Leave it to Dad? The Role of Paternity Leave in Child Development

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Abstract

We study the impact of paternity leave on early childhood socio-emotional development, using administrative data from Denmark and a large-scale survey among parents of children born between 2015 and 2018. Our identification relies on i) a panel data approach in which we control for development prior to paternity leave, and (ii) quasi-experimental variation in wage compensation used as an instrument for leave take-up. We find that paternity leave significantly improves socio-emotional development, reducing our measure of developmental concerns by about 6% of a standard deviation. Unlike previous studies that focus on the introduction or expansion of earmarked leave, our analysis captures the effects from incentives within a stable parental leave system, thus highlighting the importance of how paternity leave-taking is encouraged.

1 Introduction

Family policies targeting the role of fathers have received increasing attention in recent years, especially in EU countries, which are required to implement at least 9 weeks of earmarked (non-transferable) leave for each parent under a 2019 European Parliament directive. The overarching goal of these policies has been to increase mothers' participation in the labor market by encouraging fathers to become more involved in child care. At the same time, a large body of literature has established the critical role of early life interventions and parental investments for short- and long-term child outcomes (Berlinski and Vera-Hernández, 2019). This literature includes multiple studies on maternity leave policies (Olivetti and Petrongolo, 2017; Rossin-Slater, 2018), reflecting that mothers (historically and today) provide the majority of early care.

With policies that increasingly promote fathers' involvement in childcare, it becomes natural to ask whether this changing composition of parental time investments affects childhood development. We study this question using administrative data on parental leave take-up of Danish mothers and fathers combined with a large-scale survey on early life circumstances and well-being of children born between 2015 and 2018. The survey follows both parents of three different cohorts of children aged 9 months to 5 years and contains detailed mother- and father-reported information on child development in the form of the *ASQ:SE-2* score, which is based on the second edition of the *Ages & Stages Questionnaires: Social-Emotional* commonly used to detect irregularities in socio-emotional development among children.

Studying the impact of paternity leave on child development requires accounting for selection bias due to non-random take-up of leave. In particular, fathers from more advantaged socio-economic backgrounds tend to take more leave creating a positive, but non-causal, correlation between fathers' parental leave take-up and child development. We address this challenge in two ways.

First, we take advantage of the fact that fathers usually go on leave after 9 months, where we observe child development for the first time. Hence, we can use the 9-month ASQ:SE-2 score, in addition to the rich set of control variables in the administrative data, to control for unobserved quality of parental care. Second, we (plan to) use variation in the economic incentives for fathers as an instrument for fathers' actual leave take-up. The Danish parental leave system is characterized by relatively low public benefits (average replacement rates around 60%), which is supplemented by individual and time-limited wage compensation that vary across firms and industries. These differences in wage compensation create differences in

fathers' take-up of parental leave (Jørgensen and Søgaard, 2024).

Preliminary findings suggest that paternity leave significantly reduces the ASQ:SE-2 score by about 6% of a standard deviation, implying better development among children whose fathers take at least one day of (shared) parental leave. We find no effects on the likelihood of being at risk for age-inappropriate development.

Our findings contrast with those of Farre et al. (2024), who examine a similar research question but in a setting that differs from ours in several important ways. Most importantly, Farre et al. (2024)—as most other papers in the literature—estimates the effect of paternal leave-taking by comparing children born on either side of the introduction or expansion of earmarked paternity leave. In contrast, we study the effect of paternal leave-taking in a stable parental leave system, where fathers and daycare institutions have adjusted to the composition of parental investments in children. Second, we estimate the effect for a different set of "compliers" that react to the variation in replacement rates in the parental leave system, and not the use-it-or-lose-it nature of earmarked leave. As Andresen and Nix (2024) point out, such reforms of earmarked leave primarily affect fathers who are unwilling to engage in caregiving. Our results suggest that extended paternity leave likely has very heterogeneous effects on children in the short- vs. long-run, and depending on how paternity leave-taking is encouraged.

Our paper relates to two strands of literature. First, we contribute to the extensive literature on parental leave policies. Earlier studies have mostly focused on maternal leave (e.g., Lalive and Zweimüller, 2009; Blau and Kahn, 2013), while more recently the focus has shifted to the effects of earmarked paternity leave on gender equality and labor market outcomes (e.g., Cools et al., 2015; Druedahl, Ejrnæs and Jørgensen, 2019). While these policies are successful in promoting fathers' involvement in child care (Canaan et al., 2022), evidence on the effects of paternity leave on family well-being is more scarce, in particular early in the child's life. Previous studies find positive effects on children's school performance (Cools et al., 2015) and maternal health (Persson and Rossin-Slater, 2024), and mixed effects on marital stability (Avdic and Karimi, 2018; Olafsson and Steingrimsdottir, 2020). With the exception of Farre et al. (2024) mentioned earlier, we are the first ones to provide evidence on how early *child development* is affected by paternal leave.

Second, we contribute to the literature on early interventions and investments on child outcomes, which has mostly focused on maternal inputs. Rossin (2011) finds positive effects of maternity leave on child health in a setting with low counterfactual leave take-up, while extensions of already more generous maternity leave policies have been found to have little or no effect (Baker and Milligan, 2010; Dustmann and Schönberg, 2012; Dahl et al., 2016). We add to this literature by providing

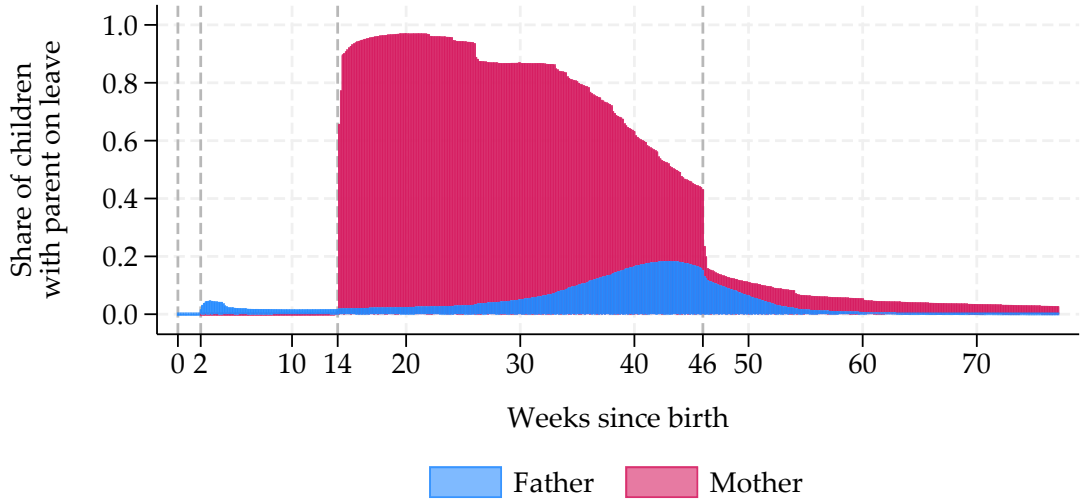
evidence on the benefits of *paternal* inputs.

The rest of this paper is organized as follows. In Section 2, we describe the institutional setting of parental leave policy in Denmark. In Section 3, we present our identification strategy. In Section 4, we describe the survey data and the Danish administrative data sources and present descriptive statistics of our sample. In Section 5, we present preliminary results. In Section 6, we conclude.

