

The Father's Quota: An Earnings Equalizer?¹

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Abstract: Parental leave quotas reserved for the father may change the distribution of paid and unpaid work in the family, but we lack empirical evidence of whether this in turn reduces the wage-gap between mothers and fathers. This paper uses an extension of the Norwegian father's quota from 6 to 10 weeks to estimate the causal effect of paternity leave on three outcomes; the *parental leave uptake* by both mothers and fathers, the *long-term earnings* of both mothers and fathers, and the degree of *specialization* within couples. We identify causal effects by way of a regression discontinuity design, using full population data from Norwegian administrative registers. We restrict our sample to parents of children in a two month window around the reform, where the mother had earnings the year prior to the reform (N=7552). The results show that the reform significantly increased the number of leave days taken by fathers. We find no effects on earnings and couple specialization in the year following the reform in the full sample, nor in subsample analysis.

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1 Introduction

Numerous studies have attributed the gender gap in earnings to gender specialization among couples with children, and across Western countries, women increase their efforts at home much more than men when a(nother) child is born (see e.g. Browning 1992; Duvander and Lammi-Taskula 2011; Lundberg and Rose 2000). As wage penalties of childbearing are smaller in contexts where household work is more evenly divided, a causal relationship between division of labor at home and the earnings development of men and women has been suggested. If such a relationship exists, the gender gap in earnings should be reduced if men increase their efforts at home.

Studying this potentially causal relationship is, however, anything but straightforward. Data on the correlation between division of household work and earning development is insufficient: Couples that share household work more equally are likely to differ from more traditional couples also on characteristics that affect earnings. Sources of variation in household work that are exogenous, i.e. uncorrelated with earnings (potential), are hence required to estimate such causal effects.

In this study we exploit one potential source of such exogenous variation, namely policy introductions that reserve parts of the parental leave exclusively for the father. The Nordic parental leave system offers parents a generous wage-compensation for staying home with their newborn child for around one year, and while the bulk of parental leave can be shared freely between the parents, it is in practice taken up mainly by the mother (Duvander and Lammi-Taskula 2011, Lappegård 2008). Hence, reserving a part of the leave period for the father implies a potentially exogenous increase in fathers' time used for home production.

In this study, we use an extension of the Norwegian father's quota from 6 to 10 weeks to estimate the effect of paternity leave on three outcomes; parental leave take-up by both mothers and fathers, the long-term earnings of both mothers and fathers, and gender specialization in couples with small children. The reform, introduced on July 1 2009, added two weeks to the total parental leave period and shifted two weeks from the shared period (usually taken by the mother) to the period reserved for the father (NAV 2015c). While the six weeks available quota up to 2009 was sufficiently short to work as an "extended holiday", (and often did), this was no longer the case after the 2009 extension: More fathers now took an extensive break from paid work to take main responsibility for their child while the mothers went back to work. The policy change could hence affect specialization in the family in two ways: By increasing the father's time spent on domestic work, potentially giving lasting changes in the division of labor, and by speeding up the mother's return to the labor market, potentially increasing her long-term earnings.

The international (quasi-experimental) literature provides somewhat mixed evidence of the de-specializing and earnings-equalizing potential of father's quotas. Supporting the idea of de-specialization, some studies find positive effects on fathers' participation in child care (Cools et al. 2015; Schober 2015) and house work (Kotsadam and Finseraas 2011; Patnaik 2015), and increases in mothers' labor supply (Kluve & Tamm 2012; Patnaik 2015).

Meanwhile, other studies report negative effects on mothers' earnings (Cools et al. 2015) and labor supply (Ekberg et al. 2013), and increases in mothers' time spent on child care (Patnaik 2015). Yet again, most studies find no causal effect on neither fathers' (Cools et al. 2015; Ekberg et al. 2013) nor mothers' (Rege and Solli 2013) income, fathers' labor supply (Cools et al. 2015; Ekberg et al. 2013; Kluve and Tamm 2012; Patnaik 2015), or fathers' (Ekberg et

al. 2013; Kluge and Tamm 2012; Schober 2013; Ugreninov 2013) or mothers' (Schober 2014) participation in child care or house work.

Two previous studies have addressed the effect of the *introduction* of the paternity quota in Norway on earnings, yielding mixed results. First, Rege and Solli (2013) identify a substantial negative effect of the introduction on fathers' earnings using a difference-in-difference design. Using a more conservative identification strategy, Cools, Fiva and Kirkebøen (2015) find no (negative) effects on father's earnings of the same reform. Whether discrepancy stems from Rege and Solli (2013) mistaking general trends for reform effects, or is due to a (stronger) bias towards null inherent in Cools et al's (2015) design, can unfortunately not be evaluated empirically.

To estimate the effect of the extension of the father's quota on leave uptake, wages and specialization, we employ a Regression Discontinuity design – a conservative identification strategy very unlikely to be biased by gradual changes in fathering practices over time. We compare couples with children born just before the extension of the father's quota to couples who had a child just after this date. For precise estimation of effects for these relatively small subgroups, the sample size provided by full population data is crucial. Our results show that the extension of the father's quota significantly increased the number of leave days taken by fathers, but we find no significant effects on neither specialization nor his or her earnings. Hence, we cannot conclude that a further extension of the father's quota worked as an “earnings equalizer”.

