Does Paternity Leave Promote Gender Equality within Households?*

Libertad González
Universitat Pompeu Fabra and
Barcelona School of Economics

Hosny Zoabi
The New Economic
School

Abstract

Evidence on the effects of paternity leave policies on family outcomes is mixed. We propose a simple household bargaining framework to understand the economic effects of paternity leave and organize the existing evidence. Our model predicts that the effects of the policy are heterogeneous and depend on the relative wages of the partners within each couple. Low wage-gap and high wage-gap couples should show limited responses to paternity leave expansions, while intermediate-gap couples should react strongly, as the policy intervention can disrupt traditional specialization agreements. Guided by the model, we use a regression discontinuity design to identify these three groups using Spanish data. We then test the model's predictions across a range of family outcomes. Consistent with the theory, we find no systematic effects of paternity leave on low- or high-gap couples. In contrast, among intermediate-gap couples, the introduction of a two-week paternity leave in 2007 led to a 3 percentage-point drop in the probability of having another child, persistent increases in fathers' daily time spent on housework and childcare of over one hour each, an 8-point increase in maternal employment two years after childbirth, and a 4-point increase in the probability of divorce.

Keywords: Gender equality, specialization, fertility, time allocation
JEL: D13, J12, J13, J16

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1 INTRODUCTION

Large gender inequalities in labor market outcomes remain widespread across countries. A growing body of evidence points to within-household specialization after parenthood as a key driver of these disparities (Cortés and Pan, 2023). Following the arrival of children, women tend to shift towards childcare and home production, reducing their labor market participation and earnings, while men specialize in paid work.

Specialization along gender lines can increase the household surplus when the wage gap between the partners is sufficiently large. This mechanism may help explain why traditional gender roles persist even in the face of policies aimed at promoting equality. Recent research suggests that widely used policy tools, such as subsidized childcare and paid parental leave, have had limited success in closing gender gaps in the labor market (Kleven et al., 2022; Olivetti and Petrongolo, 2017). In recent years, paternity leave policies have gained prominence as a strategy to promote gender equality at home and at work. By reserving a portion of paid leave for fathers, these policies aim to increase men's involvement in childcare and shift household dynamics.

A growing number of empirical studies have assessed the effects of paternity leave policies in different countries on fathers' (and mothers') time-use and labor market outcomes, as well as additional family outcomes such as fertility and divorce.[1] However, the evidence remains mixed: some studies document meaningful effects, while others find small or no impacts, depending on the context and outcome examined. In addition, some recent studies have found that paternity leave may lower fertility, which is hard to reconcile with a standard model where parental leave subsidies reduce the cost of children, and thus would be expected to increase fertility.

We propose a simple household bargaining framework to examine the economic effects of paternity leave policies. Our theoretical framework is helpful to organize the existing findings and to clarify when and why paternity leave policies might succeed or fail in shifting household behavior. We argue that the effects of paternity leave are heterogeneous and depend in a non-linear way on the gap in (potential) wages between the partners. We then test the model's predictions using Spanish data and a regression discontinuity design, showing that classifying couples based on their predicted responsiveness can reconcile the seemingly inconsistent evidence.

[1] See Table B1 in Appendix B for a summary of existing research.

Our model of household decision-making assumes that each spouse derives utility from private consumption and a public good (children). Raising children requires parental time, with mothers' and fathers' time modeled as perfect substitutes. We adopt a cooperative framework where the threat point is defined by a non-cooperative equilibrium within marriage (Lundberg and Pollak, 1993). In this setup, couples achieve an efficient, cooperative outcome on the Pareto frontier only if the allocation determined by (fixed, exogenous) Pareto weights provides each spouse with at least their utility from the non-cooperative outcome. Crucially, unlike in a Nash bargaining solution, these weights do not adjust to guarantee a cooperative surplus for both parties.[2]

In the non-cooperative outside option, we assume a Cournot game in which optimal choice is driven by the best response for both partners. In this case, each spouse provides part of the resources (time) for the public good (children) and consumes the other part. Thus, in the outside option, spouses share childcare. If couples cooperate, they specialize and operate efficiently, reaching the Pareto frontier. Specifically, in couples with a positive gender wage gap (the husband out-earns the wife), the wife specializes in raising children and the husband specializes in market work, and both consume according to the exogenous bargaining weights.[3]

The agreement to cooperate creates gains from specialization and generates efficiency. However, not all couples agree to cooperate, and this is due to the exogenous bargaining weights. To explain the intuition, assume that a woman's bargaining power is low. If the wage gap (in favor of the husband) is sufficiently high, the woman will agree to cooperate as the benefit from specialization is high, and thus the compensation she gets in terms of consumption and public good provision overweigh her small bargaining power. Alternatively, if the wage gap is sufficiently low, then the woman will be better off choosing

[2]This assumption of fixed weights is natural in a setting requiring specialization. The efficient outcome often involves full specialization (e.g., one spouse focusing primarily on childrearing), but such specialization can be irreversible, degrading that spouse's future earning potential and thus their ex-post outside option. Fixed Pareto weights can therefore be seen as a commitment device, protecting the specializing spouse from this limited commitment problem. As a direct consequence, the efficient cooperative outcome may not be realized in equilibrium if the pre-committed distribution of resources fails to be individually rational for both spouses relative to the non-cooperative fallback.

[3]Our model is symmetric and can account for reverse specialization when the wife out-earns the husband. However, we focus our theoretical analysis on the more common case of a wage gap in favor of the male partner. The literature on gender norms finds that couples tend to avoid a situation in which the wife out-earns her husband (Bertrand et al., 2015). Also, the share of such households is only 11% in Spain in 2007 (Survey of Income and Living Conditions). We do not exclude these couples from our empirical analysis but, as will be apparent later, we classify them as egalitarian couples.

her outside option. Thus, the model endogenously creates two groups of couples: One where the spouses cooperate and specialize, and another one where the partners revert to their outside option, in which both spouses work to sustain their private consumption and share childcare.

The model predicts that the introduction (or expansion) of paternity leave decreases the net benefits from cooperation. Therefore, there may be marginal couples, for whom the agreement stops being optimal, so that spouses revert to their outside option where they choose not to specialize. We can think of paternity leave as a subsidy that couples allocate optimally. Due to the best-response mechanism, the division of this subsidy better reflects the fundamentals of the partners in the outside option. Given the biased division of consumption in the cooperative case, some women (with a relatively high wage) prefer to revert to their outside option.

Thus, the model identifies three distinct groups. First, couples with a sufficiently low wage gap, who always choose the outside option in which they share childcare. Henceforth, we label this group as "egalitarian" couples. Although an expansion in paternity leave has small continuous effects on their time allocation, fertility, and consumption, these couples will keep sharing childcare. Second, couples with a sufficiently high gender wage gap, who always choose to cooperate and specialize (the wife at home and the husband at work). We label this group as "high-gap" couples. Third, in between these two corners comes the group that is most affected by the paternity leave policy. This group includes couples that switch from cooperation to their outside option. Henceforth, we label this group as "intermediate" couples.

Therefore, paternity leave induces some couples to share childcare, which yields higher gender equality within these households. However, for couples with a positive gender wage gap, sharing childcare implies a higher (opportunity) cost of raising children compared to the specialization case. Our model thus predicts that paternity leave increases the cost of raising children, which in turn reduces fertility. This result is counter-intuitive since paternity leave is a subsidy (money received by couples conditional on the birth of a child). However, the transition from cooperation to the non-cooperative outside option creates an inefficiency that is translated into an under-provision of the public good.

Two elements are crucial for this result. First, the non-cooperative outside option within marriage, in which each spouse optimally chooses the time he or she allocates

to the public good. Second, the exogenous bargaining weights. The exogeneity of the bargaining weights disconnects the allocation of resources within cooperation from the outside option for both spouses. This disconnect creates a disagreement between (some) spouses. The (exogenously) low bargaining power of women creates a biased division of consumption, to the extent that women with a relatively high wage prefer their outside option. The lower the bargaining power, and thus the higher the bias, the more women opt for their outside option.

If we assume that divorce yields a loss of utility from children, a reduction in fertility increases the probability of divorce.[4] Put differently, the transition from a state of agreement to a state of disagreement may trigger separation, which works through the under provision of the public good, namely, fertility. This also reflects the notion that children act as a friction preventing divorce.

Our model predicts that paternity leave will merely lead to small income and price (substitution) effects for egalitarian and high-gap couples, while the effect is discrete and discontinuous for the intermediate ones. The model predicts that for intermediate-gap couples, an expansion of paternity leave leads to (1) an increase in the effective length of leave taken by fathers, (2) a reduction in fertility, (3) an increase in women's employment at the expense of childcare time, (4) an increase in men's childcare time at the expense of their employment, and (5) an increase in the probability of divorce.[5]

We test the predictions of the model in the setting of Spain, which introduced two weeks of (non-compulsory) paternity leave in 2007. Eligibility was based on the date of birth of the child. We study the effect of paternity leave on household outcomes following a regression discontinuity design, such that we compare families who had children very close to the cutoff date, and are thus very similar on average along all dimensions except paternity leave eligibility.

A non-trivial question is how to classify families as egalitarian, intermediate, and

[4]See Weiss and Willis (1985) and Browning et al. (2014).

