households.

Methods

We use parents' exposure time to the subsequent childbearing after the target child to examine the association between fathers' uptake of paternity leave and continued fertility in the family. Event history analysis, a widely used tool in analyzing time-dependent data (Allison, 1984), was used to estimate the relationship between fathers' use of paternity leave for the target child (as parity one or two) and the propensity of having a next-order child. The estimated risks reflect both the timing and the quantum of the event we study.

Our dependent variables include whether the household has a subsequent child (*"event,"* 1= *"has a subsequent child,"* 0= *"has no subsequent child"*) and parents' exposure time to the continued childbearing (*"duration"*) by the W2 interview. The *duration* was originally calculated in "days" and transformed to "years" for ease of analysis, and "year" as the unit of analysis is a continuous variable. The longest duration is also the *"study window"* of the survival analysis, which is 8.33 years in our analytic sample. The hazard ratio estimated is the conditional probability of having a higher-order birth at a particular time since the birth of the target child (previous birth), given that a couple has not yet experienced this event. If there is no subsequent birth (after the target child) in the household by the W2 interview, the *duration* refers to the time difference between the survey time of W2 (for this household) and the birth date of the target child. If there is (are) registered birth(s) (after the target child) in the household by the W2 interview, the *duration* refers to the time difference between the birth date of the target child and the birth date of his/her nearest sibling.

The independent variable is the *length of paternity leave* taken by the father for the target child, which was grouped into three categories (0= *"did not take leave,"* 1= *"1-week leave",*

2= *"2 or more weeks of leave"*), as very few fathers took more than two weeks of leave (2.38%). For fathers who did not take paternity leave, the days of leave were coded as "0".

A set of control variables were considered in the analysis. We included the age of the youngest child and the mother's expected number of children to have from W2, as the expected fertility has a positive relationship with having an additional child and provides reasonable indications of actualized fertility (Bacci, 2001; Chen & Yip, 2017; Lee, 2022), especially when the target child is the first birth in the family. Other demographic and socioeconomic confounders related to paternity leave-taking and childbearing were derived from W1, including (target) child's gender, mother's age, mother's work hours (combined with employment status), mother's gender ideology, father's race, father's occupation, parents' education, parents' age difference, marriage duration (top-coded at 13 years); and household income per capita (4 quartiles). After exploratory analysis, we excluded non-significant covariates from our final model for parsimonious purposes; they are parents' birthplaces, parents' race difference, fathers' employment status, the number of older adults (>=65) in the household, and whether the target child has low birth weight. In addition, we did not add household division of labor and whether the household has domestic helper(s) into the model in estimating the effect of paternity leave-taking on continued fertility to avoid reverse causality.

For all variables used in this study, only fathers' occupations and mothers' work hours had over 4% of missing data which are missing at random. Multiple imputation with chained equations (MICE) from 25 imputed models is used to account for missing values in the following analyses.

Results

Descriptive Statistics

Table 1 presents the characteristics of our study sample, and all values and percentages are weighted at the child level. Among the 2,864 children, about one-third of children's fathers (28.2%) did not take paternity leave when they were born. Around 70% of fathers had taken paternity leave, with about one in four (24.1%) of the fathers taking 1-week leave and 47.7% taking 2 or more weeks. There were slightly more boys (50.7%) than girls (49.3%) in the study sample, and the mean age of the youngest child was about 3.4 years in W2. About 67.7% of the children's fathers were Chinese, 15.4% were Malay, and 12.4% were Indian. Over half of the mothers (52.4%) expected to have 2 children, and just over one-fourth (27.0%) of the mothers would like to have 3 children in total. Parents in our sample had relatively high educational levels, reflecting the national pattern in Singapore. About half of the parents held a bachelor's degree and above, and another 30% had a postsecondary diploma and qualification. The majority (97.9%) of the fathers were working (both full-time and part-time) at the W1 interview with the occupation "Professionals" (38.4%), and 58.7% of the mothers worked over 35 hours per week in W1.