2 Theoretical framework and previous research

Gender specialization in the household, where she is the primary caregiver while he invests more efforts in paid work, contributes to gender disparities in earnings (Becker 1991). The 2009 parental leave reform has the potential to change the specialization in the family in two important ways; by extending the period of time the father spends at home with the child instead of in paid work, and by speeding up mothers' return to paid work. Below, we outline mechanisms through which this could have an equalizing effect on couples' earnings, considering both expectations of labor market responses to changing leave lengths, and effects mediated by (lasting) changes in the division of house and care work.

A temporary absence from paid work to care for a small child is in itself found to lead to human capital depreciation (Gustavsson 2001), and hence a weaker earnings development. When fathers spend a longer spell caring for a small child, and mothers return faster to work, the earnings development of mothers should improve relative to the earnings development of fathers. Moreover, for fathers, it is possible that the earnings penalty exceeds the human capital depreciation, if employers take a longer parental leave as a signal of lower motivation or commitment.⁵ Particularly the latter mechanism suggests immediate effects that diminish over time, as the imperfect information is corrected.

When considering long-term effects of changes in unpaid housework in the family, we take the microeconomic theory of the family (Becker 1991) as a starting point. Based on the logic

⁵ Both stigma and imperfect information of the parental leave system might prompt employers to limit the earnings- and career opportunities of fathers who take longer breaks from the labor market. However, as more and more men use the father's quota, we would expect any such effects to diminish over time.

of comparative advantage, Becker argues that households are most efficient if one parent is responsible for domestic work, and the other specializes fully in market work.⁶ Furthermore, he suggests that small biological differences give women an (initially small) comparative advantage in child care. As both men and women become increasingly efficient in the type of work they specialize in, a specialization pattern accumulates over time and create what we know as the “traditional” division of labor within families. In gender egalitarian welfare states such as the Norwegian, gender specialization is most typically partial, with both parents pulling weight at home – but mothers somewhat more – and both parents being employed – but fathers both earning and working more (Kitterød and Rønsen 2013, Petersen et al 2013, Sørensen 1995). Specialization is mainly found among couples with young children (Kitterød and Rønsen 2013), underlining the importance of division of childcare in establishing these patterns.

Increasing the length of father parental leave may counteract the process of specialization, as fathers who spend time caring for a small child improve their domestic skills. Rehel (2014) finds that fathers acquired both new domestic skills and strengthen their emotional bonds with children after about one month of parental leave, and we expect additional increases in leave length to strengthen this learning effect further. If gender specialization is a cumulative or self-strengthening process, as suggested by Becker (1991), this should have a lasting impact on division of paid and unpaid work in the family, and hence on relative earnings. Similarly, using a resource-bargaining perspective, Lundberg and Pollak (1996) suggests that strengthening of non-market skills among fathers and market skills among mothers to have

⁶ See e.g. Oppenheimer (1997) for a seminal sociological critique of this notion.

lasting, de-specializing impacts of the division of labor within families. Compared to introducing a paternity quota, the 2009 extension is likely to have a more profound impact of gender specialization by making it infeasible for the mother to stay at home during the father's full parental leave (see Section 3). Both the bonding between father and child and the acquisition of household skills can be stronger if fathers spend their leave without the presence of the mother (who holds a comparative advantage in house and childcare work).

The father's quota could also affect specialization by altering the parental identities of both mothers and fathers. According to Rehel (2014), a one-month father's quota increased fathers' respect for care work. The experiences of (longer) leave-taking for fathers and (faster) labor market return for mothers may permanently change their self-conceptions as parents into less specialized categories, making these internalized parts of their identities that they take with them and act upon also after the parental leave period is over (see Patnaik 2015:11).

Suggesting a quite different response to perceived challenges to prevailing gender roles or self-concepts, West and Zimmermann's (1987) "doing gender" theory suggests that men and women compensate with *more* traditional behavior in other fields if they deviate from the gendered division of labor on one aspect. Hence, fathers who take what they perceive to be a longer than usual share of the parental leave, may compensate by increasing efforts at work afterwards. If so, any equalizing effect of the father's quota on earnings could be cancelled out, or even reversed.

2.1 Previous research on paternity leave quotas and gender specialization

Numerous studies have assessed the relationship between paternity leave and various family and child outcomes (see e.g. Patnaik 2015; Schober 2014 for a review), and their findings

primarily confirm that lower specialization (i.e. higher gender equality in the division of paid and domestic work) is correlated with higher uptake of paternity leave. However, only a handful of studies – most of which are based on Scandinavian leave policies – account for selection into leave-taking by means of quasi-experimental designs. These studies quite unanimously show that policy reforms that reserve a part of the parental leave period for the father increase both the share of fathers taking leave and the number of leave days taken by fathers (see e.g. Cools, Fiva and Kirkebøen (2015) for Norway, Ekberg, Erikson and Friebl (2013) for Sweden, Geisler and Kreyenfed (2012) for Germany, and Patnaik (2015) for Canada), while the (causal) results for specialization outcomes are more mixed.