[5]In González and Zoabi (2021), we derive the same predictions from a non-cooperative model that allows spouses to reach an informal agreement in which they can freely trade time for consumption. In that version, the model assumes two types of husbands: fair husbands, who respect the informal agreement and transfer consumption, and unfair ones, who shirk and do not transfer the agreed consumption. The two models share the insight that an "unfair" division of resources lies at the heart of the mechanism. This unfair division can take the form of exogenous bargaining weights, or it can stem from a lack of commitment and the unfairness of some husbands (or both).

high-gap couples. Since potential wages are unobserved (and actual wages are endogenous), we use the gap in age and educational attainment between the spouses to proxy for the gap in potential wages (Folke and Rickne, 2020; Bertrand et al., 2015). In order to determine the cutoffs that define the groups "endogenously", we use the predictions of the model regarding time-off from work. This removes researcher discretion in the definition of the groups, at the cost of preventing us from testing the predicted effects (since we use it to define the groups). We take advantage of the fact that our model has a clear prediction for fathers' response in terms of time at home (or time off from work) as a result of paternity leave introduction. Since fathers in egalitarian couples share a major part of childcare regardless of the policy, paternity leave will not change their behavior much. Neither does the policy affect fathers in high-gap couples, who always have an agreement to cooperate and outsource childcare to their wives. However, fathers' responses in intermediate-gap couples are discrete and significant, as these fathers move from an agreement where they specialize in market work, to sharing childcare as egalitarian couples.

This model prediction allows us to run a sort of first stage, in which we calibrate the age-gap and education-gap thresholds, that define the borders between the three groups of couples, by targeting some moments in the take-up data. Specifically, we target a very small time-off response to paternity leave introduction for fathers in the corner groups while maximizing the effect for the intermediate group. That is, we sacrifice the data on fathers' effective take-up (time off) to endogenize the classification of couples into the three groups. Thus, not only does our model predict three groups, but it also allows us to identify them. We find that, indeed, the data gives rise to such a pattern: Very small and insignificant effects of paternity leave on fathers' time off in the corners (small or large predicted wage gap), and a large effect in the middle, which is consistent with the model's predictions. In our application, about 22% of couples are in this middle group.

Then, in a second stage, we use this endogenous classification to test our model's predictions with regard to couples' fertility, employment, time-use, and divorce.[6] We do not find systematic effects of the paternity leave expansion on low- and high-gap couples, while we do find that, among intermediate-gap couples, eligibility for the two-week paternity leave led to a 3 percentage-point lower fraction of couples having another child, a 4 percentage-point increase in the proportion of couples getting divorced, a persistent

[6]Two of the data sets (for women's employment and divorce) do not contain enough information on husbands to replicate the groups exactly.

increase in fathers' housework and childcare time of more than an hour per day each, and an increase in maternal employment of 8 percentage-points (and a 10% increase in earnings) two years after the birth of the child. Our empirical results thus strongly support the main predictions of the model.

Our theory relates to several strands of research. The literature on family economics has established a strong role for the gender wage gap in household choices (Galor and Weil, 1996).[7] Our model contributes to this important literature by showing that the gender wage gap can predict the type of interaction that different couples have: Some couples cooperate while others do not, and a marginal change in the wage gap can dramatically change the way spouses share paid and unpaid work. Efficiency is reached through cooperation. However, frictions captured by exogenous bargaining weights prevent some couples from reaching efficiency. To the best of our knowledge, our model is one of the first on paternity leave, and the first to predict heterogeneous effects.[8] Finally, while the focus of our model is on paternity leave policy, it can be a useful tool for analyzing family policies in general.

We contribute to the empirical literature analyzing the effects of family policies by providing a structure that allows us to understand the big picture and reconcile existing findings on the effects of paternity leave in different countries. First, we document that paternity leave can have heterogeneous effects across different types of couples, and our model allows us to pinpoint the marginal group: couples with an intermediate gap in potential earnings between the partners. We provide evidence for Spain confirming that paternity leave has no effect on couples that are either very egalitarian (who never specialize), or that have a large difference in potential earnings (who always specialize). Instead, there is a middle group of couples for whom even small extensions can have large effects.

Second, we examine a range of outcomes, which so far have been analyzed separately

[7] Later contributions examine the role of the gender wage gap in a variety of important outcomes such as women's empowerment (Duflo, 2012; Doepke and Tertilt, 2019); the marketization of childcare (Hazan and Zoabi, 2015a; Gobbi et al., 2018; Bar et al., 2018); international trade (Sauré and Zoabi, 2014) and the gender educational gap (Chiappori et al., 2009; Becker et al., 2010; Hazan and Zoabi, 2015b)

[8] Meier and Rainer (2017) study some theoretical aspects of paternity leave and argue that paternity leave solves the hold-up problem and may increase fertility and Carrer (2021) focuses on gender norms to examine the efficiency of parental leave policies.

in empirical studies.[9] We document and rationalize effects on take-up,[10] time-use (childcare and housework),[11] labor supply,[12], fertility,[13], and divorce,[14] all of which are connected via our theory. Our model proposes a mechanism consistent with the declines in subsequent fertility found in several countries (Lee, 2022; Farré and González, 2019; Fontenay and Tojerow, 2020). Moreover, our theory links the existing evidence on fertility and parental divorce (Dahl et al., 2014; Avdic and Karimi, 2018; Olafsson and Steingrimsdottir, 2020). Finally, our results provide a potential explanation for why some papers have found small or zero effects of paternity leave on some of the outcomes of interest. We find small effects overall, but strong effects for a subset of households, which may have been "washed out" in previous studies that do not incorporate the type of heterogeneity predicted by our model. While there are a number of factors that can potentially explain the different effects of the policy found across different settings (including differences in policy design, as well as cultural norms), our theory implies that differences in the distribution of the gender wage gap within couples (leading to differences in the size and composition of the groups) may contribute to understanding differences in policy effects across countries.

We show that paernity leave as part of any parental leave policy can push some couples from traditional roles (where the husband is the breadwinner and the wife is the homemaker) to more egalitarian ones.[15] We argue that paternity leave expands the size

[9] See Table B1 in Appendix.

[10] See Avdic and Karimi (2018), Bartel et al. (2018), Cools et al. (2015), Dahl et al. (2014), Ekberg et al. (2013), Olafsson and Steingrimsdottir (2020), Patnaik (2019) and Rege and Solli (2013).

[11] Several papers find that paternity leave increases fathers' involvement in childcare and/or household work persistently (Farré and González, 2019; Kotsadam and Finseraas, 2011; Patnaik, 2019; Rege and Solli, 2013; Tamm, 2019), while others find zero effects (Ekberg et al., 2013; Kluve and Tamm, 2013).

[12] A number of studies document no impact on fathers' labor supply (Cools et al., 2015; Dahl et al., 2014; Ekberg et al., 2013; Patnaik, 2019; Rege and Solli, 2013; Farré and González, 2019), but Rege and Solli (2013) and Avdic and Karimi (2018) find some evidence of small negative effects. Regarding mothers, Patnaik (2019), Farré and González (2019), and Dunatchik and Özcan (2021) document positive effects on maternal employment, while Dahl et al. (2014), Ekberg et al. (2013) and Rege and Solli (2013) find no effect.

[13] Cools et al. (2015), and Dahl et al. (2014) find no effects of paternity leave extensions on fertility in Norway, while Farré and González (2019), Fontenay and Tojerow (2020) and Lee (2022) find small negative effects on fertility in Spain, Belgium, and Korea.

[14] Avdic and Karimi (2018) find that an increase in fathers' share of parental leave led to higher marital separation rates in Sweden, while Dahl et al. (2014) and Cools et al. (2015) report no effect of paternity leave on marital stability in Norway. Finally, Olafsson and Steingrimsdottir (2020) find heterogeneous effects in Iceland, with paternity leave increasing marital stability in more egalitarian couples but decreasing it in those where the father is more educated than the mother.

[15] Recent papers argue that labor market penalties associated with motherhood are the main obstacle for closing the gender earnings gap (Kleven et al., 2019a,b; Bertrand, 2020; Titan et al., 2021).

of the egalitarian group, in that sense promoting gender equality.[16]

The paper proceeds as follows. Section 2 presents the setup of the model. Section 3 characterizes the equilibrium and provides the main results. Section 4 presents our empirical analysis and Section 5 concludes.

2 THE MODEL

Consider a household composed of a man (father), m and a woman (mother), f. Each agent derives utility from private consumption and the number of children. They face exogenous wages and decide on their labor supply and the allocation of time to raising their children. The utility of agent $i \in \{m, f\}$ is given by

$$U_i(c_i, n) = \log c_i + \alpha \log n, \tag{1}$$

where $c_i \geq 0$ is the private consumption of agent i, and $n \geq 0$ is the couple's number of children. α is an exogenous parameter, which captures the weight on children in parents' preferences.[17]

Raising children requires parents' time,[18] and the number of children n is given by:

$$n(t_m + \tau, t_f) = (t_m + \tau) + t_f \tag{2}$$

where $\tau \in [0, \bar{\tau}]$ is the paternity leave taken by the father, $\bar{\tau}$ is the maximum paternity leave that the government provides,[19] and $t_i \geq 0$ is the voluntary time spent raising chil-

[16] While gender equality is important per se, it is also found to be an important driver for economic development (Doepke and Tertilt, 2009; Hazan et al., 2019, 2022).