2 Institutional Setting

The Danish parental leave system features many of the same components as other developed countries. During our sample period, the government provides a total of 48 weeks of leave divided into three types: (i) 14 weeks of maternity leave after birth, (ii) 2 weeks of paternity leave within the first 14 weeks after birth, and (iii) 32 weeks of shared parental leave, none of which are earmarked. We focus on the final 32 weeks of shared parental leave. As illustrated by Figure 1, parents typically allocate most leave to the mother,[1] and most fathers take leave when the child is 6–12 months old and the potential biological advantages of mothers in child rearing (e.g., due to breastfeeding) are less pronounced.

Figure 1: Timing of parental leave



Note: For each of the first 540 days after birth, the figure shows the share of children with father/mother taking shared parental leave. The sample includes all children born between 2015 and 2018 with both parents eligible for shared parental leave. Dashed lines indicate the duration of earmarked paternity leave (2 weeks), the duration of earmarked maternity leave (14 weeks), and the total duration of maternity leave if the mother takes the full shared leave (46 weeks).

Parents have wide flexibility in when and how to use the 32 weeks of shared

[1] See appendix figure 6 for the distribution of mothers' vs. fathers' leave duration.

parental leave: They can take leave together, return to work fully or part time and extend or postpone a proportion of the leave until the child is up to 8 years old. The only constraint is that parents must inform their employer about their planned leave in advance. Parents who are employed pre-birth are eligible for public parental leave benefits equivalent to unemployment benefits. For full-time employees (37 hours per week), benefits replace 100% of pre-birth earnings up to a benefit cap, which corresponds to hourly wages close to the effective minimum wage in the Danish labor market. For employees working less than full-time, the cap is scaled down proportionally. Hence, effective public replacement rates are low by European standards. This is partly offset by firm-provided wage compensation, which covers the gap between public benefits and the parent's former wage. In most cases, the wage compensation does not cover the entire period of potential leave and cannot be transferred between parents. In addition, the duration of wage compensation varies considerably across firms and sectors.[2]

3 Identification Strategy

Our main empirical challenge is to decompose observed differences in child development across different levels of paternal leave take-up into the causal effect of fathers spending more time with their children, on the one hand, and selection effects from differences in underlying parental characteristics, on the other. We first perform this decomposition theoretically, using a stylized dynamic model of child development. We then estimate the effect of paternity leave in simple cross-sections, assuming exogeneity of leave take-up conditional on observables. Next, we exploit the availability of panel data and account for the duration and timing of leave, thus relaxing the identifying assumption to a (conditional) parallel trends assumption. Finally, we (plan to) develop an instrumental variable (IV) approach that leverages quasi-random variation created by discontinuities in replacement rates.

[2] For additional details, see Jørgensen and Søgaard (2024).

3.1 Theoretical Framework

We propose a simple stylized model, where development of child i at time t, y_{it}, is determined by

$$y_{it} = y_{it-1} + \delta PL_{it} + v_{it}, \qquad v_{it} \sim N(\mu_i, \sigma^2) \tag{1}$$

$$= y_{it-s} + \delta \sum_{t=t-s}^{t} PL_{it} + \sum_{t=t-s}^{t} v_{it}, \tag{2}$$

where PL_{it} indicates leave taken by child i's father at time t, δ is the effect of paternal leave on child development, and v_{it} are unobserved changes in child development. We allow v_{it} to be distributed with non-zero mean μ_i, such that for $PL = 0$ (i.e., in a counterfactual scenario), μ_i corresponds to the mean growth in child development.

We define $p_i^{late} = \sum_{t=T-s}^{T} PL_{it}$ as the amount of leave taken after $t = T - s$ and p_i as the total amount of leave. $\Delta_i^{late} = \delta p_i^{late}$ and $\Delta_i = \delta p_i$ are the corresponding total effects of (late) leave, such that

$$y_{iT} = y_{iT-s} + \Delta_i^{late} + \sum_{t=T-s}^{T} v_{it} \tag{3}$$

$$= y_{i0} + \Delta_i + \sum_{t=0}^{T} v_{it}. \tag{4}$$

Therefore, we can express the average total effect of paternity leave on children of leave takers, $\Delta = E[\Delta_i \mid p_i > 0]$, as

$$\Delta = E[y_{iT} \mid p_i > 0] - E[y_{iT} \mid p_i = 0] + \alpha_0 - \alpha_1 + T(\mu_0 - \mu_1), \tag{5}$$

where $\mu_1 = E[v_{it} \mid p_i > 0]$ and $\mu_0 = E[v_{it} \mid p_i = 0]$ are the (counterfactual) mean growth in child development for leave takers and non-leave takers, respectively, and $\alpha_1 = E[y_{i0} \mid p_i > 0]$ and $\alpha_0 = E[y_{i0} \mid p_i = 0]$ are the corresponding levels of development at birth. Then, $\alpha_0 - \alpha_1 + T(\mu_0 - \mu_1)$ can be interpreted as selection bias.

Similarly, $\Delta^{late} = E[\Delta_i \mid p_i = p_i^{late} > 0]$ is the average effect on children of late leave takers, i.e., fathers who take their entire leave after $t = T - s$ (as opposed to early

takers who take their entire leave before $t = T - s$), and is given by

$$\begin{aligned} \Delta^{late} &= E[y_{iT} - y_{iT-s} \mid p_i = p_i^{late} > 0] - E[y_{iT} - y_{iT-s} \mid p_i = p_i^{late} = 0] \\ &\quad + s(\mu_0 - \mu_1^{late}) \end{aligned} \tag{6}$$

$$\begin{aligned} &= E[y_{iT} - y_{iT-s} \mid p_i = p_i^{late} > 0] - E[y_{iT} - y_{iT-s} \mid p_i > 0, p_i^{late} = 0] \\ &\quad + s(\mu_1^{early} - \mu_1^{late}), \end{aligned} \tag{7}$$

where μ_1^{early} and μ_1^{late} are equivalent to μ_1, conditional on being an early or late leave taker, respectively. Here, $s(\mu_0 - \mu_1^{late})$ and $s(\mu_1^{early} - \mu_1^{late})$ can be interpreted as selection bias.

3.2 Cross-sections and panel data

One can think of development at birth (α in the model above) as a form of innate ability, while developmental growth thereafter (v) is determined by, for example, parental inputs, quality of child care, or random (e.g., health) shocks. Under the assumption that, conditional on observables, both ability and developmental growth are not systematically different between children of leave takers and children of non-leave takers (corresponding to $\alpha_0 = \alpha_1$ and $\mu_0 = \mu_1$ in the model), we identify the treatment effect (Δ) using cross-sections of the form

$$y_{ij,3yr} = \beta_0 + \beta_1 Leave_i + X_{ij}'\gamma + u_{ij}, \tag{8}$$

where y_{ij3} is the outcome for child i reported by parent j at age 3 (i.e., after taking leave), and $Leave_i$ is an indicator of whether the father took leave. β_0 is a constant and X_{ij} is a vector of controls, including parent and child gender, and parental income and education. β_1 is our coefficient of interest and, under the identifying assumption above, corresponds to the "true" treatment effect Δ from our model. This is also shown by Equation (5) and illustrated in the upper left panel of Figure 2, which is a graphical representation of our model for $\alpha_0 = \alpha_1$ and $\mu_0 = \mu_1$.