Starting with studies that analyze parents' efforts in paid work, there are two studies that estimate the effect of the introduction on the Norwegian father's quota in 1993 on parents' labor market outcomes. First, Rege and Solli (2013) applied a difference-in-difference (DD) design to estimate the effect on paternal wages until the child was five years old, demonstrating a (long-term) negative effect. Second, analyzing effects on both earnings and employment, Cools, Fiva and Kirkebøen (2015) found no significant (negative) effects of the introduction of the Norwegian father's quota on fathers' earnings or working hours – though the magnitude of their estimates are similar to those of Rege and Solli (2013). They do, however, find a weak, but statistically significant *negative* effect⁷ on mothers' earnings –

⁷ This result must be interpreted with some caution, as the 1993 policy reform also extended the shared leave (usually taken by mothers).

quite contrary to what one would expect in a strictly Beckerian framework.⁸ Ekberg, Eriksson and Friebe's (2013) DD study of the introduction of the one-month father's quota in Sweden in 1995 yields similar results; while they find no effect on fathers' wages or labor supply, there is a weak but negative effects on mothers' labor supply. Using a RD design to study the implementation of a two-month father's quota in Germany in 2007, Kluve and Tamm (2012) find no effects on fathers' (short term) labor supply but positive effects on mothers'. Finally, in a recent working paper, Patnaik (2015) uses time diary data and a difference-in-difference design to analyze the effects of the introduction of a five-week father's quota in Quebec in 2006. She finds that the introduction increased maternal employment, while there are no effects on fathers' labor supply.

Moving on to studies that analyze effects on care and household work, Patnaik (2015) finds that fathers in Quebec, Canada, significantly increase the time they spend on housework due to the introduction of the paternity quota. Québécois mothers respond to the same reform by reducing the time they spend on housework, and shifting more time to care work. Studies from European countries yield more mixed results. Kluve and Tamm (2012) find no effects of the introduction of the German father's quota on fathers' time spent on child care. The introduction of a father's quota neither affected the share of sick leave days taken by the father in Sweden (Ekberg et al. 2013) nor in Norway (Ugreninov 2013). Using survey data, Kotsadam and Finseraas (2011) find that parents who had their child just after the

⁸ The discrepancy in findings on father's earnings is likely due to Cools et al (2015) choosing a more conservative identification strategy, defining only children born within 3 months after the reform as treated. Whether Rege and Solli's (2013) estimates capture trends correlated with the reform, or Cools et al. (2015) find no effects for fathers due to a stronger bias toward null, can unfortunately not be resolved empirically.

introduction of the father's quota reported lower levels of conflict over the division of housework and divided laundry work more equally. However, they find no effects on attitudes toward gender equality or support for public childcare. Cools et al. (2015) find that the introduction of the Norwegian father's quota improved school performance of children whose father had higher education than the mother, indicating that the reform had long-lasting positive effects on the time fathers spend with children. Finally, Kotsadam and Finseraas (2013) find that teenagers whose fathers were exposed to the fathers' quota tend to have a more gender equal division of housework.

In sum, while father's quotas seems to have led to a more gender egalitarian division of house and care work, there is not consistent evidence that this translates into the a more egalitarian division of market work. The reform examined in this paper might provide new insights on this issue due to two important features that set it apart from previous studies that assess the *introduction* of a paternity quotas – consistently of about one month length. First, it increased the father's quota to a substantial ten weeks, which entailed that the father claiming the leave would participate in care work for a longer period of time. Moreover, it became a less feasible option for the mother to be on holiday for the entire paternity leave period, and the chances that anticipated learning/bonding effects will occur are therefore stronger. Second, it entailed a reduction in the number of shared weeks – which most often are taken by the mother – rather than these being constant (as was the case for the 2005 and 2006 policy reforms in Norway) or extended (as was the case for the 1993 reform in Norway). Hence, the potentially equalizing effect comprises two components; the increase in fathers domestic work, and the increase in mothers paid work.

3 Reform details

The Norwegian parental leave system ensures income replacement and job security so employed parents can care for their new child. With an outspoken goal of strengthening the relationship between father and child, as well as to improve the gender equality in the division of paid and domestic work between the parents (St. meld. no. 70, 1991–92: p.30), the Norwegian government introduced a father's quota on April 1 1993. This reserved a given number of weeks of leave exclusively⁹ for the father, and divided the parental leave into a mother's quota, a father's quota and shared period which could be divided freely between the parents. The duration of all three parts of the parental leave has gone through substantial changes since 1993, and the developments are summarized in Table 1. Throughout these changes, parents can choose between 80 or 100 percent income replacement for a correspondingly longer or shorter leave. The social security system replaces earnings up to a cap of 6G¹⁰, but several employers, including the Norwegian public sector, top up parental leave compensation for incomes above this cap.

⁹ The father's quota could not be transferred to the mother unless she was a single parent, the father was ineligible to paid parental leave, or the father was too sick or otherwise unable to care for the child.

¹⁰ The base rate (G) of the Norwegian Social Insurance scheme is an annually adjusted amount used to define benefit eligibility and calculate pensions.

Table 1: Development in the paid parental leave scheme, with 80/ 100 percent income coverage. Number of weeks.

Effective date	Reserved mother ^a	Reserved father	To be shared	Total number of weeks
April 1 1992	9	-	24/33	33/42
April 1 1993	9	4	29/39	42/52
July 1 2005	9	5	29/39	43/53
July 1 2006	9	6	29/39	44/54
July 1 2009	9	10	27/37	46/56
July 1 2011	9	12	26/36	47/57
July 1 2013	17	14	18/28	49/59
July 1 2014	14	10	26/36	49/59

^a: Three of these weeks are to be used prior to giving birth, and an additional six immediately after. The father cannot take any of his leave days during this period.