[17] For the sake of simplicity, we assume that spouses share the same preferences over the number of children, and we do not include a quality dimension of children. These elements are not necessary to derive our main predictions, and we do not consider child quality outcomes (human capital) in our empirical application. Doepke and Kindermann (2019) show that many couples in fact disagree about the number of children. An extension of the model with heterogeneous preferences for children and/or with child quality may be worth exploring for a richer set of predictions.

[18] We assume for simplicity that there is no monetary cost of children and that childcare time cannot be outsourced. The reason is that the purpose of the model is to study the effects of a specific policy (paternity leave). The model may be extended to include a monetary cost of children and/or market childcare, and those extensions would allow one to derive predictions regarding policies such as child benefits or childcare subsidies.

[19] For the sake of simplicity, we abstract from maternity leave (its inclusion does not affect any of our main results).

dren by parent i (in addition to paternity leave).[20] Each individual has one unit of time.[21]

2.1 Outside option

We assume that the two members of the couple have an outside option where they behave non-cooperatively. The solution in the outside option is given by a Cournot equilibrium, where each spouse chooses the amount of time that she or he spends on raising children, and the father decides whether to take paternity leave (and how long).

The budget constraint of an individual i is given by

$$c_i(t_i, \tau) = w_i(1 - t_i) \tag{3}$$

where w_i is an exogenous wage per unit of time, and $w_i(1 - t_i)$ is lifetime income, $i \in \{m, f\}$.[22]

The husband solves the maximization problem:

$$\max_{t_m, \tau} U_m = \log c_m + \alpha \log n$$
$$\textbf{s.t. } c_m = w_m(1 - t_m),$$

with $\tau + t_m \leq 1$, $t_m \geq 0$, $\tau \in [0; \bar{\tau}]$, while the wife solves the maximization problem:

$$\max_{t_f} U_f = \log c_f + \alpha \log n$$
$$\textbf{s.t. } c_f = w_f(1 - t_f),$$

with $0 \leq t_f \leq 1$. We denote the utilities in the outside option by U_i^O.

[20] By voluntary we mean unpaid time, as opposed to paternity leave which is paid by the government. We assume that $\bar{\tau}$ is small relative to the individual's total time endowment (more details on this assumption below).

[21] A previous version of the model incorporated learning by doing in raising children. Although it adds another motive for specialization, all of our main (qualitative) results remain unaffected (González and Zoabi, 2021).

[22] Notice that the father's budget constraint can be rewritten as $c_m(t_m, \tau) = w_m(1 - t_m - \tau) + w_m\tau$, which collapses to equation 3 by assuming full wage replacement of parental leave. His labor supply is therefore $(1 - t_m - \tau)$. The full wage compensation is just a simplifying assumption. Any partial compensation delivers the same qualitative results. A previous version of the model (González and Zoabi, 2021) incorporated returns to experience, which adds another motive for specialization (all our qualitative results are intact).

2.2 Cooperation

Given the outside option, the two members of the couple can (potentially) improve their individual utilities by cooperating. Spouses cooperate only if both weakly increase their utility compared to their outside options. We assume that in cooperation the couple maximizes the sum of weighted utilities, subject to a joint budget constraint, while time constraints remain separate. Formally, the couple maximizes:

$$\max_{t_m, t_f, \tau} \theta U_f + (1-\theta) U_m$$
$$\textbf{s.t. } c_m + c_f = w_f(1-t_f) + w_m(1-t_m),$$

with $\tau + t_m \leq 1$, $t_m \geq 0$, $\tau \in [0; \bar{\tau}]$ and $0 \leq t_f \leq 1$. $\theta \in [0,1]$ is an exogenous parameter, which captures the bargaining power of the wife in the household's cooperative decision-making. We denote the utilities in cooperation by U_i^C.

3 SOLUTION

In this section we solve the outside option and the cooperative case. Then we show the conditions under which each case is optimal. Finally, we analyze the effects of a paternity leave extension via a comparative statics exercise.[23]

3.1 Outside Option

In the outside option, each agent maximizes her/his own utility given the optimal behavior of the spouse. The optimal value of consumption, time allocation and fertility are given by:

$$c_i = w_i \frac{\bar{\tau} + 2}{\alpha + 2}$$
$$t_i = \frac{\alpha - \bar{\tau}}{\alpha + 2}$$
$$\tau = \bar{\tau}$$
$$n = \frac{\alpha(\bar{\tau} + 2)}{\alpha + 2},$$

[23] See Appendix C.1 for a detailed solution of the cooperative and non-cooperative cases, and Appendix C.2 for the proofs of propositions and lemmas.

respectively. Thus, in the outside option the father always chooses full paid leave (essentially a free subsidy).[24] Moreover, both spouses allocate the same (voluntary) time for children.[25]

3.2 The Cooperative solution

In the cooperative case, couples maximize the joint utility while pooling their resources, as described in subsection C.1. The optimal choice for consumption is given by:

$$c_f = \theta B$$
$$c_m = (1-\theta)B,$$

where $B = w_f(1-t_f) + w_m(1-t_m)$ is the household's budget (total earnings). If we assume that the wife has a lower market wage than the husband, then raising children is done by the wife as she has the lower opportunity cost and thus, optimal time allocation and the number of children are given by:

$$\begin{aligned} t_m &= 0 \\ \tau &= \bar{\tau} \\ t_f &= \min\left[\frac{\alpha-\bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha}; 1\right] \\ n &= t_f + \bar{\tau}, \end{aligned} \tag{4}$$

where $\omega = w_m/w_f$ is the gender wage gap (the wage ratio between the spouses). We assume that $\omega \in (1, +\infty)$.[26] Equation 4 shows that in the cooperative case, the husband takes the full available leave that he is eligible for.[27] We further assume that $\alpha < 1 + \bar{\tau}$, which implies that the husband allocates $\bar{\tau}$ for raising children and works $1-\bar{\tau}$ (i.e. he spends no time on childcare beyond paternity leave). Regarding the wife, equation 4 reveals two cases, depending on the wage gap between the partners: One where the wife raises children full time (full specialization within the household), and another where the wife works part-time and raises children the rest of her time (partial specialization within

[24] We assume that $\alpha > \bar{\tau}$ for any $\bar{\tau}$. This guarantees that parents' voluntary time for raising children is positive. Notice that α determines the share of resources allocated to children in both the cooperative and non-cooperative cases, which is assumed to be higher than any parental leave.

[25] This equality in voluntary childcare time is a result of the log-linearity of the utility function.

[26] Under alternative assumptions about the wage gap, the model will give rise to different patterns of specialization.

[27] We assume that α is sufficiently large to guarantee that women spend non-zero time raising children. As shown in the detailed solution in Appendix (C.1), the assumption that we made in Section (3.1) that $\alpha > \bar{\tau}$ is sufficient for t_f to be strictly positive.

the household).[28]

Proposition 1. *Under cooperation, spouses specialize. If $\omega < \bar{\omega}$, the wife works part time. Alternatively, if $\omega \geq \bar{\omega}$, the wife raises children full time.*

Proposition 1, which follows directly from Equation 4, presents a threshold level of the spousal wage ratio beyond which the mother raises children her full unit time, and below which she works in the market part time. Panel A of Figure I illustrates these two cases as a function of the spousal wage ratio. The intuition is that, for a sufficiently low wage gap, raising children (which is done solely by the mother) is expensive, making parents optimally choose low fertility, and thus the mother splits her unit time between raising children and working. Since the father does not raise children, his wage acts as a pure income effect. As w_m increases, and with it the gender wage gap, the income effect dominates the substitution effect (household income increases relative to the cost of children). As a result, fertility increases and female labor supply declines. This continues until the couple reaches the threshold level, $\bar{\omega}$ where the mother spends her full unit time in raising children.[29]

This threshold level is given by:

$$\bar{\omega} = \frac{\bar{\tau} + 1}{\alpha} \tag{5}$$

Thus, the model predicts that, under cooperation, there are two cases (depending on the spousal gender wage gap): one in which the mother raises children her full time unit (and thus does not work for pay), and another one where the mother works part time in the market.[30]

3.3 An Agreement to Cooperate vs. the Outside Option

Now we consider the couple's optimal choice (cooperation vs. the outside option). That is, when will the couple reach an agreement to cooperate and when will they choose the non-cooperative outside option? As discussed above, in cooperation spouses specialize, with the wife allocating part or all of her unit time to raising children.

Assumption 1. $\theta < \bar{\theta}$,

[28] In both cases, the husband works full-time.

[29] See Galor and Weil (1996) and Sauré and Zoabi (2014) for a similar mechanism in a unitary model.

[30] Notice that $\bar{\omega} > 1$ always holds, as $\alpha < 1 + \bar{\tau}$.

where $\bar{\theta} = (\frac{(\bar{\tau}+2)\alpha}{(\alpha+2)(\bar{\tau}+1)})^{\alpha+1}$.

As will be apparent later in this section, Assumption 1 simplifies the analysis, as it allows us to concentrate on the case where all couples that agree to cooperate choose full specialization.