However, given that both child development and paternal leave take-up vary substantially with parents' socioeconomic background, the same may arguably be true for children's ability. In other words, parents with better education, higher income, and possibly other unobservable characteristics that affect ability are more likely to select into paternal leave (corresponding to $\alpha_0 \neq \alpha_1$ in our model).

To address this, we exploit the availability of panel data, by estimating an equation of the form

$$y_{ij,3yr} = \beta_0 + \beta_1 Leave_i + \beta_2 y_{ij,9mo} + X_{ij}'\gamma + u_{ij}, \tag{9}$$

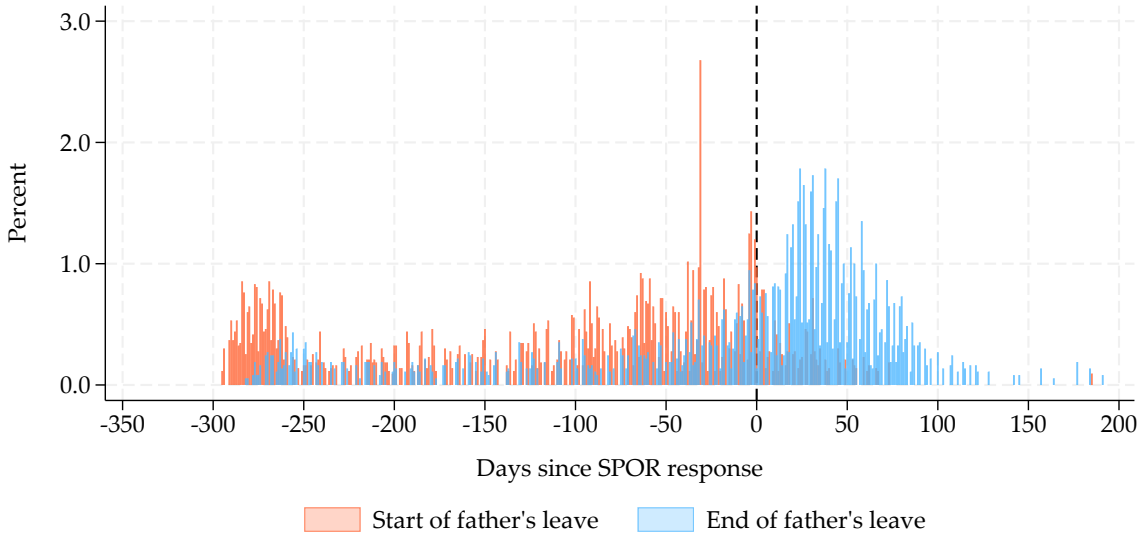
Figure 2: Model

Note: Each panel illustrates the identifying assumptions for one of the empirical specifications from Section 3.2 by showing specific realizations of the model described in Section 3.1. For each line, initial development (i.e., at age 0) corresponds to α from the model. Slopes are given by μ or $\mu + \delta$ (during times of paternity leave). Kinks indicate start and end of paternity leave. The upper left panel shows cross-sections ($\alpha_0 = \alpha_1$, $\mu_0 = \mu_1$), where we only make use of observing child development at age 3. The upper right panel shows our application of panel data (i.e., we observe child development twice), comparing late leave takers to non-leave takers ($\mu_0 = \mu_1^{late}$). The lower left panel shows panel data, comparing late leave takers to early leave takers ($\mu_1^{early} = \mu_1^{late}$). The lower right panel shows panel data with continuous treatment (μ is constant, conditional on the duration of leave). Dashed lines indicate counterfactuals for children representing the "treatment group" in the given specification.

where $y_{ij,9mo}$ is the outcome at the age of 9 months. Here we additionally take advantage of the fact that fathers typically take their share of parental leave after a longer period of maternal leave (usually about 6–12 months after birth, see Figure 1), and thus in many cases between the first and the second SPOR interview (see Figure 3). For these fathers, we can consider $y_{ij,9mo}$ the "pre-treatment" outcome and $y_{ij,3yr}$ the "post-treatment" outcome. Therefore, our identifying assumption simplifies to a parallel trends assumption: children of (treated, i.e., late) leave takers and children of non-leave takers can be born with different abilities, as long as they follow similar trends after birth. This corresponds to $\mu_0 = \mu_1^{late}$ in Equation (6) and is illustrated in the upper right panel of Figure 2.

We can additionally control for whether fathers took leave before or after the inter-

Figure 3: Timing of paternity leave relative to SPOR interview



Note: Each orange (blue) bar corresponds to the percentage of children with a father whose first (last) day of paternity leave was on the day indicated by the horizontal axis, corresponding to the number of days between the day both parents were invited to participate in SPOR and the first (last) day of paternity leave. For example, an orange bar at a value of -1 (1) indicates the share of children whose father took his first day of paternity leave one day before (after) he and the mother were invited. We restrict the sample to children from the first SPOR wave with a father who took at least one day of paternity leave. Bars with fewer than 5 children are omitted.

view by estimating an equation of the form

$$y_{ij,3yr} = \beta_0 + \beta_1 Leave_i + \beta_2 y_{ij,9mo} + \beta_3 Late_i + X'_{ij}\gamma + u_{ij}, \tag{10}$$

where $Late_i$ is an indicator for having taken leave after the interview, and now β_3 is our coefficient of interest. This is equivalent to using early leave takers (instead of non-leave takers) as the control group, which addresses the concern that not only children's abilities may differ between leave takers and non-leave takers, but also other unobservable characteristics that affect developmental trends (μ) after birth (such as quality of parental investments). The identifying assumption is now that child development follows parallel trends conditional on taking leave, i.e., μ may differ between leave takers and non-leave takers, but not between early and late types. This is shown by Equation (7) and illustrated by the slopes of the green (leave takers) and red (non-leave takers) lines in the lower left panel of Figure 2.

Finally, by exploiting the availability of daily administrative records of paternal leave spells, we can control for the exact number of leave days taken after the interview (instead of a binary indicator for early vs. late leave). This addresses the problem of fathers who take leave partly before and partly after the first SPOR interview. It also allows us to account for variation in the total duration of leave, i.e., different treatment intensities. We can then identify the effect of one day of

paternal leave) under the assumption that for all possible numbers of (late) leave days taken, i.e. for all $p \in \mathcal{P} = \{1, ..., s\}$, we have

$$\begin{aligned} &E[y_{ij,3yr}(0) - y_{ij,9mo}(0) \mid Leave_i = 1, p_i^{late} = p] \\ &\quad = E[y_{ij,3yr}(0) - y_{ij,9mo}(0) \mid Leave_i = 1, p_i^{late} = 0], \end{aligned} \tag{11}$$

where $y_{ij,t}(0)$ is the counterfactual outcome at time t (Callaway, Goodman-Bacon and Sant'Anna, 2024). In other words, for children of late leave takers, trends should be parallel to the average trend for early leave takers, regardless of how many (late) days of leave they take. We can relax this assumption by additionally controlling for the total duration of leave p_i, thus allowing for differential trends across different levels of p_i. This is illustrated in the lower right panel of Figure 2.

3.3 Instrumental Variables

We additionally (plan to) leverage differences in the generosity of employer-provided wage compensation (serving as a supplement for public parental leave benefits) across firms and industries. These differences create discrete changes in replacement rates at particular combinations of parents' take-up of parental leave. As Jørgensen and Søgaard (2024) show, this creates quasi-experimental variation in how parents allocate shared parental leave.