(Set Table 1 about here)

Among the 2,864 children who participated in two waves, 1,210 (42.5%) had additional younger siblings by the W2 interview. Among them, the average duration of having a subsequent child was about 3.91 years. Out of the 1,210 additional children, 782 were second births, and 300 were third births. Among children (n=616) who were the only child in the household in W1, 36.6% of them had a second sibling by the W2 interview; and among children

(n=975) who were the second child in the household in W1, about 9.8% of them had a third sibling by the W2 interview.

Figure 1 shows that in the total analytic sample (N=2,864), around 50% of the children's parents did not have a subsequent child by the end of the study window (8.33 years), and fathers who took paternity leave spent a shorter time to have a subsequent child than those who did not take leave. To be specific, 5.50 years after the birth of the target child, 50% of the children's parents with fathers taking 1-week paternity leave had a subsequent child, while it took about 5.87 years for 50% of parents with fathers taking 2 or more weeks of leave to have a subsequent child. For the group with fathers taking no leave, the time to have a subsequent child is over 8.33 years, as 50% of parents from this group did not have continued childbearing by the end of the study window. We then compared the survival functions of continued childbearing by the length of paternity leave taken by the father. Results from all four tests, including the log-rank test, Wilcoxon test, Tarone-Ware test, and Peto-Peto-Prentice test, suggested that the time difference for a couple to have a subsequent child among fathers who did not take leave, took 1-week leave, and took 2 or more weeks of leave was not statistically significant in the total analytical sample if not differentiate the birth order of the target child.

(Set Figure 1 about here)

Effect of Paternity Leave-Taking on Continued Childbearing

Table 2 shows the results from Cox regression models for having a second birth by the W2 interview. Model 0 included only one independent variable - the length of paternity leave taken by the father, and model 1 added all sociodemographic covariates. In the final model 2, the mother's expected number of children was also controlled (the same pattern in Table 3).

Results showed that the effect of taking 1-week or 2 or more weeks of paternity leave was not statistically significant. However, the hazard ratios of taking 1-week leave were above one across all three models. By the end of the study window, around 20% of couples did not have a second child (Fig. 2).

Mothers' expected number of children was significantly positively associated with the couples' second birth intensities, indicating that the couple had a second birth sooner if the mother expected to have two or more children. Compared to Chinese Singaporean fathers, Malay Singaporean fathers had about 41% higher probability of having a second birth; however, the hazard ratio became marginally significant (HR=1.27†) after considering mothers' expected number of children. Fathers with a postsecondary diploma or qualification were about 30% less likely to have a second birth than those with lower than secondary education. Finally, couples from higher income households (3rd and 4th quartile groups) had a second birth sooner after the born of the first child.

(Set Table 2 about here)

(Set Figure 2 about here)

Table 3 presents the results of having a third birth by the W2 interview. Taking 1-week paternity leave had a significant positive association with the speed of having a third birth (HR=1.58*) in model 0; however, the positive relationship became nonsignificant after controlling for covariates and mothers' expected number of children (models 1 & 2). Taking 2 weeks or more paternity leave had no significant relationship with the speed of having a third child in all three models. Figure 3 showed that couples had a similar speed to have a third child regardless of the length of leave taken by the father, and over 60% of couples did not have a

third birth by the end of the study window. Consistent with results for having a second child, mothers with an expectation of having 3 (HR=2.07†) or 4 or more children (HR=2.38*) were positively related to the speed of having a third birth. Moreover, the interaction effect between the length of paternity leave taken by the father and mothers' expected number of children is also not significant for the likelihood of having either a second or third birth. It is also shown that highly educated mothers, especially those with a bachelor's degree and above, had a lower probability and speed of having a third child (HR=0.50** and 0.62† in models 1 & 2), whereas fathers' education was not related to couples' third birth intensities.