Under this scenario, we first tackle the problem from the woman's point of view, who faces the following choices: to cooperate, fully specialize in raising children and consume θw_m, or to opt for the non-cooperative outside option, allocating part of her time for raising children and consuming her own wage income. Therefore, the trade-off that the woman faces depends on the wage gap between the spouses. The higher the wage gap, the greater the gains from cooperation for the wife. If the wage gap is sufficiently high, even with small θ, the wife's consumption will be high enough to make her better off under cooperation compared to her outside option. Moreover, for a sufficiently small θ, there exists a wage gap larger than one, for which the woman opts for her non-cooperative outside option. We conclude with the following lemma:

Lemma 1. *Under Assumption 1, there exists a threshold level of the wage gap between the spouses, ω^*, such that*

- *the woman chooses her outside option for $\omega < \omega^*$*
- *the woman chooses to cooperate by fully specializing in raising children for $\omega \geq \omega^*$*

This threshold level of the gender wage gap, which is derived by equalizing women's utility in both states, is given by:

$$\omega^* = \left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{1+\alpha} \left(\frac{\alpha}{\bar{\tau}+1}\right)^{\alpha} \frac{1}{\theta} \tag{6}$$

Equation 6 shows that θ plays a role in creating the two groups of women. The lower θ, the more women find it optimal to choose their outside option.

In order to verify when the family will cooperate, we tackle now the problem from the husband's point of view. It turns out that Assumption 1 guarantees that the husband

always agrees to cooperate ($\forall\omega > 1$).[31] Therefore, the couple agrees to cooperate whenever the wife agrees to do so. We thus conclude the household's optimal choice with the following proposition.

Proposition 2. *The couple chooses the non-cooperative outside option if $\omega < \omega^*$, and chooses to cooperate (specialize) otherwise.*

To simplify the analysis, we limit our model's parameters to the case that guarantees that under optimal cooperation, the full specialization scenario arises: The wife is full time at home and the husband is full time at work (apart from his paternity leave). Formally, we need the condition $\bar{\omega} < \omega^*$ to be satisfied. This condition is implied by Assumption 1.[32]

To summarize, for a sufficiently low gender wage gap, the ability of the husband to redistribute consumption to his spouse is rather low. Therefore, the wife prefers not to cooperate but to invest part of her time in raising children, and work part-time to sustain her consumption. On the contrary, for a sufficiently high gender wage gap, the ability of the husband to redistribute consumption is relatively high. Therefore, even with a small θ, the wife is still willing to cooperate (specializing fully at home). Thus, the exogeneity of θ plays a crucial role. This exogeneity disconnects the bargaining weights from the outside option of each spouse, which creates disagreement between spouses if the gender wage gap is sufficiently low. Panel B of Figure I illustrates how the couple's optimal choice depends on the wage gap between the spouses. With these results, we can proceed now to analyze the effects of a paternity leave expansion.

[31] More precisely, Assumption 1 is a sufficient condition. The necessary condition for the husband to agree to cooperate is $\theta < 1 - (\frac{\bar{\tau}+2}{\alpha+2})^{\alpha+1}(\frac{\alpha}{\bar{\tau}+1})^{\alpha}$. Notice that under full specialization the husband's income is the only source of income in the household. It becomes straightforward, that when θ is sufficiently low and thus (1-θ) is sufficiently large, the husband consumes more under cooperation compared to his outside option. Moreover, the under-provision of the public good (children) in the non-cooperative outside option reinforces his preference of the cooperative case.

[32] This condition rules out the case of partial specialization. Alternatively, if $\bar{\omega} > \omega^*$, three cases are possible: The couple may choose the non-cooperative outside option, they may choose to cooperate with the wife working part time (partial specialization), or they may choose cooperation with the wife raising children full time (full specialization). While this more complicated scenario adds another group of couples where women work part-time, the effect of paternity leave, which is the focus of this model, is qualitatively identical to the case discussed above. For a detailed explanation see Appendix D.

3.4 Comparative statics

To answer our central question, how the introduction or expansion of paternity leave affects household choices, we carry out a comparative statics analysis using the equilibrium results from the previous subsection. We assume that the economy is populated by a continuum of couples characterized by a gender wage gap ω that is distributed over $(1, \infty)$. We show that an increase in paternity leave from the initial level $\bar{\tau}^0$ to $\bar{\tau}^1$ moves some couples from a state of agreement (specialization) to a state of no agreement (outside option).

Proposition 3. *An increase in paternity leave increases the fraction of couples choosing the outside option. Formally,* $\frac{\partial \omega^*}{\partial \bar{\tau}} > 0$.

Proposition 3 follows directly from equation 6 and our assumption that $\alpha < \bar{\tau} + 1$.[33] It implies that some couples in the vicinity of ω^*, with $\omega \geq \omega^*$, switch from an agreement to cooperate (specialize) to their outside option. Formally, couples with $\omega \in [\omega^*(\bar{\tau}^0), \omega^*(\bar{\tau}^1))$ make this switch. The intuition for this marginal group lies in the exogenous bargaining weights that are biased towards men and against women. Paternity leave triggers the marginal women to revert to their outside option, which creates this intermediate group. Panel C of Figure I illustrates this effect.

The model thus reveals three distinct groups of couples. First, in the range of a sufficiently small gender wage gap, the model reveals an "egalitarian" group that chooses the non-cooperative outside option (no specialization) even before any policy change. These couples always share childcare. Second, in the range of a sufficiently high gender wage gap, the model predicts another group of couples that always agree to cooperate (specialize). In between these two corner groups, lies the group most affected by the policy change. These intermediate wage-gap couples switch from an agreement to cooperate to their outside option as a result of the increase in paternity leave.

Next, we show that while the effect of a paternity leave expansion is small and continuous for the corner groups, it is significant and discrete for the intermediate one. Table I

[33] Notice that both thresholds ($\bar{\omega}$ and ω^*) increase with paternity leave. In other words, paternity leave fosters women's participation in the labor force in two ways: first, assuming away the outside option, it pushes women from a corner solution (fully at home) to an interior solution (part-time job); second, it induces more women to prefer the outside option. Since we assume that $\omega^* > \bar{\omega}$, we abstract from the first effect.

summarizes the quantitative effects of an increase in paternity leave by $\Delta\tau = \bar{\tau}^1 - \bar{\tau}^0$ on our main outcomes, for each of the three different groups of couples. For egalitarian couples, the effect of paternity leave is driven by the non-cooperative best-response for both spouses. In this case, when paternity leave is introduced or expanded, the husband optimally takes up the full paternity leave, as it is a free subsidy (row 1). In response, he reduces his voluntary time for raising children as well as his labor supply with the corresponding weights (rows 2 and 3). The wife's best response is to reduce her voluntary time for raising children and increase her labor supply (rows 4 and 5).

For high-gap couples, the effect of paternity leave is straightforward as these couples are fully specialized, such that the husband is fully at work (apart from the paternity leave period) and the wife is raising children her full unit of time. In this, the husband will just reduce his labor supply by the exact amount of the paternity leave expansion. Notice that the magnitudes of the reactions in the egalitarian and the high-wage groups depend directly on the size of the paternity leave expansion. Since paternity leave is assumed to be small relative to parents' unit time endowment, these magnitudes are small and negligible.

The main effect of paternity leave policy is found to be in the intermediate group, as these couples switch from cooperation (specialization) to their non-cooperative outside option as a result of the paternity leave expansion. While the husband's voluntary time at home jumps at the expense of his labor supply, the mirror image occurs for the wife. These magnitudes depend on α, which captures a significant share of household resources. These are significant and large changes as these couples switch from full specialization to sharing childcare. What happens to fertility, one of our main outcomes of interest? Row 6 of Table I shows that fertility drops significantly, as a result of the underprovision of the public good due to the non-cooperative nature of the interaction in the outside option.

Thus, while a paternity leave expansion has negligible effects for egalitarian and high-gap couples, it has large and significant effects for intermediate-gap couples. We conclude our model's predictions with the following proposition.

Proposition 4. *For intermediate wage-gap couples, an expansion in paternity leave leads to:*
(i) An increase in fathers' time at home (beyond the paternity leave period),
(ii) a reduction in fertility,

(iii) an increase in women's employment at the expense of childcare time, and
(iv) an increase in men's childcare time at the expense of their employment.

Given previous findings in the literature, we are also interested in studying the effects of paternity leave on divorce. Would a paternity leave expansion have any effect on parental separation? While we do not model divorce explicitly, one can conjecture that by adding the standard assumption that divorce yields a loss of utility from the public good (children), a reduction in the number of children reduces the utility loss from divorce. As a result, a paternity leave expansion (which according to our predictions reduces fertility in some couples) implies a potential increase in divorce. We thus also predict that an expansion of paternity leave may lead to an increase in divorce probabilities (in the intermediate group)[34]

4 Empirical Analysis

In order to test the predictions of our theory, we exploit the introduction of thirteen days of paternity leave in Spain in March 2007. This reform did not affect the length or generosity of maternity leave.[35] The new permit was voluntary and non-transferable, and it replaced 100% of earnings (financed by Social Security). All new fathers were eligible, provided that they held a formal salaried job at the time of birth (and had worked in the formal sector for at least 180 days during the previous seven years).