4 Data and Descriptives

4.1 Data

We use administrative data for the full population in Denmark. The data combine several administrative registers (linked at the individual level via personal identification numbers) that contain detailed information on earnings and benefits received as well as demographic information. The data allow us to link individuals over time to other family members. Our two main data sources are spell data on the use of parental leave covering parents of children born between 2015 and 2019 and monthly earnings data for the universe of Danish employees. We compute the duration of parental leave from the start and end dates of the spell. Our measure of paternal leave is an indicator for whether any of the shared parental leave was taken by the father.

We link administrative registers to SPOR, a web-based questionnaire survey on *children's development and well-being through life*, conducted by the Danish Center

for Social Science Research (VIVE) in cooperation with Statistics Denmark. In two waves, Statistics Denmark sampled approximately 117,000 children and invited both parents via their digital mailbox. The first wave, conducted in 2017/18, included three cohorts of children born between 2014 and 2018. In the second wave, conducted in 2019/20, the same three cohorts were invited again, in addition to a new fourth cohort (born in 2018/19). Parents were invited in the month after their child turned 9 months, 2, 3, 4, or 5 years old (depending on the cohort and wave). A detailed overview of the data collection process can be found in appendix figure 7.

For about two-thirds of all sampled children, at least one parent participated in at least one of the two waves. As shown in Figure 4, mothers were about 20 percentage points more likely to participate than fathers. In addition, despite lower participation rates, low-income families are overrepresented among the participants (compared to the general population) because they were intentionally oversampled. Our sample includes approximately 68,000 children born between 2015 and 2019,[3] with at least one parent participating in SPOR, and a father who is eligible for parental leave.[4] This corresponds to 22% of all children born in Denmark during this period.

Our main outcome is the ASQ:SE-2 (henceforth: ASQ), a measure of children's socio-emotional development. It is assessed through a questionnaire of about 30 questions about children's skills and behaviors. Parents answer each question on a 3-point scale. For each item, the parent's response is translated into either 0, 5, or 10 points, with more points indicating poorer development. An additional 5 points are added if the parent indicates that the behavior in question worries them. The exact number and content of items varies with the child's age.

4.2 Descriptives

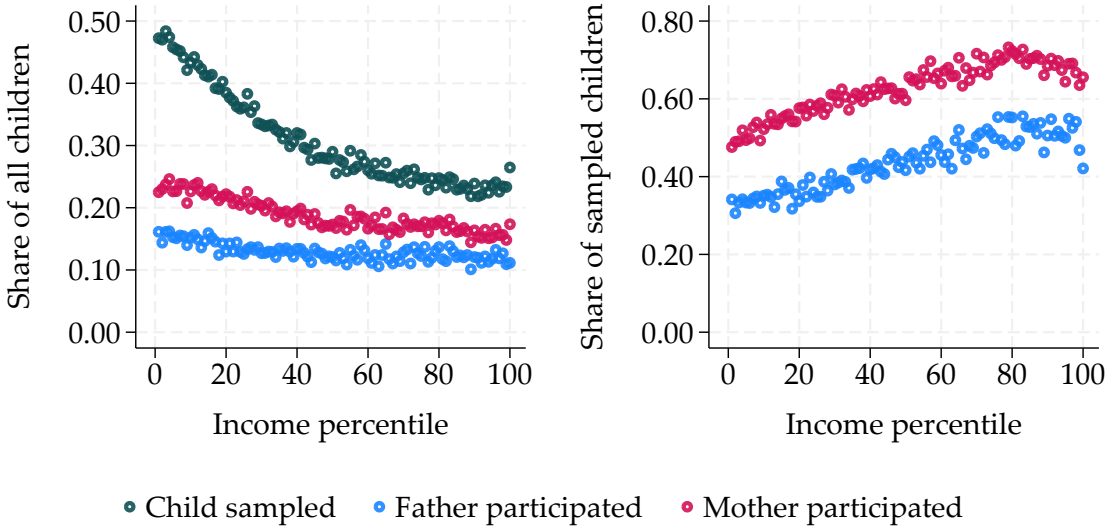
Table 1 shows summary statistics for child development and parental leave take-up in our sample. On average, fathers report higher ASQ scores (corresponding to poorer development) than mothers.[5] This observation persists when controlling

[3] Overall, i.e. including children born in 2014, the SPOR sample includes about 77,000 children. However, we exclude children born in 2014, since parental leave take-up is only sufficiently covered in the register data from 2015 onwards.

[4] We proxy eligibility for shared parental leave by having taken at least one day of earmarked paternity leave. Some parents are not eligible for either earmarked or shared leave because they receive other benefits. Since parents rarely ever forgo earmarked leave, we consider it a good proxy for eligibility.

[5] See appendix figure 8 for the full distribution of ASQ scores by parent gender and age in our sample. Also see appendix figure 9 for the age-specific cumulative distributions.

Figure 4: SPOR sampling and participation rates by income



Note: The figure shows the share of children with a father/mother participating in at least one of the two waves of the SPOR survey by parents' income percentile. Shares are calculated based on the sample of all children in the population (born between 2015 and 2019; left panel), and on the sample of all children whose parents were invited to participate in the survey (right panel). The left panel additionally indicates the share of children whose parents were invited. For each child, we compute income as the average of mother's and father's annual disposable income in the year of the child's birth. We assign children to percentiles based on the distribution of income among all children with a father that is eligible for parental leave.

for child-fixed effects (i.e., it is not simply that fathers are more likely to respond for children with poorer development) and does not vary systematically with the duration of paternity leave.[6] 45% of fathers (and 80% of mothers) take at least one day of parental leave. Fathers who take leave take on average about 2.2 months, which is about 5.5 months less than mothers. Among couples in which at least one parent takes leave, 79% of the total leave (i.e., father's and mother's leave combined) is taken by the mother and 21% by the father. The average start date of fathers' leave is about 8.6 months after the birth of the child, which is about 5 months after the start date of mothers' leave.

ASQ scores are negatively correlated with the duration of paternal leave (i.e., children of fathers who take longer leave do better; see Figure 5a). In addition, fathers with high levels of income (see Figure 5b) and education (see Figure 5c) take longer leave and have children with lower ASQ scores. Thus, the negative correlation between ASQ and paternal leave take-up is partly explained by differences in the amount of leave taken by fathers from different socioeconomic backgrounds.

[6] See appendix figure 10.