(Set Table 3 about here)

(Set Figure 3 about here)

Sensitivity Analysis: Concern for Selection

We also considered the possibility that the relationship between fathers' taking paternity leave and couples' continued childbearing may be due to selection (Duvander & Andersson, 2006; Lee, 2022). For example, fathers with more advantaged individual backgrounds (i.e., native-born, married, with higher SES), a stronger fatherhood identity, greater prenatal involvement, and more preferences for children are more likely to take paternity leave and have subsequent children (Duvander et al., 2019; Duvander & Andersson, 2006; Petts et al., 2019, 2020; Yeung & Li, 2023). Propensity score matching, as a method that approximates the experimental design, has often been used to address the selection issue in observational studies by matching and comparing respondents who are similar on all other observed confounders but differ in whether they receive the treatment (in this study, whether the father took paternity leave) (Petts & Knoester, 2018, 2019b, 2019a; Rosenbaum & Rubin, 1983). This study utilized

augmented inverse propensity weighted (AIPW) estimators to assess whether the association between the length of paternity leave taken by the father and continued childbearing was due to selection (Cattaneo, 2010). Compared to traditional propensity score matching, AIPW extends the estimation to multiple treatments (i.e., categorical treatment of different lengths of paternity leave), and it is a doubly robust estimator that combines the regression adjustment and inverse-probability weighting (Robins et al., 2007).

This study implemented propensity score analysis in the following steps. First, propensity scores were generated using multinomial logistic regression that considered various predictors of fathers' length of paternity leave taken. Second, we generated the inverse probability weight based on propensity scores predicting each category of the length of paternity leave taken by the father. Then, we generated a combined weight by multiplying the sampling weight at the child level with the inverse probability weight. Finally, we conducted Cox regression models using the combined weight as the regression weight. Table 4 presents the results using propensity score analysis. Consistent with estimations from Cox regression models, taking paternity leave had no significant relationship with having a second or third child, though some of the hazard ratios were above one.

(Set Table 4 about here)

Robustness Check

We also used piecewise exponential (PE) models as a robustness check as the proportional hazard assumption required by the Cox regression models was violated. Exposure time (measured in years) is recoded from *"duration"*, starting at 1 year after the birth of the target

child (at parity one or two), and it was divided into the following 8 intervals: 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, and 8-9. In the PE model, we assume that the risk of having a subsequent child is constant within each time interval but could vary between intervals. Censored cases, indicating families that do not have a subsequent child by the W2 interview, were also taken into account on an equal footing (Oláh, 2003; Sun et al., 2019). Different from Cox regression models, PE models require a *person-time* data structure, and we had 4,615 and 5,556 person-time records for predicting the relative risks of having a second and a third birth, respectively.

Results from PE models (see Table A1 and A2 in the appendix) presented consistent and similar estimations of having subsequent children with Cox models. Overall, paternity leave-taking had no significant relationship with continued fertility at the parity of one or two. Although the hazard ratios of taking 1-week leave were above one, they were not statistically significant for having either a second or third child. The effects of other covariates, such as mothers' expected number of children, fathers' race, mother's education, and household income per capita, on the likelihood of continued childbearing aligned with findings from our main models.

Discussion and Conclusion

The relationship between fathers' uptake of parental or paternity leave and continued childbearing at the individual level remains inconclusive based on studies mainly from European and Nordic countries. Existing literature has paid scant attention to the Asian context, where many countries have experienced ultra-low fertility rates and have implemented leave policies for fathers in recent years in an attempt to boost fertility rates. Notably, the length of leave for fathers in many Asian societies (i.e., Hong Kong, Taiwan, and Indonesia) is usually

much shorter than in Nordic countries. Even though in South Korea and Japan, where fathers are entitled to parental leave of up to one year, the take-up rate remains relatively low—approximately 30% in 2023 (Choi, 2024; J. Tan, 2024)—compared to considerably higher take-up rates for fathers' quota observed in Nordic countries. The only empirical study in South Korea explored the impact of fathers' leave experience on couples' fertility intentions instead of fertility outcomes using nonrepresentative data, which compromises generalizability (Lee, 2022). Therefore, our study aimed to fill the research gap by examining how fathers' use of short paternity leave (2 weeks) influences couples' fertility behavior of having a subsequent child in an up to 8-year period using the nationally representative longitudinal data in Singapore. Results from event history analysis suggest a consistently nonsignificant association between fathers' paternity leave-taking and continued childbearing of having a second or third birth.