As we can see from the table, the father’s quota was expanded from the original four weeks to five weeks in 2005 and six weeks in 2006, with a corresponding one-week expansion in the *total* leave period in both these years. In 2009, however, the father’s quota was expanded by four weeks, wherein only two weeks were added to the total leave period and the remaining two were shifted from the shared leave. This rather substantial policy change prompted a significant political debate, and was criticized for “taking” leave from the mother and “giving” it to the father – an argument that reflects the strong tendency for mothers to take all or most of the shared leave (Dahl et al. 2014; Fougner 2012). The father’s quota was extended with two additional weeks in both 2011 and 2013, whereas the first reduction came in 2014 when the father’s quota was reduced from 14 to 10 weeks.¹¹

All fathers whose child is born on or after the policy implementation date were eligible for the father’s quota, as long as both parents had accumulated individual rights to paid parental

¹¹ Preliminary analyses suggest that Norwegian fathers have reduced their leave uptake after this policy change (NAV 2015a).

leave. The eligibility criteria for paid parental leave have changed slightly over the period captured in the table, but for our sample (i.e. those who had a child close to July 1, 2009), eligibility depended on both parents having pensionable income for at least six out of the ten months before the child was born. Moreover, it was a requirement that the mother's eligibility was based on part time (50 percent) employment or higher (Ot. Prp. No 56: p.3).

There are requirements to the mother's labor market activity when the father uses the shared weeks in the paid parental leave scheme, however, this is not the case when the father uses the father's quota (NAV 2016). The mother can therefore – if desirable – stay at home together with the father on either paid holidays, unpaid leave or graded leave (Ot.pr. no. 56: p.3).

However, Norwegian holiday legislation (entitling all employees in full time position to five weeks of paid holidays a year), combined with the rules on flexible leave uptake (NAV 2015b) and the now 10 weeks father's quota entails that it is impossible for the mother to stay at home during the entire father's quota without the family experiencing a substantial drop in disposable income. It is therefore likely that the 2009 reform increased not only the number of leave days taken by fathers, but also the number of days that fathers spent alone with their child.

4 Data and identification strategy

4.1 Data

We base all analyses on data from Norwegian population registers covering the time period between 2008 and 2013. Our main study sample is women who had a child in June or July 2009, where the father is known. From this main sample we make four further restrictions.

First, as we take interest in gender specialization, same-sex couples are excluded. Second, as leave spells are registered to parents, we exclude couples who had another child 15 months before or after the focal child was born. Third, as an exogenous proxy for parental leave rights, we include only focal children whose mothers had earnings the year prior to the reform. Finally, as multiple births give rise to correlated observations, only one focal child per birth (and parental leave spell) is included in the sample.

In the final study sample we then record leave taking and subsequent patterns of income for both the mother and the father for up to three years after the focal child was born. This information is merged with other socio-demographic on the parents and their union. To capture efforts in paid work, we use the sum of earned income and primary and secondary business income (“yrkesinntekt”) (Steinkellner 2003). This allows us to get an even better proxy of efforts in paid work than earned income alone would give. For brevity, we still refer to this outcome variable as earnings. Missing earnings are set to 1, facilitating calculation of log earnings.

Our main outcome of interest is a measure of family specialization in market work, which is proxied as her earnings divided by the sum of her and his earnings. An increase in this outcome means a shift towards a less traditional division of labor in the couple. It should be noted that an increase in the specialization measure could imply that a mother with a relatively large share of the household income increases her relative contribution even more, but as that the mother earns more than the father in less than 1 in 4 couples, a positive effect on this outcome will mostly be due to a decrease in family specialization. We also estimate

effects on log earnings for mothers and fathers, earnings in 1000 NOK, and as well as the propensity to be working (as captured by earnings at least 1G).

While a valid regression discontinuity design does not require inclusion of covariates beyond the running variable, covariates can both sharpen the precision of the estimates and provide a robustness check. Most importantly, however, we use information on observable characteristics measured prior to the reform (in 2008) to conduct subgroup analysis. We obtain information on educational attainment and enrollment from the National Educational Database (NUDB). When used as a control variable, educational attainment is grouped into four levels: Basic (not completed high school), completed high school, higher education lower degree (BA), and higher education higher degree (MA or PhD). To retain test strength, we collapse these categories into lower (basic and high school) and higher (higher and lower degree) for the subsample analysis. Missing information on education is coded as a separate fifth category. Individuals are defined as students if they have been enrolled in education for at least one month during the current year. Based on information on the mother's and father's birth year, we construct measures of being a young mother and father. As teenage fertility is very low in Norway, we set the cutoff for these dummy variables to being under 23 years at the birth of the focal child. Furthermore, we include a dummy variable for the whether the focal child's parents were in a union in 2008 as a proxy for living together when the focal child is born.