Table 1: Summary statistics

	Total			Fathers			Mothers		
	Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Child female	0.490	0.500	57,856	0.489	0.500	23,589	0.491	0.500	34,267
Parent female	0.592	0.491	57,856	0.000	0.000	23,589	1.000	0.000	34,267
ASQ									
9 months	36.058	19.225	26,162	39.555	20.019	10,035	33.882	18.382	16,127
2 years	34.216	21.310	13,511	36.732	21.918	5,238	32.624	20.761	8,273
3 years	46.741	25.251	20,865	50.474	25.481	8,244	44.303	24.800	12,621
4 years	40.014	24.748	11,351	43.166	24.794	4,512	37.935	24.498	6,839
5 years	40.563	26.655	7,569	43.834	26.436	3,118	38.272	26.571	4,451
Parental leave									
Any leave taken	0.626	0.484	80,750	0.453	0.498	40,375	0.799	0.401	40,375
Duration (months)	5.103	3.295	50,536	2.250	2.035	18,294	6.722	2.726	32,242
Start (months after birth)	5.280	7.181	50,536	8.635	10.968	18,294	3.376	1.598	32,242
End (months after birth)	14.317	14.827	50,536	15.736	17.377	18,294	13.513	13.095	32,242
Share in couple	0.500	0.428	72,102	0.210	0.315	36,051	0.790	0.315	36,051

Note: The table presents summary statistics for children in our final sample. Parental leave corresponds to the non-earmarked shared parental leave, of which both parents combined can take up to 32 weeks). For all statistics on parental leave, we include two observations (mother and father) for each child. Statistics on the duration of leave are calculated for the sample of parents who take at least one day of leave. *Share in couple* corresponds to the share of combined leave taken by each parent (e.g., 0.5 if both parents take the same amount of leave) and is calculated for the sample of all couples where at least one parent takes leave.

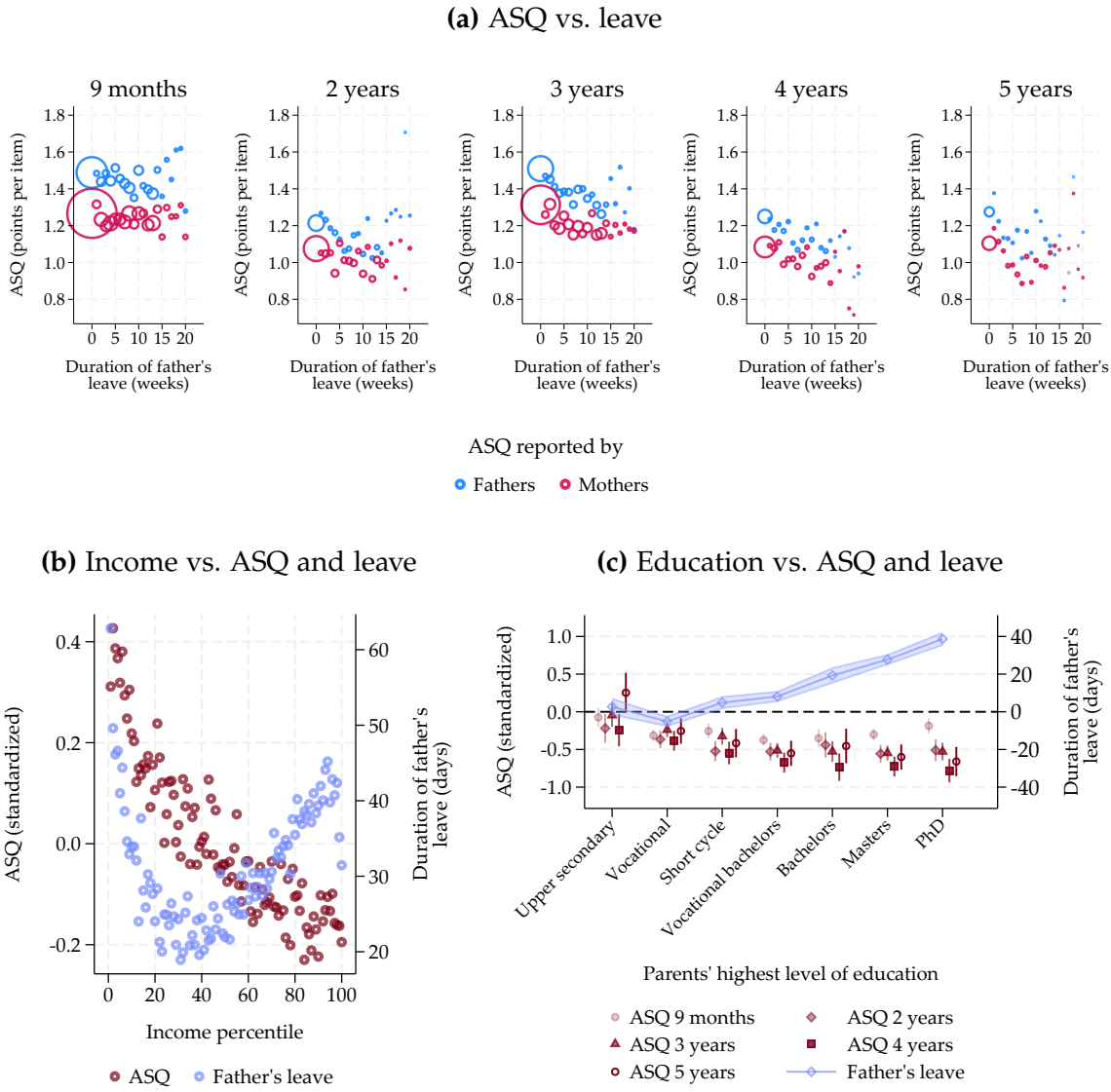
5 Preliminary Results

We present first preliminary estimation results in Table 2. Our primary outcome is the ASQ score of 3-year-old children, standardized within this age group. The table shows cross-sections (columns 1 and 2), and our analysis of panel data, where we control for the standardized ASQ of the same children at the age of 9 months (column 3) or, alternatively, a set of indicators corresponding to 20 bins of the 9-month ASQ (column 4). We find that, on average, taking paternity leave reduces ASQ scores by 6% of a standard deviation, which is statistically significant at the 1% level.

We use the two older cohorts from the first wave of the survey to test the validity of our results. For these cohorts, we observe the ASQ score when children are 2 and 3 years old, respectively, and again two years later. If our results were driven by unobservable differences in parental characteristics leading to different counterfactual trends in development for children of leave takers and non-leave takers, we would expect to find similar effects at later ages, when child development is still affected by the same parental characteristics but not by paternity leave. Since we find no effects for either of the older cohorts, we argue that the coefficients estimated for the youngest cohort are likely to be interpreted as causal effects of paternity leave.

Following Farre et al. (2024), we further define binary indicators for "good progress"

Figure 5: Correlations between ASQ, duration of father's shared parental leave, income, and education



Note: Panel (a) shows average ASQ scores by number of weeks of shared parental leave taken by the father and child age. We calculate scores per item, i.e., we divide the total score by the number of items in the questionnaire (which varies by child age). The size of each circle reflects the corresponding sample size. Panel (b) shows average (standardized) ASQ scores by parents' income percentile. For each child, we compute income as the average of mother's and father's annual disposable income in the year of the child's birth. The red markers in Panel (c) show coefficients (along with 95% confidence intervals) from five regressions (one for each age group) of standardized ASQ scores on a set of indicators for parental education. The blue markers show coefficients (along with 95% confidence intervals indicated by the area above and below) from a regression of the duration (in days) of shared parental leave taken by the father on the same indicators of parental education. The omitted category is primary education.

and "normal development". "Good progress" indicates that the child scores lower than one standard deviation above the mean in all seven ASQ sub-scores (corresponding to areas of development).[7] "Normal development" indicates that the

[7] The seven areas of development are self-regulation, compliance, adaptive functioning, autonomy, affect, social-communication, and interaction with people. Note that we observe the ASQ:SE-2, while Farre et al. (2024) observe the ASQ-3, which is similar but not equivalent. In particular, the ASQ-3 is a more general measure of child development and less focused on *socio-emotional* develop-

child scores lower than two standard deviation above the mean in all sub-scores. We find a (weakly significant) reduction of 2.2 percentage points in the indicator for "good progress" and no effects on "normal development."