The lack of significant policy impact on fertility may be attributed to two reasons. First, prior literature revealing positive associations between fathers' use of parental leave and continued childbearing, especially at the second birth, was primarily conducted in Nordic countries, where fathers are entitled to a more generous leave duration of fathers' quota, ranging from 3 to 6 months and gender relation is more equal (Bassford & Fisher, 2020; Duvander et al., 2019; Golightly & Meyerhofer, 2022; Lappegård, 2010). In contrast, Singapore's paid paternity leave is 2 weeks, which may be too low an incentive or too short for fathers to get fully involved in childcare responsibilities to develop gender-egalitarian parenting attitudes and behaviors or fatherhood ideology that are conducive to having more children. One recent study in Singapore pointed out that taking 1-week paternity leave was associated with mothers' higher parenting aggravation, suggesting the duration may be too short to relieve mothers'

parenting stress (Yeung & Li, 2023).

Second, there are stark differences in social, cultural, and policy contexts between Singapore and the Nordic countries. To some extent, the nonsignificant association between paternity leave-taking and subsequent childbearing aligns with negative findings from studies in Spain (Farré & González, 2019) and Hungary (Oláh, 2003), where traditional gender-role attitudes prevail, and women shoulder the bulk of domestic work. Under the influence of Confucianism, Singapore also stresses traditional family values (Yeung & Hu, 2018; Tham, 2022), and mothers remain the primary caregivers of young children. This is reflected in the skewed distribution of maternity and paternity leaves (16 weeks for the mother and 2 weeks for the father) in the country. Referring to gender equality theory and findings from previous studies, Duvander and colleagues noted that the design of the parental leave policy for fathers needs to be oriented towards gender neutrality or gender equality to promote fertility (Duvander et al., 2010, 2019; Duvander & Andersson, 2006). In Singapore, only about half of eligible fathers have taken paternity leave, and the work culture that is only starting to become supportive of paternity leave may deter fathers from using the leave, especially for those with the least privileged occupations, such as machine operators, assemblers, and cleaners (Lai & Zhuo, 2019; A. Tan, 2021; Yeung & Li, 2023). Considering the high female labor force participation rate (76.6% for the 25-64 age group) in Singapore (MOM, 2023), the traditional gender norms and unequal division of family leave may reinforce women's caregiving responsibilities at home, increase their opportunity costs of having more children, and thus may not lead to a substantial increase in fertility rates. These cultural and policy contexts are similar to those in Japan, Korea, Hong Kong, and Taiwan; hence, results may apply to these regions

too.

This study contributes to the literature on paternity leave and continued childbearing from an Asian perspective. Results contradict those from a study in South Korea (Lee, 2022), which pointed out that fathers' leave experience depressed couples' fertility intentions for another child, especially at parity two. This could be attributed to its lower income replacement rate (around 44.6%) of parental leave for fathers (Hong et al., 2023) compared to Singapore's fully paid paternity leave, despite offering greater flexibility and a more generous leave duration (up to 1 year). Another potential explanation for this discrepancy could be the insufficient institutional and social support for childbearing and childrearing in South Korea (Lee, 2022). Apart from paid paternity leave, Singapore offers more comprehensive pronatalist policies for parents and families compared to South Korea, including financial incentives for newborns, tax relief for working mothers, and accessible public childcare services. Nevertheless, the gendered division of unpaid work remains unequal in Singapore, and women took the primary responsibilities of domestic work, including childcare. Traditional gender norms and inequalities may undermine couples'—particularly mothers'—desire to have more children. Therefore, achieving meaningful work-life balance through systemic changes is likely essential for paternity leave to effectively boost fertility rates in Singapore. A key strength of our study lies in its use of nationally representative data and a focus on actual fertility behavior rather than merely fertility intentions. This approach provides a more reliable understanding of the impact of fathers' leave-taking on fertility outcomes. Furthermore, we enhance the measurement by specifying the duration of paternity leave taken by fathers and employing event history analysis, which is better suited than multinomial logistic regression for examining

whether and when couples continued childbearing.

Some limitations are noted in this study. First, this study only measures the expected number of children for the primary caregivers (mothers in our study) due to data availability, which may lead to biased estimations of the couple-level fertility intention. Second, despite our effort to ensure temporal order, control for confounding covariates, and use the propensity score matching method, potential unobserved heterogeneity remains possible; thus causality cannot be firmly established. Future studies should continue to adopt alternative statistical methods (i.e., DID, RD) to examine the causal relationship between paternity leave-taking and continued childbearing.