The model predicts heterogeneous effects of a paternity leave extension, depending on the gap in potential wages within the couple. In particular, we expect that paternity leave extensions will not affect behavior in couples that are either egalitarian (who would already have been sharing market and household work before the extension) or high potential wage-gap couples (who would have been specializing before and who would continue to specialize after the reform). However, we expect a decrease in specialization (division of labor within the couple in terms of home production and market work) in an intermediate group of couples that are neither egalitarian nor high wage-gap (in terms of comparative advantage in market work). More specifically, we expect that this middle group, which we label as intermediate wage-gap couples, will react to extensions in paternity leave with increases in the length of leave taken by the father, an increase in fathers'

[34] In a previous version of the paper, we modeled divorce explicitly, and thus formalized this last prediction (González and Zoabi (2021)).

[35] Maternity leave was 16 weeks both before and after the reform.

involvement in childcare and housework beyond paternity leave, as well as an increase in maternal labor supply. The model also predicts a decrease in subsequent fertility, and a potential increase in divorce.

Fathers were eligible for the longer paternity leave if their child was born after March 23, 2007. Our population of interest is composed of couples who had a child in a close neighborhood of the date of the policy change. Our regression discontinuity design compares couples who had a child shortly before the threshold date with those who had a child shortly after, using several data sources to measure the different outcomes of interest. The exact bandwidth around the threshold varies across data sets due to sample size considerations. We allow the effect of paternity leave to vary as a function of the characteristics of couples.

4.1 Data and descriptive statistics

4.1.1 Take-up

To study the take-up of paternity leave among eligible families, we use the *Survey on the Use of Parental Leave and their Labor Consequences* (which we will refer to as the *Madrid Survey* or MS), which was conducted between January and June 2012 in the metropolitan area of Madrid (Fernández-Cornejo et al., 2012). The survey targeted parents living in Madrid with a child aged 3 to 7 at the time of the survey. The MS provides information on the month and year of birth of the youngest child, as well as data on parental leave take-up, socio-demographic characteristics of the family, labor supply, and child-related time-use of both parents, for 1,130 children. Out of these 1,130 observations, there are 1,101 observations that have information on month and year of birth of the child, and 94.5% of the children were born between January 2005 and December 2008. Our final sample includes 1,094 observations.

We use this data set to analyze the effect of paternity leave introduction on the take-up and length of paternity leave, as well as on the total number of leave days taken by fathers (immediately after childbirth). Before the introduction of paternity leave in 2007, fathers could take 2 days of paid leave after the birth of a child. They could also take vacation days, unpaid leave, or even use up some of the maternity leave time. After March 23, 2007, fathers were offered an additional two weeks (13 days) of paternity leave (with 100% wage replacement).

Our main dependent variables are: a binary indicator for paternity leave take-up, the number of days of paternity leave taken, and the number of days off taken right after the birth of the child (including paternity leave as well as additional days off: vacation and other). We consider two bandwidths around the introduction of paternity leave: 12 and 18 months. Take-up is zero by construction for fathers of children born before March 23, 2007.

4.1.2 Fertility

To analyze the effects of paternity leave on subsequent fertility, we use administrative micro data on the universe of births taking place in Spain between 2007 and 2013 (INE, 2007–2013). The data are made available publicly by the Spanish Statistical Institute and come from birth certificates. We requested as additional variables the exact date of birth of each child as well as the previous child born to the same mother.

The high quality of the data allows us to restrict the sample to a close neighborhood of the threshold (8 to 12 weeks before and after). Our main sample includes women having a child between January and June of 2007. We observe all of them, with their precise date of birth, in the 2007 birth certificates. We refer to this one as the "reference child".

Using the data for later years combined with the information on the date of later births as well as the previous birth to the same mother, we can construct our main dependent variables, which are individual-level indicators for whether each mother had another child within 2, 4 and 6 years after the date of birth of the reference child. About 6% of mothers had another child within two years of the birth of the reference child, while 22% had another child within 4 years, and close to a third within 6 years.

4.1.3 Childcare and housework time

To analyze the effects of paternity leave on fathers' time-use, and in particular the time devoted to childcare and housework, we use the Spanish Time-Use Survey (INE, 2009–2010a), conducted between October 2009 and September 2010, i.e. about three years after the birth of the reference child (for parents whose child was born close to the introduction of paternity leave). We restrict the sample to include only different-sex parents living in a couple (married or cohabiting) whose youngest child was born 3 years before or after the reform (2004-2010). The final sample includes 941 fathers and 1,047 mothers (the survey

interviews only one adult per household). Due to sample size considerations, our smaller bandwidth is 20 months, such that the relevant children were between 1 and 4 years old at the time of the survey.

The survey includes detailed information on the daily minutes devoted to different activities, including childcare and housework, as well as household socio-economic characteristics, and the month and year of birth of all the interviewee's children. We use the number of daily minutes devoted to each task as dependent variables. On average, fathers in our full sample devote about 100 minutes per day to both childcare and household chores.

4.1.4 Maternal employment

To analyze the effects of paternity leave on maternal employment, we use longitudinal Social Security data ("Muestra Continua de Vidas Laborales", MISSM, 2009). This data set provides information on the working histories of a representative sample of 4% of people affiliated with Social Security in a given year. Our sample includes women having a child in a 9-month window around the introduction of paternity leave (i.e., between July 2006 and December 2007).

Our main dependent variables are indicators for maternal employment 12 and 24 months after the birth of the reference child (born close to the date of paternity leave introduction), as well as their accumulated earnings over the 24 months following the birth of the reference child. About 68% of the women in our sample were employed two years after the birth of the reference child, and their accumulated earnings over those initial two years were close to 13,000 euro.

4.1.5 Divorce

Finally, to analyze the effects of the 2007 extension on parental divorce, we merge Labor Force Survey (LFS, INE, 2008–2010b) data for all quarters of 2008-2010 (i.e. between 4 and 15 quarters after the policy change). We select all women with a child born between November 2006 and August 2007 (5 months before and after the policy change). The main outcome is an indicator for parental separation. About 8.3% of women reported being separated or divorced at the time of the survey.

4.2 Empirical strategy

We follow a regression discontinuity approach, where the running variable is the month (or exact date) of birth of each couple's child, and the threshold is the date of birth that determines eligibility for paternity leave. The identifying assumption is that, close enough to the threshold, control and treated families are comparable in all dimensions but paternity leave eligibility, or at least there is no discontinuous jump for other reasons exactly at the threshold. We estimate the following equation:

$$Y_{it} = \alpha + \beta D_{it} + \gamma t + \delta X_{it} + \varepsilon_{it}, \tag{7}$$

where Y is the dependent variable of interest (e.g. subsequent fertility) for family i who had a child in month t, D is an indicator for paternity leave eligibility (i.e. the couple having had a child after the paternity leave introduction), t is the running variable (month of birth of the child in most data sets, normalized so it takes value 0 in April 2007, -1 in March 2007, etc.), and X are control variables (such as mother's age and educational attainment). We allow for a linear trend in the running variable t, which is in practice allowed to vary at the threshold. This is important since some of our samples include couples who had a child several months before or after the threshold. The coefficient of interest is β, which captures a discrete jump in the outcome variable coinciding with paternity leave eligibility.

We estimate this equation in the full sample (which will give us the average intent-to-treat effect), and also separately for couples that vary in terms of the gap in potential wages between the partners. We classify couples in terms of the age and education gap between the spouses, which serves as a proxy for the gap in potential earnings.[36] In order to detect potential heterogeneous effects, we split couples into three groups: egalitarian, intermediate and high wage gap couples.

Our identification strategy requires no sorting across the threshold, i.e. parents did not manipulate the date of birth in order to become eligible for the new policy. The paternity leave extension was included in a larger package which was approved in Parliament in early 2007. The text of the law stated that fathers would be eligible for all children born starting the day after the law's publication in the official bulletin. The exact date of

[36] Years of schooling and years of labor market experience are strongly predictive of wages in Mincerian regressions. We use age as a proxy for potential labor market experience.

publication was hard to anticipate, so that it wouldn't have been feasible for couples with a due date in March to adjust the date of birth across the threshold [37].

We provide additional support for our identifying assumption by testing for balance in covariates across the threshold in all of our different data sets, and separately for each group of couples. Our results show that families are comparable in their observable characteristics on both sides of the RD cutoff, which assuages potential seasonality concerns. Some of our outcomes are observed during the recession period that followed after 2007. Our research design relies on comparing couples close to the threshold, i.e. who had a child close to March 2007, and who are observed at the same point in time afterwards. Thus, the recession does not pose a threat to our identification strategy per se.[38] Note also that our focus on heterogeneous effects across groups helps alleviate most of these types of concerns.

4.3 Results

4.3.1 Validity checks

We test for balance in covariates across the threshold for the different data sets, both in the full sample and by family type. We run regressions of the form of equation 7 without controls, where we use the control variables one by one as the dependent variable, to detect any possible discontinuities in family characteristics coinciding with the policy cutoff. The regression results are shown in Tables B2 to B6.

4.3.2 Take-up and identifying the marginal group

The results of our tests for balance in covariates are shown in Table B2. We consider eighteen family characteristics. In the full sample, we find a discontinuity in two of them (at the 95% confidence level): education of the father, and education gap between the partners. In the three subsamples, only one coefficient is significant at 95%, out of 54.

[37] Farré and González (2019) show that there was no sorting across the threshold in terms of number of births.