We plan to add results for the remaining specifications from Section 3.2 (controlling for the timing of leave and considering a continuous treatment variable) as well as for our IV approach in the future.

Table 2: Preliminary results

	Age: 3 years				Age: 4 years		Age: 5 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standardized ASQ								
Father took leave	-0.167***	-0.084***	-0.064***	-0.060***	-0.005	-0.004	-0.023	-0.020
	(0.023)	(0.024)	(0.022)	(0.022)	(0.021)	(0.021)	(0.024)	(0.025)
Respondent female	-0.240***	-0.250***	-0.123***	-0.120***	-0.095***	-0.098***	-0.039*	-0.043*
	(0.021)	(0.023)	(0.021)	(0.020)	(0.020)	(0.020)	(0.023)	(0.023)
Child female	-0.247***	-0.246***	-0.207***	-0.208***	-0.161***	-0.163***	-0.119***	-0.120***
	(0.023)	(0.023)	(0.021)	(0.021)	(0.020)	(0.020)	(0.023)	(0.023)
Good progress								
Father took leave	0.058***	0.028**	0.022**	0.022*	0.009	0.009	0.020	0.019
	(0.011)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)
Respondent female	0.084***	0.081***	0.043***	0.043***	0.048***	0.046***	0.021	0.017
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.014)	(0.014)
Child female	0.069***	0.069***	0.057***	0.057***	0.051***	0.050***	0.027**	0.025*
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)
Normal development								
Father took leave	0.027***	0.011	0.007	0.005	-0.001	-0.001	0.010	0.008
	(0.007)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)
Respondent female	0.040***	0.042***	0.017**	0.015**	0.011	0.012	0.007	0.009
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)
Child female	0.051***	0.051***	0.043***	0.044***	0.028***	0.028***	0.021**	0.020**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)
Education		✓	✓	✓	✓	✓	✓	✓
Income		✓	✓	✓	✓	✓	✓	✓
Initial ASQ (std.)			✓		✓		✓	
Initial ASQ (bins)				✓		✓		✓
N	8,480	8,480	8,480	8,480	7,813	7,813	5,208	5,208

Note: The table shows regression estimates for the simple cross-sections specification with (column 1) and without (column 2) controls for income and education (measured in the child's year of birth). In columns 3–8, we exploit panel data by additionally controlling for the initial ASQ. In columns 1–4, the outcome is the ASQ of 3 year old children and the initial ASQ corresponds to the ASQ at the age of 9 months. In columns 5 and 6, the outcome is the ASQ of 4 year old children and the initial ASQ corresponds to the ASQ at the age of 2 years. In columns 7 and 8, the outcome is the ASQ of 5 year old children and the initial ASQ corresponds to the ASQ at the age of 3 years. For the initial ASQ, we either use the standardized score (columns 3, 5, and 7) or a set of indicators corresponding to 20 bins (columns 4, 6, and 8).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

ment. In addition, the ASQ-3 is divided in five rather than seven areas of development. We plan to use different binary outcomes in the future, which will be based on cutoffs that are adjusted to the Danish setting.

6 Conclusion

We provide new evidence on the impact of paternity leave on early childhood development, using a large-scale survey on early life circumstances and well-being of children aged 9 months to 5 years, linked to Danish administrative data. We exploit the panel structure of the survey to address the issue of selection bias due to non-random take-up of leave by controlling for earlier development. We find that paternity leave reduces the ASQ:SE-2 scores of 3-year-old children by about 6% of a standard deviation, suggesting improved development for children whose fathers take leave.

These findings contribute to the broader literature on parental leave policies and early childhood investments. In contrast to previous studies, such as Farre et al. (2024), our analysis focuses on a stable leave system where fathers' participation is driven by economic incentives rather than earmarked leave reforms. In the context of these studies, our results suggest potentially large heterogeneity in the effects of paternity leave and highlight the role of underlying motivations for fathers' leave-taking.

In the future, we plan to extend our analysis with an alternative empirical approach that relies on discrete changes in wage replacement rates, creating quasi-random variation in how parents allocate their shared leave. This will help us to test the robustness of our current findings and to better understand the underlying mechanisms, in particular the role of economic incentives.

References

Andresen, Martin Eckhoff, and Emily Nix. 2024. "You Can't Force Me Into Caregiving: Paternity Leave and the Child Penalty." *Economic Journal*.

Avdic, Daniel, and Arizo Karimi. 2018. "Modern Family? Paternity Leave and Marital Stability." *American Economic Journal: Applied Economics*, 10(4): 283–307.

Baker, Michael, and Kevin Milligan. 2010. "Evidence from Maternity Leave Expansions of the Impact of Maternal Care on Early Child Development." *Journal of Human Resources*, 45(1): 1–32.

Berlinski, Samuel, and Marcos Vera-Hernández. 2019. "The Economics of Early Interventions Aimed at Child Development." In *Oxford Research Encyclopedia of Economics and Finance*.

Blau, Francine D., and Lawrence M. Kahn. 2013. "Female Labor Supply: Why Is the United States Falling Behind?" *American Economic Review*, 103(3): 251–256.

Callaway, Brantly, Andrew Goodman-Bacon, and Pedro H. Sant'Anna. 2024. "Difference-in-differences with a Continuous Treatment." National Bureau of Economic Research w32117.

Canaan, Serena, Anne Sophie Lassen, Philip Rosenbaum, and Herdis Steingrimsdottir. 2022. "Maternity Leave and Paternity Leave: Evidence on the Economic Impact of Legislative Changes in High Income Countries."

Cools, Sara, Jon H. Fiva, Jon H. Fiva, Lars Johannessen Kirkebøen, and Lars Johannessen Kirkebøen. 2015. "Causal Effects of Paternity Leave on Children and Parents." *The Scandinavian Journal of Economics*, 117(3): 801–828.

Dahl, Gordon B., Katrine Vellesen Løken, Magne Mogstad, Magne Mogstad, Kari Vea Salvanes, Kari Vea Salvanes, and Kari Vea Salvanes. 2016. "What Is the Case for Paid Maternity Leave." *The Review of Economics and Statistics*, 98(4): 655–670.

Druedahl, Jeppe, Mette Ejrnæs, and Thomas H. Jørgensen. 2019. "Earmarked paternity leave and the relative income within couples." *Economics Letters*, 180: 85–88.

Dustmann, Christian, and Uta Schönberg. 2012. "Expansions in Maternity Leave Coverage and Children's Long-Term Outcomes." *American Economic Journal: Applied Economics*, 4(3): 190–224.

Farre, Lidia, Libertad Gonzalez, Claudia Hupkau, and Jenifer Ruiz-Valenzuela. 2024. "Paternity leave and child development."

Jørgensen, Thomas Høgholm, and Jakob Egholt Søgaard. 2024. "The division of parental leave: Empirical evidence and policy design." *Journal of Public Economics*, 238: 105202.

Lalive, Rafael, and Josef Zweimüller. 2009. "How Does Parental Leave Affect Fertility and Return to Work? Evidence from Two Natural Experiments." *Quarterly Journal of Economics*, 124(3): 1363–1402.

Olafsson, Arna, and Herdis Steingrimsdottir. 2020. "How Does Daddy at Home Affect Marital Stability." *The Economic Journal*, 130(629): 1471–1500.