4.2 Identification strategy

The expansion of the father's quota was implemented July 1 2009, and our empirical strategy takes advantage of this clear cutoff in eligibility and the fact that families with children born

just before and just after the cut-off should be very similar. We use the increase in the father's quota and the reduction in the shared leave (usually taken by the mother) as a discontinuous function of the birth date of the child, and estimate sharp Regression Discontinuity (RD) estimates to capture reform effects using the birth date of the child as our assignment variable. Sharp RD takes the following basic form (Angrist & Pischke 2014):

$$Y_i = \alpha_i + \rho D_i + \gamma z_i + \varepsilon_i$$

Where α is a constant term, γz nets out general trends in the assignment variable, D is a dummy variable for treatment, and ρ gives the reform effect on the outcome. The equation is estimated on both uptake and outcome variables using the stata command `rd` (Nichols 2007), which specifies a local polynomial regression for the running variable. The choice of bandwidth in local polynomial regression implies a tradeoff between less bias (narrower bandwidth) and higher precision (wider bandwidth). The `rd` command automatically suggests the specification that minimizes MSE (mean squared error), as suggested by Imbens and Kalyanaraman (2012). We choose this as our preferred specification, but also check whether the results are robust to higher and lower bandwidths. The RD command does not allow for inclusion of covariates, and does not converge for outcomes with limited variation. Hence, we also estimate OLS regressions including a control for birth date and birth date squared. In general, results are comparable across specifications, so this should not affect the results. We plan to further check the robustness of the standard errors using the `rdrobust` command, as suggested by Calonico, Cattaneo and Titiunik (2014).

Our identifying assumption is that the specification of the running variable (γz) nets out all variation correlated with the outcome and the running variable that is not due to the reform.

The running variable is specified either as a local polynomial of birth date, or as birth date and birth date squared. The main challenge to this assumption lies in selection around the cut-off (Tamm 2013, Cools et al 2015). Such self-selection into (or out of) eligibility could happen in two main ways; by parents timing the conception of a child in anticipation of the reform, and by expectant parents with due dates close to July 1 postponing/speeding up induced births or planned caesarian sections. Families where the father is more involved in family matters will presumably time the birth to after the introduction, whereas families where the father is less involved might want to time the birth to before the introduction. These different types of fathers are likely to differ in their labor market attachment as well. Hence, if such strategic timing exists, comparing families with children born just before and just after the cut-off will yield biased results.

The intention to expand the father's quota to ten weeks was declared by the government already in 2005 (Soria Moria 2005, p 43), but the policy and its details (including date of implementation) was not proposed in the Council of State until April 3 2009 (Stortinget 2015). This would leave less than nine months until the implementation, suggesting that strategic timing of conceptions not is of any major concern.¹² On the other side, Cools et al. (2015) find strong evidence of strategic timing of births two weeks before and after the 1993 introduction of the fathers quota (c.f. Brenn and Ytterstad 1997). Using placebo tests (testing for "effects" on earnings in the year prior to the reform) we do also find some evidence of

¹² It should be noted the public debate regarding the reform picked up in Norwegian newspapers as early as October 2008 (i.e. nine months prior to the implementation), but that it remains unlikely that future parents were able to guess the implementation date, as previous family policy reforms had been implemented on both April 1, May 1 and July 1

strategic timing, with high-income couples shifting into the treatment group. When we exclude parents of children born the seven days before and the seven days after the reform, no such evidence remains. Hence, we keep this restriction in our main results, giving a study sample of 7 552 couples.¹³

5 Results

5.1 Effects on leave uptake

For the reform to affect earnings or household specialization through changes in leave uptake, a reform effect of the leave uptake of mothers and/or fathers is required. The reform provides incentives to a positive effect on fathers' leave length, and a negative effect on mothers' leave length. The main effects on uptake are shown in Table 2.

Table 2: Reform effects on uptake parental leave. N=7552.

	MEN			WOMEN		
	Est	95% C.I.		Est	95% C.I.	
		L. L.	U.L.		L. L.	U.L.
Parental leave days						
Preferred bandwidth	19.7	10.6	28.7	26.7	-7.4	61.0
Half pref. bandwidth	37.7	8.3	67.1	.		
Twice pref. bandwidth	15.5	10.1	21.0	9.0	-5.3	23.2
With covariates (OLS)	14.8	9.4	20.2	4.2	-8.1	16.6
Mean duration of spell						
Preferred bandwidth	15.9	5.4	26.4	19.3	-9.1	47.6
Number of spells						
OLS	-0.1	-0.3	0.0	0.1	0.0	0.1

¹³ To avoid that the local polynomial regression adapts to the missing data around the cutoff, we add 7 to the running variable for all births before the cutoff, and add 7 to all births after the cutoff.

Starting with the results for fathers, the estimates in Table 2 show a rather substantial increase of nearly 20 leave days. A visual RD (not shown) also reveals a clear jump for men, and the increase in fathers' leave days is both statistically significant and robust across different RD specifications (bandwidths) – though there is a substantial loss of precision when half the optimal bandwidth is used. When exogenous covariates are added, the point estimate hardly changes, and precision increases somewhat. In sum, we find that the 2009 extension of the father's quota did, like previous studies have shown for the introduction, increase the average number of days that fathers spend on parental leave.

For a lasting effect on gender specialization in the family, it has been argued that it is crucial that the father strengthens his care skills by spending time alone with the child – rather than using the additional days as “family time”. Though we cannot observe directly the fashion in which the leave is taken, we can test whether the additional leave length adds to the mean length of each spell of parental leave (providing some indication of a longer spell as main caregiver at home) or whether the *number* of leave spells is affected. As shown in Table 2, the mean duration of each of the father's parental leave spells is affected almost as much as the total length of the father's parental leave. The effect on number of spells is quite precisely estimated to be zero. Hence, the reform induced fathers to extend one (of their) parental leave spells with nearly three weeks, which could potentially affect specialization in the family.