To the best of our knowledge, this is the first empirical study to investigate the association between fathers' paternity leave and continued childbearing—specifically the likelihood of having a second or third child—using nationally representative longitudinal data in Asia. Our findings add to the international comparison of paternity leave literature and suggest that the cultural and policy contexts matter. In countries where traditional gender norms are prevalent, and paternity leave is unevenly distributed compared to maternity leave, and with a relatively short duration such as a few day days or two weeks in Singapore, fathers' uptake of leave may fall short of achieving the pronatalist objective of incentivizing couples to have more children. As noted, the results from this study have wider policy implications for other Asian countries, particularly those in East Asia. Simply offering paternity or parental leave to fathers may not significantly boost fertility rates if patriarchal gender norms and deeply ingrained work cultures remain unchanged. Although we did not find a significant effect of fathers' use of leave, the coefficients between paternity leave-taking and having subsequent children are positive,

suggesting that perhaps a positive relationship is possible if paternity leave is longer. Since 1 January 2024, the Singapore government has further doubled the paternity leave to 4 weeks with an additional 10 weeks of paid parental leave to be shared between the parents, which offers an opportunity for future studies to investigate whether this policy reform will have a positive impact on fertility rates in the country.

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Tables

Table 1 Descriptive statistics of sociodemographic characteristics of parents and children

Variables	Mean (SD) or %	Range
Length of paternity leave taken		0-2
Did not take leave	28.19	
1-week leave	24.12	
2 or more weeks of leave	47.69	
Family & Child Characteristics		
Age of youngest child (in year, W2)	3.42 (1.91)	0-8
Child's gender		0-1
Male	50.66	
Female	49.34	
Mothe's age	34.88 (4.18)	20-44
Father's age	37.70 (5.41)	19-68
Parents' age difference	2.82 (4.08)	-11-36
Mother's expected number of children		1-4
0 or 1 child	8.60	
2 children	52.42	
3 children	26.98	
4 or more children	12.00	
Mother's birthplace (1=Singapore)	66.09	0-1
Father's birthplace (1=Singapore)	76.04	0-1
Father's Race		1-4
Chinese	67.70	
Malay	15.41	
Indian	12.38	
Others	4.51	
Mother's education		1-3
Lower than secondary school	18.02	
Postsecondary diploma & qualification	31.42	
Bachelor's degree and above	50.56	
Father's education		1-3
Lower than secondary school	18.85	
Postsecondary diploma & qualification	30.39	
Bachelor's degree and above	50.76	
Father's employment status (1=Currently working)	97.91	0-1
Mother's work hours		0-2
Currently not working	27.97	
Less than 35 hours per week	13.32	
35 hours and above per week	58.72	
Father's occupation		1-5
Legislators, Senior Officials, and Managers	19.57	
Professionals	38.35	
Associated Professionals and Technicians	19.13	

Clerical Support Workers; Service and Sales Workers, Craftsmen, and Related Trade Workers	13.22	
Machine Operators, Assemblers, Cleaners	9.74	
Marriage duration (W1, in years)	7.52 (3.03)	1-13
Total household income (W1, logged)	11.25 (1.31)	0-15.48

Notes: N=2,864. The mother's expected number of children is weighted at the household level, and all the other values are weighted at the child level.

Table 2 Hazard ratio of having a second birth from Cox regression models by the W2 interview

Variables	Model 0	Model 1	Model 2
Father's uptake of paternity leave (ref.=did not take leave)			
1-week leave	1.09	1.20	1.14
2 or more weeks of leave	1.13	0.95	0.93
Mother's expected number of children (ref.= 0 or 1 child)			
2 children			6.89***
3 children			10.79***
4 or more children			9.65***
Mother's age		0.98†	0.99
Parents' age difference		0.99	0.98
Age of youngest child		0.76***	0.83***
Target child's gender (1=Male)		1.05	1.09
Father's race (ref.=Chinese)			
Malay		1.41*	1.27†
Indian		0.93	0.96
Others		0.75	0.66
Mother's education (ref.=Lower than secondary school)			
Postsecondary diploma & qualification		0.87	1.00
Bachelor's degree and above		1.06	1.17
Father's education (ref.=Lower than secondary school)			
Postsecondary diploma & qualification		0.82	0.72*
Bachelor's degree and above		0.87	0.83
Mother's work hours (ref.=Currently not working)			
Less than 35 hours per week		1.37†	1.25
35 hours and above per week		1.12	1.11
Father's occupation (ref.=Legislators, Senior Officials, and Managers)			
Professionals		1.06	1.10
Associated Professionals and Technicians		1.10	1.22
Clerical Support Workers; Service and Sales Workers, Craftsmen, and Related Trade Workers		0.94	1.00
Machine Operators, Assemblers, Cleaners		1.28	1.44†
Household income per capita (ref. 1st quartile – lowest)			
2nd quartile		1.05	1.03
3rd quartile		1.38*	1.34*
4th quartile – highest		1.36*	1.31†
Marriage duration (in years)		1.01	1.00
Obs	1,170	1,170	1,170