[38] This may seem more of an issue in the samples with the larger bandwidth. In our analysis of take-up, we include children born in April 2006 to March 2008, and the fathers are surveyed in early 2012. Thus, all of the children in our sample were born before the recession hit (in the second quarter of 2008). In the time-use survey sample, we include children born between August 2005 and November 2008. Even children born in November 2008 would have been conceived before the start of the 2008 recession, and all fathers were surveyed in 2010, after the recession was over.

Table II presents the results for the effect of the introduction of paternity leave in 2007 on take-up and the number of leave days taken by fathers surrounding the birth of their child. We report the results for two different bandwidths: 12 and 18 months around the threshold.[39] The first panel shows the results for the full sample. We find that about 73% of potentially eligible fathers actually took paternity leave. Average length was almost 10 days, which suggests that everyone took the full 13 days, conditional on take-up. We also find that the introduction of paternity leave led to an average increase in the number of leave days actually taken by fathers of about 7-8 days, suggesting a partial crowd-out of other sources of leave.

Our model predicts that men in all couples should take paternity leave, while the effect of paternity leave eligibility on childcare time beyond the paid leave period is heterogeneous depending on the gap in potential wages between the spouses. In particular, our model gives rise to a clear distinction in fathers' responses in terms of total time off from work across the three groups of couples. We thus predict that paternity leave will discontinuously increase fathers' effective time off only for the intermediate group of couples, while it will have no discontinuous effect on families with a larger or smaller wage gap between the partners. We use this prediction to identify the marginal group of couples.

We proxy the gap in potential wages with the gap in age and educational attainment between the partners (the age and education gaps are calculated as husband's age or schooling minus wife's age or schooling, in years). In our take-up sample, the man is 2 years older than the woman in the average couple, while she has about 0.6 more years of education. Descriptively, the length of leave taken by fathers (in the post-reform sample) varies non-linearly with the age gap in the couple (Figure A1, Panel A), as well as with the education gap (Figure A1, Panel B).

More formally, we find the age and education gap thresholds that define the three groups by targeting the difference in the effects of paternity leave introduction on fathers' total time off across the groups. As described in more detail in Appendix A, we target a zero response to paternity leave introduction for the corner groups (small or large wage-gap) while maximizing the difference with the intermediate one.

[39] We do not use standard methods of optimal bandwidth selection because of the discrete nature of our running variable (month of birth).

We thus sacrifice the data on fathers' time off in order to calibrate and endogenize the classification of couples into the three groups. The resulting classification is depicted in Figure II. As expected, couples with higher age and educational gaps in favor of the husband are classified as higher gender wage gap.[40] We expect that couples that we classify as egalitarian should specialize less than couples in the high-gap group. In our data (see Sections 4.3.4 and 4.3.5), we find that 59% of women in high-gap couples are employed two years after the birth of a child, compared with 81% of those in the intermediate group and 85% in the egalitarian one. We also find that "egalitarian" women spend almost 3 hours less per week on household chores than "high-gap" women, while egalitarian men spend 40 minutes more on childcare.

Figure IIIa shows the coefficients in the leave length regressions for the three groups (also shown in column 5 of Table II). We find, as targeted, a positive significant effect of paternity leave eligibility on total time off by fathers in the intermediate group of couples, while the effect is smaller and not statistically significant for egalitarian and high wage-gap couples. The difference between the middle group and the other two is also significant. Although these are targeted moments, the fact that we do find an intermediate group with large effects while the effects are close to zero in the other groups is a first piece of evidence consistent with our model predictions (Proposition 4).

The full regression results for the three groups are shown in Table II.[41] Our results show similar effects on take-up across the different types of couples (columns 1 and 2), as predicted by our model.[42] However, this only translates into a significant increase in actual time off for the intermediate group. Fathers in egalitarian couples increase their total leave by (an insignificant) 1 to 4 days in response to paternity leave introduction, while the effect is between 4 and 7 days for high wage-gap couples. Thus, the paid paternity leave days replace other sources of time off in these families. The middle group of intermediate couples, on the other hand, increase the father's time off by almost a month (22 to 25 days). Note that this intermediate group includes 20-23% of all couples. Our es-

[40] In our resulting classification, the age difference appears to be more binding than the education difference. This is in spite of educational attainment being typically at least as predictive of wages as age (or experience) in Mincerian regressions. We acknowledge that the age difference might be capturing additional couple characteristics that may also correlate with the wage gap between the spouses. For example, a higher age gap in favor of the husband is correlated with a higher likelihood of the wife being foreign-born, which in turn is associated with lower wages.

[41] The results for the test of balance in covariates in each group of families are shown in Table B2.

[42] Note that paternity leave take-up and length are not zero in the control group. Before the reform, fathers had the right to two days off from work immediately after childbirth.

timates thus suggest that fathers in this group not only take the full 13 days of paid leave, but they increase their time off by an additional 12 to 15 days, as a result of the reform. This is consistent with our predictions that the reform leads these couples to switch from a specialization regime to one where childcare is shared.

4.3.3 Fertility

Next, we estimate the effect of paternity leave on couples' subsequent fertility. Dependent variables are now individual-level indicators for the mother having another child within 2, 4 and 6 years after the date of birth of the reference child in the neighborhood of March 24, 2007. Because the birth data cover the universe of children born in Spain, and since we observe the exact date of birth, we can focus on parents of children born very close to the relevant threshold. We consider two bandwidths: children born within 8 and 12 weeks around March 23, 2007. In terms of our validity checks, we find no significant discontinuity at the threshold in the covariates considered, either in the full sample or in any of the subgroups (results are shown in Table B3).[43]

Our results for the full sample in Table III indicate that paternity leave eligibility may have led to lower subsequent fertility after 2, 4 and 6 years, as already documented in Farré and González (2019). However, the coefficient is small, not stable across specifications, and mostly insignificant.

We next apply the endogenous classification of families calibrated in the take-up sample, and show that the negative effect on subsequent fertility is driven by the group of couples with an intermediate wage gap. Figure IIIb shows the effects on subsequent fertility (after 6 years) for the three groups of couples (and the 12-week bandwidth, see also column 6 of Table III). We find a significant decrease in the fraction of parents having another child within 6 years for intermediate couples, while we find small and insignificant effects for egalitarian and high wage gap couples.

The full regression results are shown in Table III. Two years after having a child in 2007, egalitarian couples that were eligible for paternity leave are slightly less likely to have had another child, but the effect is small and insignificant. For high wage-gap couples, on the other hand, we find small positive coefficients (also insignificant). However,

[43] Farré and González (2019) report balance in a rich set of covariates for the full sample.

eligible intermediate couples are 1.4 to 1.6 percentage points less likely to have another child within 2 years, a 23% reduction (compared to the mean in the control group, shown in the table). This significant effect for the intermediate group persists after 4 years (2.1-3.4). By 2013 (six years after paternity leave introduction), we find no effect on additional fertility for egalitarian and high wage-gap couples, while intermediate couples are 2.5 to 4 percentage points less likely to have had another child, suggesting a 7-11% reduction in completed fertility. The fact that the effect persists after 6 years supports the prediction of the model that intermediate wage gap families have switched regimes due to the introduction of paternity leave.[44]

Previous papers studying paternity leave in Norway, Spain and Belgium found zero or small negative effects on fertility outcomes (see Table B1). We show, for the case of Spain, that the small aggregate effects are driven by non-negligible effects in the "marginal" group of couples.

4.3.4 Childcare and housework time

We next analyze the effect of paternity leave introduction on fathers' contribution to childcare and housework beyond the paternity leave period (about 3 years after the birth of the child). We estimate regressions for total daily minutes of childcare time, housework, and market work by fathers. Table IV presents the results for two different bandwidths around the birth-date determining eligibility (20 and 28 months). The results of the balance in covariates tests are shown in Table B4. We find a significant discontinuity in only one out of the 15 covariates considered.

Results for the full sample in Table IV show insignificant effects on fathers' time-use. We do find positive coefficients for childcare and housework time, and negative ones for market work, but they are imprecisely estimated.

We next explore heterogeneity across types of families using our endogenous classification of couples. Note that, according to our model, the gap in potential wages predicts specialization patterns (in levels). If our couple classification is correct, egalitarian couples should specialize less than high-gap ones. We do find that (control) men in egal-

[44]Our model also predicts higher fertility levels in high-gap compared with egalitarian couples. Our classification does not do a good job at matching this prediction, with fertility levels that are quite similar across the three groups of couples.

itarian couples spend more time in childcare than men in the other groups (see means in columns (1) and (2) of Table IV), while women in high-gap couples spend more time in housework (and work less in the market) than women in the other groups (columns 3 to 6). These descriptive statistics are consistent with our classification of couples, although we acknowledge that some others are not (for example, for men's housework time).

As for our regression results, we find that, as a result of the introduction of paternity leave, fathers in intermediate couples increase childcare and housework time (see Figure IIIc), unlike fathers in egalitarian and high-gap couples. The results are presented separately for each of the groups in Table IV. We find no significant effect of paternity leave introduction on fathers' time devoted to childcare or housework for egalitarian and high wage-gap families. The coefficients for egalitarian and high-wage couples are unstable across different bandwidths, and never significantly different from zero.