Turning to the point estimates for mothers (Table 2, left panel), a more surprising result emerges: In spite of the two weeks reduction in the length of the leave available to the mother, we find no significant decrease in the number of leave days taken by mothers at the

introduction of the reform. In the preferred specification, the point estimate for average length of leave is positive. In this specification, confidence intervals are large, and the estimate is far from statistical significance. When the bandwidth is increased or covariates are added, the estimate moves closer to zero and precision is improved, giving a more precise zero finding. Unsurprisingly, neither the mother's average number of parental leave spells taken nor the average length of each spell is affected by the reform.

The fact that we find no significant behavioral response to a reform that reduced the parental leave length available to mothers with two weeks is somewhat puzzling. A potential explanation could be that the reform induced some mothers to lengthen their parental leave days by choosing an 80 % rather than a 100 % income compensation (See Table 1).

The combination of an increased leave length for fathers, and no change for mothers, lends itself to two quite different interpretations. Firstly, an increased length of fathers' leave, all else equal, could be interpreted as a decrease in family specialization. Secondly, one could also argue that this pattern simply indicates an increase in the total family time in the household (see Cools et al (2015) for a similar explanation regarding the 1993 reform).

Regardless of interpretation, any effects on earnings must be mediated by changes in *his* leave uptake behavior. While this points toward an expectation of negative effects on his earnings, it is also very well possible that stronger father's involvement in the long run frees up time for mother's market work, increasing her future earnings.

5.2 Main results

Our main results focus on household specialization, both in the short and long run (Table 3).

We also present results for effects on his and her earnings separately.

Table 3: Descriptive statistics, main outcomes.

	Mean	SD	P25	Median	P75
Fathers' earnings in 2011 (1000 NOK)	529.2	1064.6	371.6	478.2	632.3
Mothers' earnings in 2011 (1000 NOK)	316.6	201.7	198.1	320.1	4114.9
Specialization in 2011	0.39	0.21	0.28	0.39	0.48

5.2.1 Effects on specialization

Our main outcome of interest is household specialization, defined as her earnings as a proportion of the household's total earnings. As parental leave rights (if in place) extend into 2010, we therefore start measuring *effects* of parental leave uptake in 2011 the earliest.¹⁴ Descriptive statistics over selected outcomes are shown in Table 3. For specialization, we see that the mother earns less than the father (specialization > 0.5) in less than one in four couples. Most typically, as shown by both the mean and the median, is that she provides 40 per cent of the household earnings.

¹⁴ Earnings in 2010 will be affected by whether 80 or 100 per cent income compensation is chosen for the parental leave, which is in itself not a «specialization outcome».

Table 4: Main results. N=7552.

	MEN			WOMEN		
	Est	95% C.I.		Est	95% C.I.	
		L. L.	U.L.		L. L.	U.L.
Specialization in 2011						
OLS	.			0.00	-0.03	0.02
Specialization in 2013						
OLS	.			0.00	-0.02	0.03
Earnings 2011 (1000 NOK)						
Preferred bandwidth	3.19	-40.10	46.48	20.84	-18.66	60.34
Half pref. bandwidth	-2.92	-107.85	102.00	84.03	-59.01	227.06
Twice pref. bandwidth	-11.06	-49.95	27.83	-9.54	-35.01	15.94
With covariates (OLS)	-1.9	-3.9	3.5	-19.1	-46.2	8.1
Earnings 2013 (1000 NOK)						
Preferred bandwidth	-1.91	-55.48	51.67	7.63	-20.51	35.76
Prob. of employment 2011						
OLS	0.00	-0.03	0.03	0.00	-0.04	0.04
Prob. employment 2013						
OLS	0.01	-0.02	0.04	-0.01	-0.04	0.03
Log earnings 2011						
OLS	-0.09	-0.39	0.21	-0.03	-0.40	0.35
Log earnings 2013						
OLS	0.00	-0.34	0.34	0.11	-0.25	0.48
ROBUSTNESS CHECKS						
Earnings 2008 (1000 NOK)						
Preferred bandwidth	58.68	-14.41	131.77	39.48	-0.11	79.07
Half pref. bandwidth	-128.34	-583.42	326.74	64.96	-126.55	256.47
Twice pref. bandwidth	12.85	-23.11	48.80	4.89	-15.83	25.61

If effects of specialization are cumulative, we would expect any earnings penalties to become more severe over time. Hence, we also estimate effects on earnings when the focal child is

four years old (in 2013). At this age, most Norwegian children are enrolled in kindergarten, and a more permanent pattern of (absence of) specialization in the family is likely to have settled. However, as before, we find no effects of the parental leave reform on specialization in the family. The point estimates for effects on specialization is exactly zero at two decimals' precision. The confidence intervals allow us to consider effects larger than about a tenth of a standard deviation (absolute value of confidence limits lies in the range 0,02-0,03, relative to a standard deviation of 0,21 found in Table 3). Results are robust to inclusion of exogenous controls.

5.2.2 Effects on his and her earnings

While our main results regard relative income, we also explore whether there are effects on his or her earnings that cancel each other out and/or for some other reason is not captured by the specialization measure. Moreover, we investigate effects at the extensive margin (the probability of being employed) as well as earnings in 1000 NOK (capturing effects on an absolute scale) and log earnings (capturing effects on a relative scale). All estimates are displayed in Table 4.

Starting with the effects on absolute earnings, estimates are consistently insignificant and close to zero for both mothers and fathers, both in the short (2011) and long (2013) run. Again, the results are robust across specifications (not shown). Moving on to the effects on log earnings, point estimates are consistently negative indicating a reduction in mean earnings ranging from 8 to 24 percentage points. However, none of the estimates are statistically significant from zero, neither in 2011 nor 2013. Finally, effects on his and her propensity to

be employed are quite precisely estimated to be zero, indicating that the changes in the parental leave system did not affect labor supply on the extensive margin.