Olivetti, Claudia, and Barbara Petrongolo. 2017. "The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries." *Journal of Economic Perspectives*, 31(1): 205–230.

Persson, Petra, and Maya Rossin-Slater. 2024. "When Dad Can Stay Home: Fathers' Workplace Flexibility and Maternal Health." *American Economic Journal: Applied Economics*, 16(4): 186–219.

Rossin, Maya. 2011. "The effects of maternity leave on children's birth and infant health outcomes in the United States." *Journal of Health Economics*, 30(2): 221–239.

Rossin-Slater, Maya. 2018. "Maternity and Family Leave Policy." In *The Oxford Handbook of Women and the Economy*.

A Figures and Tables

Figure 6: Cumulative distribution of the duration of shared parental leave by gender

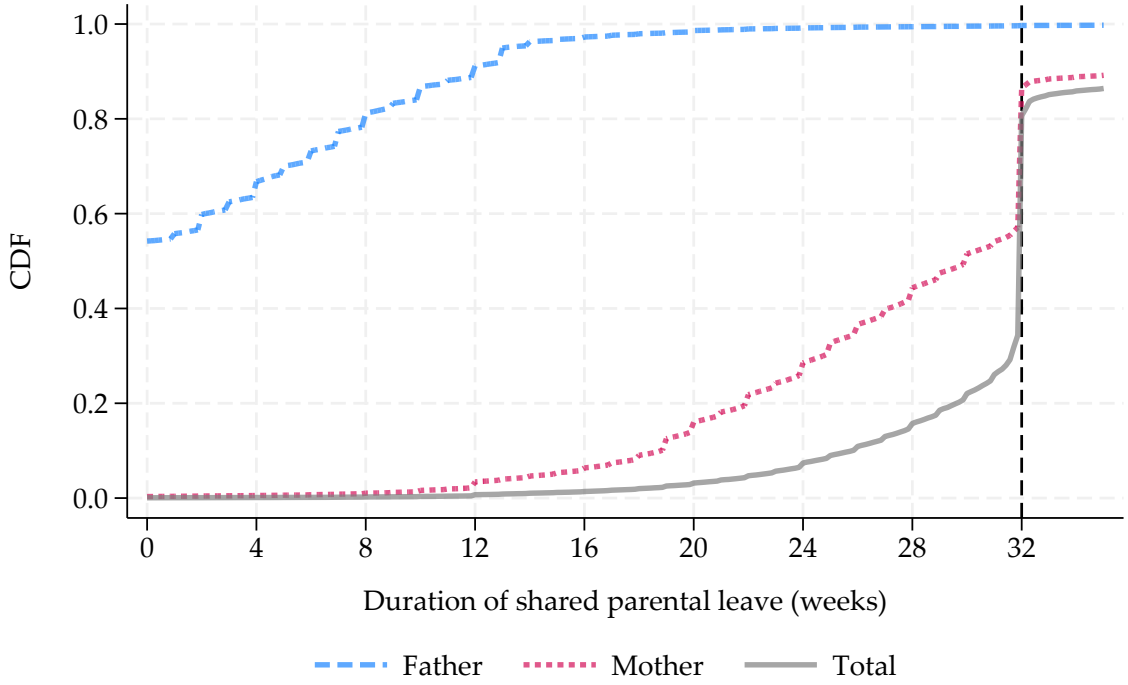
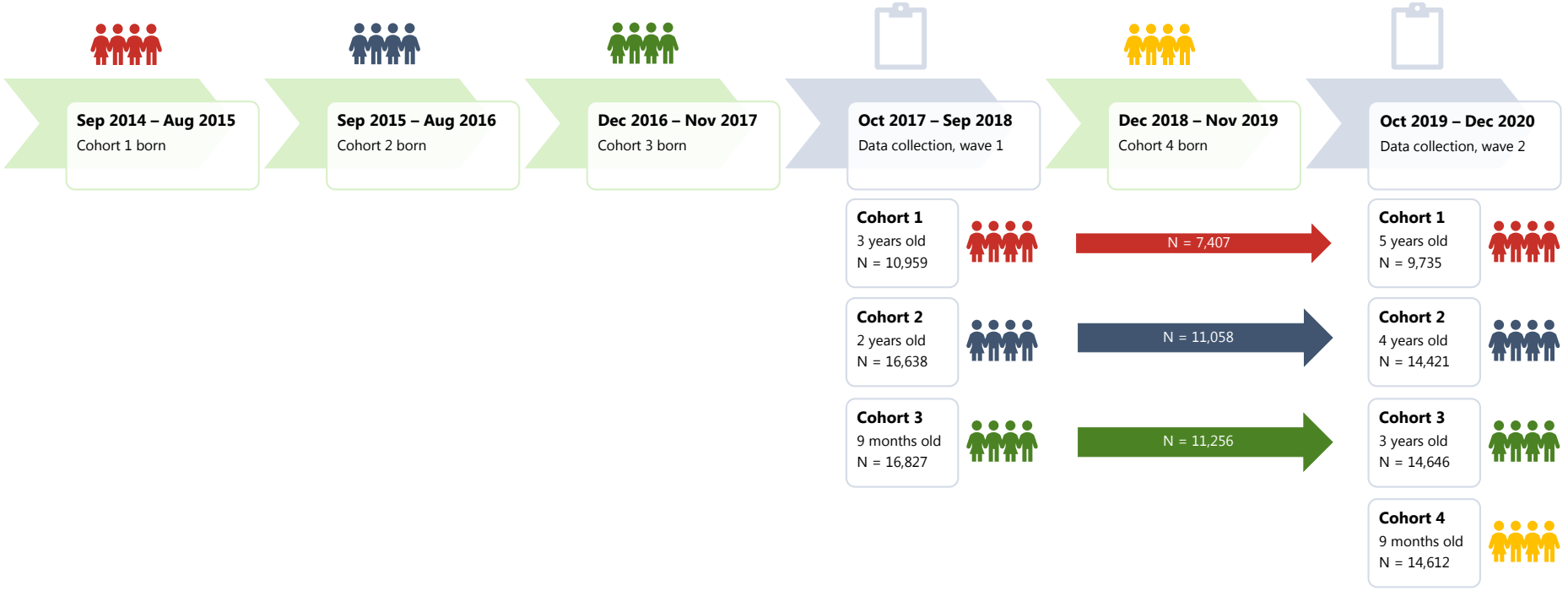


Figure 7: Data collection



Note: Numbers in arrows indicate the number of children that we observe in both waves. Note that all numbers are based on the full sample of children in SPOR, which may slightly differ from sample sizes used in our analyses, primarily because we exclude children whose parents receive other benefits, and thus, are not eligible for parental leave benefits.