We do find significant positive effects for fathers in the intermediate group. Eligible fathers in intermediate couples spend significantly more time on childcare and housework after the introduction of paternity leave. The increase in daily childcare and housework time is more than one hour each.

In terms of magnitude, fathers increase their childcare time to a level that roughly corresponds to mothers' pre-treatment mean in the relevant group of couples. Paternity leave eligibility appears to lead to about equal contributions from fathers and mothers to total childcare time. As for housework time, the increase by 69-103 daily minutes (from a baseline of 102-105) also leads to men spending roughly the same amount of time as mothers on housework in the control group of intermediate couples.

The estimated effect of paternity leave introduction on the time fathers spend on paid work is negative in intermediate couples, although the coefficients are not significantly different from zero for any of the bandwidths.

4.3.5 Maternal employment

Next, we study how paternity leave affected mothers' labor market outcomes. Our main dependent variables are indicators for maternal employment 12 and 24 months after the birth of the reference child (born close to the date of paternity leave introduction), and accumulated earnings over the 24 months following the birth of the reference child.

We show that there was no significant discontinuity in covariates at the threshold (see Table B5).

Results for the full sample are shown in the first panel of Table V. We find that mothers whose partners were eligible for paternity leave are about 3 percentage points more likely to be employed a year after childbirth, an effect that seems to persist after two years. This has a small impact on earnings, of about 300 euros (or 3%).

We then explore heterogeneity of this effect across types of couples.[45] Table V presents the results for two different bandwidths around the birth-date determining paternity leave eligibility: 3 and 6 months.[46] Once again, our results show that the aggregate effect is driven by women in intermediate couples (Figure IIId). In these marginal households, paternity leave eligibility leads to large, significant increases in maternal employment and earnings. Two years after childbirth, women in eligible families in the intermediate group are 8-9% more likely to be employed, and their accumulated earnings are higher by 7-9%. We find no such effect among mothers in egalitarian or high wage-gap couples.

4.3.6 Divorce results

Finally, we study the effect of the introduction of paternity leave on marriage dissolution. The sample is now composed of all women living with a child born close to the threshold, including those who were not living with a partner at the time of the survey. 8.3% of women living with a child born close to the cutoff were separated when surveyed in 2008-10.

The results of testing for balance in covariates around the threshold are shown in Table B6. Note that the treated group has significantly fewer children at the time of the survey. This is consistent with the negative effects on fertility that we have documented.

[45] The Social Security data do not provide information on the educational attainment of the partner. Thus, we classify couples based on the age difference and maternal education level, using the main age difference thresholds as determined by the endogenous classification of couples used in the previous sets of outcomes. Intermediate couples are those with an age gap of 2-3 and a mother with medium education level, or an age gap >3 and maternal education is high. Couples are classified as high wage gap if mother's education level is low or the age gap is > 3 years and mother's education level is medium/low. Couples are egalitarian if the age gap is < 2 and mother's education level is medium/high or age gap 2-3 but mother's education level is high.

[46] Note that, as expected, employment rates are considerably higher for women in egalitarian compared with high-gap couples.

We find (Table VI) no overall effect on the probability of divorce for the full sample of women, as also found in Farré and González (2019). The coefficients are all very small in magnitude, and none are significant at the 95% confidence level.

For the analysis of heterogeneous treatment effects, we cannot apply the same classification of couples as before because we do not observe husband characteristics for separated women. We thus now classify mothers based on their own age and educational attainment only (i.e. high vs. low predicted potential wage of women).[47]

Figure IIIe (using a 3-month bandwidth around the date of paternity leave introduction and the classification based on both age and schooling, as in column 5 of Table VI) shows that the effect of paternity leave introduction on the probability of divorce is heterogeneous across the three groups of women: couples in the intermediate group experience an increase in divorce probability, while we find no significant effect on egalitarian or high wage gap couples. As shown in Table VI, the increase in the probability of divorce for women from the intermediate group is between 3 and 6 percentage points, depending on the classification and the bandwidth.[48] We find no significant increase in the divorce probability for the high wage-gap and egalitarian groups (in fact, we find negative effects among high-wage mothers in the egalitarian group, consistent with Olafsson and Steingrimsdottir (2020)).

All in all, our calibration exercise targets one prediction of the model, on heterogeneous effects of paternity leave on leave length. We use this prediction to define the groups, and then test the remaining predictions of the model about the effects of paternity leave on a range of additional outcomes. The model also generates predictions about the levels of all of these outcomes (essentially, egalitarian couples should specialize less than high wage-gap ones). We can also verify these predictions in the data. Some of them do hold (e.g for maternal employment and housework time), but not all (e.g. for fertility). We are thus not able to capture all the levels well, but we believe that we are able to capture the effects of changes in paternity leave and the marginal group of affected

[47] The following classifications are used: Based on mother's schooling: college, high school, less than high school. Based on mother's age and education: college education and age 40+ at first childbirth, high school graduates aged 22-39 at first childbirth, and less than high school and <40 at first childbirth OR high school and <27 at first childbirth.

[48] Note that the classification based on schooling only does a better job at matching our model predictions for levels, with higher separation rates in the egalitarian group.

households.[49]

5 Conclusions

We propose a simple household bargaining framework to think about the effects of paternity leave policies on family outcomes. In our model, husbands and wives in different-gender couples decide on paternity leave and the allocation of time between home production and the labor market. They can choose the non-cooperative outside option, or they can reach an agreement to cooperate, in which the wife specializes in home production (raising children) while the husband works for pay. Our model predicts that the effects of a paternity leave extension are heterogeneous and depend on the relative wages of the partners within each couple. Egalitarian couples (with a sufficiently small gender wage gap) do not specialize and play the outside option, while intermediate-gap (with a medium gender wage gap) and high-gap couples do reach such an agreement. An expansion in paternity leave moves intermediate-gap couples to their outside option, where women work more and men do more home production. As a result, the cost of raising children increases and fertility declines. Assuming that children act as friction preventing divorce, lower fertility increases the probability of divorce.

Using Spanish data and a regression discontinuity design, we provide evidence consistent with our model's predictions. In a first stage, using the model's predictions about fathers' total leave responses to a paternity leave extension, we calibrate the thresholds to endogenously classify couples into egalitarian, intermediate-gap and high-gap couples. In a second stage, we use this endogenous classification to examine the impact of paternity leave on subsequent fertility, time-use, employment, and marital stability. While we don't find systematic effects of paternity leave expansion for egalitarian or high-gap families, we find a reduction of 3 percentage points in the fraction of intermediate couples going on to have another child, a 4 percentage-point increase in the proportion of intermediate couples getting divorced, a persistent increase in fathers' housework and childcare time of more than an hour per day each, and an increase in maternal employment of 8 percentage points two years after childbirth.

[49] Table V shows that employment rates and earnings are lowest for women in high wage-gap couples, and highest in egalitarian ones. This is consistent with Table IV showing that women in high-gap couples spend more time in housework. However, Table III shows that high-wage couples don't have higher subsequent fertility than the other groups, and they have the lowest divorce rate only in one of the two classifications in Table VI.

Our theory and empirical results show that introducing or expanding paternity leave leads to more equality within couples by pushing some couples to the egalitarian group, where fathers spend more time in home production activities (and mothers spend more time in paid work). The discontinuous change in the equilibrium for intermediate-gap couples expresses something deep that has changed in the relationships within couples. Our model suggests that some couples abandon (or never adopt) the agreement of traditional gender roles.

A number of studies have analyzed the effects of family policies on gender inequality in labor market outcomes. A recent paper by Kleven et al. (2022) analyzes parental leave and subsidized childcare policies in Austria, and finds that they did not lead to any substantial improvements in the gap in earnings between men and women with children. While our paper shares this view at the aggregate level, our model suggests that the small or zero aggregate effects may hide significant impacts in the marginal group of couples, defined by the (intermediate) gap in potential wages between the spouses. We encourage researchers to test our predictions using data for other countries.

Our model suggests that paternity leave can lower fertility as it induces some families away from a specialization agreement. We provide empirical evidence consistent with this prediction, where we infer causality by exploiting a discontinuity generated by the policy introduction. We acknowledge that our empirical analysis focuses on short-term effects of the policy, and that our model does not incorporate other potential mechanisms such as social norms that may react to the institutional environment. It may well be that paternity leave policies affect social norms over the longer run (Farré et al., 2023), and that in turn more gender-egalitarian social norms lower the cost of children for women, leading to more agreement between partners, which in turn may increase fertility (Doepke and Kindermann, 2019). Estimating these longer-run effects is beyond the scope of our paper.

A growing literature argues that labor market penalties associated with motherhood are the main remaining obstacle to closing the gender gap in earnings (Bertrand, 2020; Cortés and Pan, 2023; Kleven et al., 2019a,b; Titan et al., 2021). Our model shows that paternity leave leads some couples (with an intermediate gap in earnings between the spouses) to become more egalitarian, with women working more and men sharing childcare. We also find that paternity leave policies may lower fertility and increase marital

dissolution in these households. We thus argue that more generous paternity leave policies have the potential to be an instrumental tool in promoting gender equality. This needs to be weighted against the potential costs of higher separation rates, since the literature suggests that women lose from divorce and that marital separation is an important driver of gender (wealth) inequalities.