Notes: All values are weighted at the child level. Robust standard errors are not presented.

†$p < .01$, *$p < .05$, **$p < .01$, ***$p < .001$.

Table 3 Hazard ratio of having a third birth from Cox regression models by the W2 interview

Variables	Model 0	Model 1	Model 2
Father's uptake of paternity leave (ref.=did not take leave)			
1-week leave	1.58*	1.26	1.14
2 or more weeks of leave	1.27	0.99	1.01
Mother's expected number of children (ref.= 0 or 1 child)			
2 children			0.43*
3 children			2.07†
4 or more children			2.38*
Mother's age		1.02	1.02
Parents' age difference		0.93**	0.94*
Age of youngest child		0.57***	0.64***
Target child's gender (1=Male)		1.28†	1.19
Father's race (ref.=Chinese)			
Malay		1.32	1.14
Indian		0.68	0.72
Others		1.28	1.00
Mother's education (ref.=Lower than secondary school)			
Postsecondary diploma & qualification		0.65†	0.73
Bachelor's degree and above		0.50**	0.62†
Father's education (ref.=Lower than secondary school)			
Postsecondary diploma & qualification		1.30	0.99
Bachelor's degree and above		1.11	0.80
Mother's work hours (ref.=Currently not working)			
Less than 35 hours per week		1.31	1.19
35 hours and above per week		1.02	1.05
Father's occupation (ref.=Legislators, Senior Officials, and Managers)			
Professionals		0.76	0.83
Associated Professionals and Technicians		1.00	1.02
Clerical Support Workers; Service and Sales Workers, Craftsmen, and Related Trade Workers		1.11	1.01
Machine Operators, Assemblers, Cleaners		0.78	0.87
Household income per capita (ref. 1st quartile – lowest)			
2nd quartile		0.93	0.93
3rd quartile		1.02	1.11
4th quartile – highest		1.23	1.27
Marriage duration (in years)		0.99	0.98
Obs	1,150	1,150	1,150

Notes: All values are weighted at the child level. Robust standard errors are not presented.

†$p < .01$, *$p < .05$, **$p < .01$, ***$p < .001$.

Table 4 Selection model results of the effect of paternity leave-taking on having a second and a third birth

	Second birth		Third birth	
Variables	Selection model 1 (HR)	Selection model 2 (HR)	Selection model 1 (HR)	Selection model 2 (HR)
Father's uptake of paternity leave (ref.=did not take leave)				
1-week leave	1.26	1.17	1.00	0.99
2 or more weeks of leave	1.03	0.95	1.24	1.08
Mother's expected number of children (ref.= 0 or 1 child)				
2 children		6.95***		0.46*
3 children		11.01***		2.47*
4 or more children		9.89***		3.46**
Control variables	Yes	Yes	Yes	Yes
Obs	1,004	1,004	1,008	1,008

Notes: Sampling weight (at the child level) was combined with inverse probability weight under multiple imputations. Robust standard errors are not presented. Control variables include (target) child's gender, age of the youngest child, mother's age, mother's work hours, father's race, father's occupation, parents' education, parents' age difference, marriage duration; and household income per capita (4 quartiles).

*$p < .05$, **$p < .01$, ***$p < .001$.