Figure 8: ASQ distribution by reporting parent

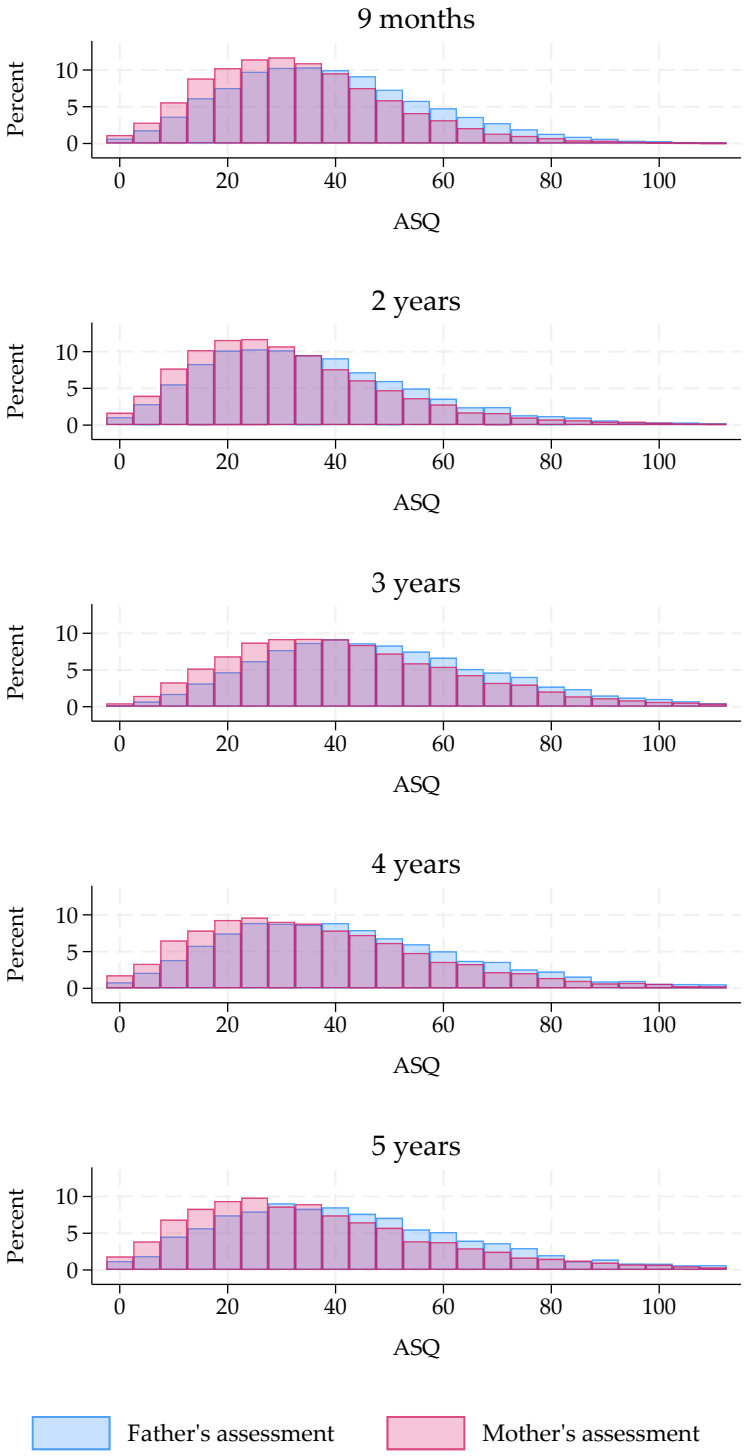


Figure 9: Cumulative distribution of ASQ

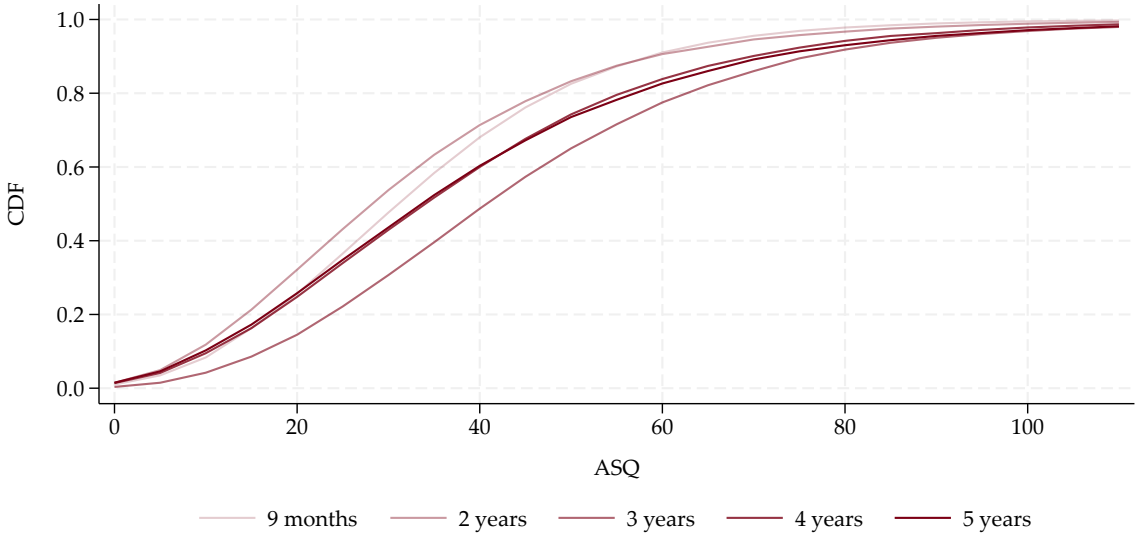
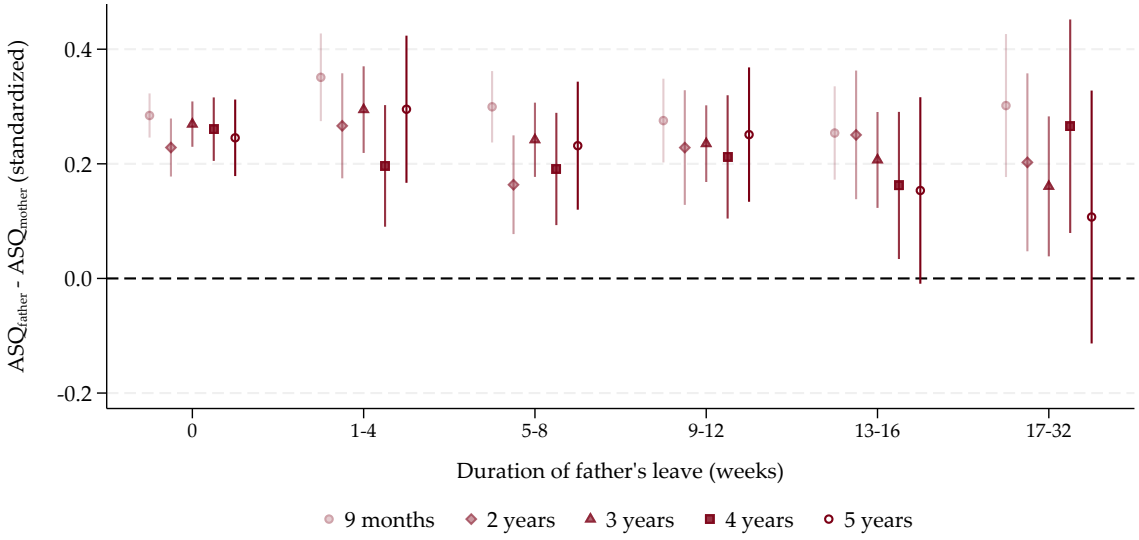


Figure 10: Father-mother difference in reported ASQ by father's shared parental leave take-up



Note: The figure shows coefficients of 25 regressions (one for each age group and each level of paternity leave duration indicated by the horizontal axis) of (standardized) ASQ scores on parent gender, in a sample with one observation per parent-child combination, and accounting for child-fixed effects.