For earnings in 2011, we present results for three different specifications or bandwidths as a robustness check. For both fathers' and mother's earnings, estimates are consistently insignificant and close to zero. Using half the preferred bandwidth, confidence intervals get meaninglessly large, and also in our preferred specification, precision is somewhat lacking. When earnings are measured in 2013, we again find no significant effects. Again, the result is robust across specifications (not shown).

In sum, it is unsurprising that no changes in his or her labor supply were detected when relative earnings did not change significantly.

5.3 Subsample analysis

Table 5: Subsample analysis. Estimates from OLS regression.

	Est	95% C.I.		N
		L. L.	U.L.	
Specialization in 2011				
Both parents >23	-0,008	-0,033	0,018	6942
Mother high school or lower	0,001	-0,030	0,028	3422
Mother BA or higher	0,012	-0,053	0,030	3880
Parents in union 2008	-0,015	-0,047	0,016	3947

Differential effects could be due to variation in reform uptake by socioeconomic groups, and/or to differential effects of the same uptake patterns by socioeconomic group. In short, we find no significant effects on relative earnings in any of the subsamples. Models for mothers' and fathers' earnings (not shown) also show zero effects. Obviously, precision decreases when samples shrink, but we can still consider substantial effects statistically unlikely. This

further strengthens the interpretation that a three weeks increase in paternity leave uptake did not have a significant effect on couples' relative earnings.

5.4 Robustness checks

In the above, we have shown that our results are robust to choice of bandwidth, and to inclusion of exogenous covariates. In general, the results of these robustness checks strengthens the plausibility of our identifying assumption, and hence the causal interpretation of our results. We have conducted two additional robustness checks. First, we have estimated a “placebo reform”, that is, the effect of the reform on earnings one year prior to the reform (2008). Results are shown in the lower panel of Table 4. A significant effect on this outcome would indicate that a comparison of parents of children born just before and just after the cutoff is not “all else equal”, meaning that our results do not have a causal interpretation. Reassuringly, we find no significant “reform effects” on earnings in the year prior to the reform. This holds across the parent's sex and across model specifications.

Second, both to test the sensitivity of our results and to investigate the potential of increasing power, we widen the window which is defined based on the birth date of the focal children (results not shown). Reassuringly, increasing the sample does neither change our results substantially nor significantly. However, a larger sample does not increase the precision of our estimates, which is why we choose a narrower window (giving the advantage of a lower risk of bias) in our main results.

6 Concluding discussion

This study has assessed the effect of an exogenous increase in paternity leave of about three weeks on the relative earnings of mothers and fathers. Though the change in paternity leave induced by this reform is substantial, it did not significantly affect earnings of mothers and fathers, neither in the short nor the long run. Estimated by way of a regression discontinuity design, a battery of robustness checks indicates that our results are not driven by self-selection or strategic timing. The absence of effects is consistent with a similar study of the effect of the introduction of the Norwegian paternity quota (Cools et al 2015). Hence, neither the introduction nor extensions of paternity quota in Norway seem to have immediate effects on gender specialization.

The reform could have effects on outcomes beyond those we can measure here. Perhaps most importantly, longer paternity leaves may reduce the statistical hiring discrimination of women in their main childbearing years, as young employees of both sexes could be expected to have absences from paid work due to starting or extending a family. It is also important to underline that quasi-experimental designs do not capture dynamic effects – that is, effects mediated by norms, practices and social interaction that are found among individuals who are *not* directly exposed to the reform. If the reform led to a gradual change in fathering practices that after a while reduced gender specialization in market work, this will not be captured by our estimates.

However, in our evaluation, the burden of evidence lies on those who claim the coexistence of no immediate effects of increased paternity leave and strong effects of the same change in the long run. In our theory section, we point toward mechanisms of comparative advantage and

gender specialization, as well as signaling. For signaling, the negative effect on earnings should be strongest for the first treated fathers: As long paternity leaves become increasingly common, fathers who take longer leaves should be less, not more, likely to face discrimination. We also see no particular reason why the effects reduced specialization in couples with small children should interact with whether contextual factors – such as whether other fathers take longer parental leave.¹⁵

Why, then, does an increase in paternity leave not leave a permanent mark on gender specialization, as theory predicts it would? One potential explanation would be that the reform did not really reduce gender specialization, but rather increased the household's total amount of resources allocated to home production. This explanation finds some support in that mothers do not reduce their time spent on parental leave. This is consistent with previous studies finding that the introduction of the father's quota in Norway had a small negative effect on mothers' earnings (Cools et al 2015), and that mothers spend more time with their children due to the introduction of a father's quota in Quebec (Patnaik 2015). As we find no effects on mothers' earnings, this explanation indicated that the extension of the father's quota implied a shift to investment in child quality from other types of leisure. Another potential explanation is that there was an endogenous pattern in the take-up of the reform – that is, that

¹⁵ Indeed, such a dependency would imply a violation of the Stable Unit Treatment Value (SUTVA) assumption required for estimation of Local Average Treatment Effects in quasi experimental setups.

fathers who expected to face the smallest wage penalties would be most likely to respond to the reform by taking longer leave.¹⁶

When no effects on earnings were found for the *introduction* of the paternity quota in Norway, it was argued that the paternity quota was simply too short to have a lasting impact on division of labor in the family. Following this line of argument, one should expect non-linear effects of increases of the paternity quota, and that subsequent extension should have more profound implications for earnings. Our results refute the expectation of such non-linear effects for durations of paternity leave up to ten weeks. It is obviously possible that even longer extensions are required for permanent effects on gender specialization to emerge. However, this raises the question of the duration of parental leave required in order to generate lasting effects – and whether extensions in that range are politically feasible.