Figures

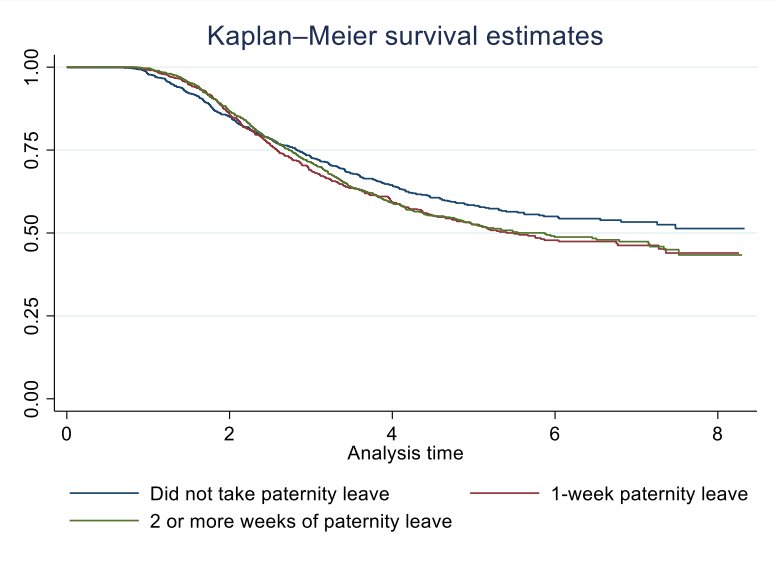


Fig. 1 Kaplan-Meier survival functions of having a subsequent child by the length of the paternity leave

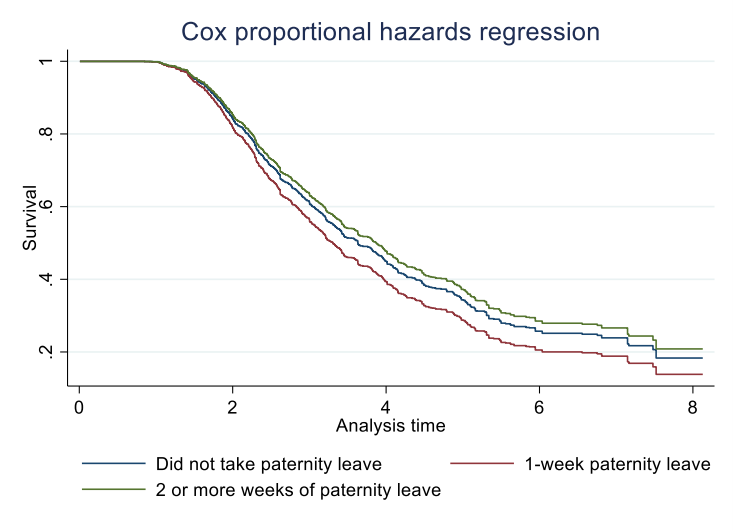


Fig. 2 Cox survival functions for a second birth by the length of paternity leave

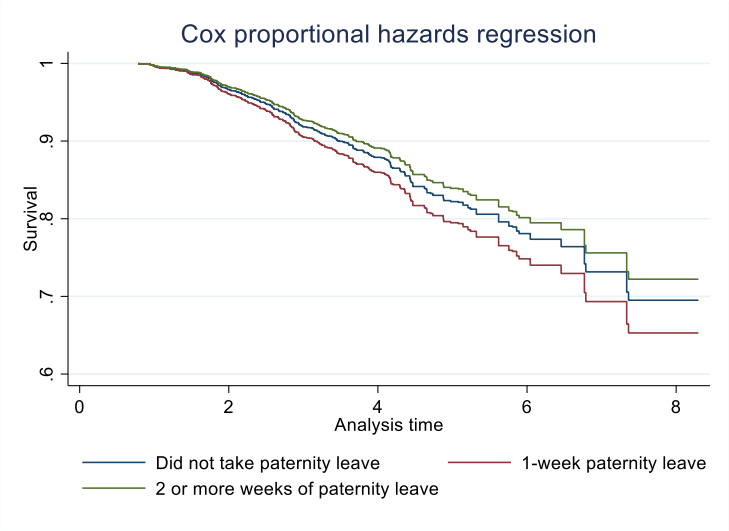


Fig. 3 Cox survival functions for a third birth by the length of paternity leave