Importantly, the lack of immediate effects on relative earnings should not be mistaken for a lack of effects of the paternity quota per se. The reform did yield a substantial increase in the time fathers spend with their small children – which has in its own right been found to both be beneficial for children and fathers. Following this line of thought, an interesting question for future research is whether this change led to an increase in union stability.

¹⁶ Importantly, this does not challenge the validity as the reform as a quasi-experiment, as the treatment itself remains exogenous.

References

- Angrist, J. D., and J.-S. Pischke (2014). *Mastering 'Metrics*. Princeton: Princeton University Press.
- Becker, G. S. (1991). *A Treatise on the Family*. Cambridge, MA: Harvard University Press.
- Brenn, T. and E. Ytterstad (1997). Daglige fødselstall for Norge 1989-93 [Yearly numbers of births in Norway 1989-93]. *Tidsskrift for den norske legeforening* 117: 1098-1101.
- Browning, M. (1992). Children and household economic behavior. *Journal of Economic Literature* 30(3): 1434-1475.
- Calonico, S., M. D. Cattaneo and R. Titiunik (2014). Robust data-driven Inference in the regression-discontinuity design. *The Stata Journal* 14(4): 909-946.
- Cools, S., J. H. Fiva and L. J. Kirkebøen (2015). Causal Effects of Paternity Leave on Children and Parents. *Scandinavian Journal of Economics* 117(3), 801-828.
- Dahl, G.B., Løken, K.V. and Mogstad, M. 2012. Peer effects in program participation. NBER Working Paper 18198. National Bureau of Economic Research.
- Duvander, A-Z. and M. Johansson. 2012. What are the effects of reforms promoting fathers' parental leave use? *Journal of European Social Policy* 2012 22: 319-330
- Ekberg, J., R. Eriksson and G. Friebel. 2013. Parental leave — A policy evaluation of the Swedish “Daddy-Month” reform. *Journal of Public Economics* 97 (2013): 131–143
- Johansson, Elly-Ann. 2010. The effect of own and spousal parental leave on earnings. *Working paper* 2010:4. Institute for Labour Market Policy Evaluation.
- Karimi, A., E. Lindahl and P.S. Thoursie. 2012. Labour supply responses to paid parental leave. *Working paper* 2012:22. Institute for Labour Market Policy Evaluation.

- Kotsadam, A. and H. Finseraas (2011). The state intervenes in the battle of sexes: Causal effects of paternity leave. *Social Science Research* 40(2011): 1611-1622.
- Kotsadam, A., E. Ugreninov and H. Finseraas (2010). The long term effect of own and spousal parental leave use on mothers earnings. In *Gender, Work and Attitudes*. PhD Thesis. Gothenburg: University of Gothenburg, Department of Economics.
- Lundberg, S. and E. Rose (2000). Parenthood and the earnings of married men and women. *Labour Economics* 7(2000): 689-710.
- Lundberg, S. and E. Rose (2002). The effects of sons and daughters on men's labor supply and wages. *Review of Economics and Statistics* 84(2): 251-268.
- Imbens, G. and K. Kalyanaraman (2012). Optimal Bandwidth Choice for the regression Discontinuity Estimator. *Review of Economic Studies* 79(3): 933-959.
- NAV (2015a). Fedre tar ut fedrekvoten i tråd med regelverket. [Fathers use the father's quota in line with the regulations]. Retrieved online from:
<https://www.nav.no/no/NAV+og+samfunn/Statistikk/Familie+-+statistikk/Nyheter/fedre-tar-ut-fedrekvoten-i-tr%C3%A5d-med-regelverket>.
- NAV (2015b). Fleksibelt uttak. [Flexible uptake of paid parental leave]. Retrieved online from: <https://www.nav.no/no/Person/Familie/Venter+du+barn/fleksibelt-uttak--1036>
- NAV (2015c). Folketrygdløven. Kapittel 14: Ytelser ved fødsel, svangerskap og adopsjon. [The National Insurance Act. Chapter 14: Benefits regarding child birth, pregnancy and adoption]. Retrieved online from:
<https://www.nav.no/rettskildene/Rundskriv/Generell+del+-+Kapittel+14.183541.cms>
- NAV (2016). Spesielt om foreldrepenger til far. [About paid parental leave to the father]. Retrieved online from:

<https://www.nav.no/no/Person/Familie/Venter+du+barn/spesielt-om-foreldrepenger-til-far--347656>.

Nichols, A. (2007). Causal inference with Observational Data. *Stata Journal* 7(4): 507-541.

Rege, M. and I. Solli. 2013. The Impact of Paternity Leave on Fathers' Future Earnings. *Demography* 50:2255–2277.

Stortinget (2015). Endringer i folketrygdloven. [Changes in The National Insurance Act].

Retrieved online from: <https://www.stortinget.no/no/Saker-og-publikasjoner/Saker/Sak/?p=42411>.