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TABLES

TABLE I: Effects of an increase in paternity leave, $\bar{\tau}$

	Egalitarian	Intermediate	High-gap
τ	$\Delta\tau > 0$	$\Delta\tau > 0$	$\Delta\tau > 0$
t_m	$-\frac{\Delta\tau}{2+\alpha} < 0$	$\frac{\alpha-\bar{\tau}^0-\Delta\tau}{2+\alpha} > 0$	0
l_m	$-\Delta\tau\frac{1+\alpha}{2+\alpha} < 0$	$\frac{\bar{\tau}^0-\alpha-\Delta\tau(\alpha+1)}{2+\alpha} < 0$	$-\Delta\tau < 0$
t_f	$= \Delta t_m < 0$	$-\frac{2+\bar{\tau}^0+\Delta\tau}{2+\alpha} < 0$	0
l_f	$\frac{\Delta\tau}{2+\alpha} > 0$	$\frac{2+\bar{\tau}^0+\Delta\tau}{2+\alpha} > 0$	0
n	$\Delta\tau\frac{\alpha}{2+\alpha} > 0$	$\frac{(\Delta\tau+1)\alpha-2(\bar{\tau}^0+1)}{\alpha+2} < 0$	$\Delta\tau > 0$

Note: t_i is the share of time allocated on uncompensated non-market work. l_i is the share of time allocated on market work. n denotes the number of children. $\Delta\tau$ denotes the increase in paternity leave from the initial level $\bar{\tau}^0$ to $\bar{\tau}^1$.

TABLE II: Effect of paternity leave introduction on total leave length

	Take-up (binary)		Paternity leave (days)		Total leave (days)	
	(1)	(2)	(3)	(4)	(5)	(6)
			Full sample			
Eligibility	0.734***	0.726***	9.619***	9.456***	8.185***	6.509***
	(0.0292)	(0.0298)	(0.322)	(0.376)	(1.464)	(2.260)
Mean control	0.079	0.055	1.04	0.73	8.76	9.25
N	459	724	459	724	459	724
			Egalitarian couples			
Eligibility	0.713***	0.739***	9.302***	9.616***	3.714	0.526
	(0.0600)	(0.0500)	(0.743)	(0.644)	(2.247)	(3.772)
Mean control	0.108	0.074	1.42	0.97	8.99	8.44
N	231	352	231	352	231	352
			Intermediate couples			
Eligibility	0.637***	0.716***	9.174***	9.695***	24.90***	21.99***
	(0.0972)	(0.0993)	(1.300)	(1.184)	(6.079)	(5.690)
Mean control	0.085	0.057	1.14	0.77	10.39	11.45
N	96	163	96	163	96	163
			High wage gap couples			
Eligibility	0.707***	0.673***	9.300***	8.760***	4.132	7.019**
	(0.0834)	(0.0496)	(1.068)	(0.665)	(2.521)	(3.133)
Mean control	0.03	0.022	0.39	0.29	6.99	8.46
N	132	209	132	209	132	209
Bandwidth	12 months	18 months	12 months	18 months	12 months	18 months

Note: The data source is the Madrid Survey. Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variables are: a binary indicator for take-up of paternity leave (cols. 1-2), the number of paternity leave days taken (cols. 3-4), and the number of days off taken by the father after the birth of the reference child (including paternity leave, vacation days, etc, cols. 5-6). The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 23, 2007). We always control for a linear trend in month of birth that is allowed to change after the threshold. The sample includes fathers who had a child 12 to 18 months before or after March 2007. Controls include a dummy for first births, marital status of the mother, and mother's and father's age at birth, immigrant and labor market status, and educational attainment. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see Figure III for details). *** p<0.01, ** p<0.05, * p<0.1

TABLE III: Effect of paternity leave introduction on subsequent fertility

	Two years		Four years		Six years	
	(1)	(2)	(3)	(4)	(5)	(6)
			Full sample			
Subseq. fertility	-0.00431	-0.00592*	-0.000275	-0.0116*	0.00177	-0.0155*
	(0.00299)	(0.00355)	(0.00467)	(0.00604)	(0.00591)	(0.00804)
Mean control	0.0620	0.0628	0.226	0.235	0.324	0.337
N	126,051	182,305	126,051	182,305	126,051	182,305
			Egalitarian couples			
Subseq. fertility	-0.00383	-0.00658	0.00668	-0.00844	0.0119	-0.00772
	(0.00333)	(0.00401)	(0.00670)	(0.00851)	(0.00812)	(0.0103)
Mean control	0.0633	0.0635	0.232	0.240	0.329	0.343
N	55,269	79,860	55,269	79,860	55,269	79,860
			Intermediate couples			
Subseq. fertility	-0.0141**	-0.0156**	-0.0214**	-0.0344**	-0.0246**	-0.0394**
	(0.00574)	(0.00678)	(0.0107)	(0.0139)	(0.0122)	(0.0164)
Mean control	0.0632	0.0659	0.244	0.256	0.352	0.370
N	29,023	41,984	29,023	41,984	29,023	41,984
			High wage gap couples			
Subseq. fertility	0.00185	0.00174	0.00506	-9.57e-07	0.00640	-0.00928
	(0.00497)	(0.00598)	(0.00850)	(0.0110)	(0.0110)	(0.0145)
Mean control	0.0595	0.0596	0.207	0.214	0.296	0.308
N	41,759	60,461	41,759	60,461	41,759	60,461
Bandwidth	8 weeks	12 weeks	8 weeks	12 weeks	8 weeks	12 weeks
Linear trend	Y	Y	Y	Y	Y	Y
Quadratic trend	N	Y	N	Y	N	Y

Note: The data source is Spanish birth certificates (Spanish Statistical Institute), 2006-2013. Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variable is an indicator for whether a given woman had another child within 2, 4, or 6 years of the date of birth of the reference child. The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 23, 2007). The sample includes women who had a child 8 or 12 weeks before or after March 2007 (depending on the column). Controls include fixed effects for day of the week (of birth). The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see Figure III for details). *** p<0.01, ** p<0.05, * p<0.1

TABLE IV: Effect of paternity leave introduction on the time-use of fathers

	Childcare		Housework		Paid work	
	(1)	(2)	(3)	(4)	(5)	(6)
			Full sample			
Minutes (per day)	26.03	17.05	15.37	8.171	-13.12	-28.75
	(20.18)	(16.05)	(20.99)	(17.61)	(41.51)	(33.75)
Mean control	97.08	94.42	107.4	105.8	258.1	264.7
Mean (mothers)	178.5	183.3	213.5	215.0	140.1	139.2
Observations	525	730	525	730	525	730
			Egalitarian couples			
Minutes (per day)	15.50	-0.481	5.574	-1.575	-24.68	-43.93
	(35.94)	(26.59)	(32.28)	(27.00)	(62.82)	(51.83)
Mean control	104.8	97.25	102.8	104.7	269.2	273.2
Mean (mothers)	185.5	186.4	203.8	205.6	143.5	146.6
Observations	241	345	241	345	241	345
			Intermediate couples			
Minutes (per day)	90.71**	71.36**	102.6**	68.78*	-63.11	-83.86
	(36.57)	(31.48)	(49.30)	(40.57)	(78.72)	(71.37)
Mean control	79.62	90.72	101.5	104.8	277.3	259.0
Mean (mothers)	170.3	175.0	207.3	210.4	141.5	136.0
Observations	117	160	117	160	117	160
			High wage gap couples			
Minutes (per day)	27.54	10.35	-11.82	-13.72	64.51	49.63
	(31.92)	(27.44)	(37.55)	(32.72)	(78.11)	(61.83)
Mean control	98.57	93.19	115.9	107.8	235.1	258.0
Mean (mothers)	175.3	184.0	226.9	227.8	135.8	132.8
Observations	164	224	164	224	164	224
Bandwidth	20 months	28 months	20 months	28 months	20 months	28 months

Note: The data source is the Spanish Time-Use Survey of 2009-10. Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variable is the number of minutes per day that a father devotes to childcare, housework or paid work (depending on the column). The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 2007). We always control for a linear trend in month of birth that is allowed to change after the threshold. The sample includes men living in a couple at the time of the survey who had a child 20 to 28 months before or after March 2007. Controls include a dummy for first births, marital status of the mother, an indicator for weekdays (vs. weekend), as well as age, educational attainment, and migrant status of mother and father, and region fixed-effects. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see Figure III for details). *** p<0.01, ** p<0.05, * p<0.1

TABLE V: Effect of paternity leave introduction on mother's employment

	Employment after 12 months		Employment after 24 months		Accum. earnings (24 months)	
	(1)	(2)	(3)	(4)	(5)	(6)
			Full sample			
Labor outcome	0.033***	0.045***	0.011	0.031*	516**	580*
	(0.011)	(0.017)	(0.011)	(0.017)	(205)	(299)
Mean control	0.635	0.635	0.673	0.682	12,795	12,754
Observations	5,014	10,317	5,014	10,317	4,994	10,276
			Egalitarian couples			
Labor outcome	0.035*	0.049*	0.003	0.016	406.61	234.07
	(0.019)	(0.028)	(0.018)	(0.026)	(539.95)	(778.84)
Mean control	0.804	0.810	0.847	0.848	19,608	19,405
Observations	1,311	2,561	1,311	2,561	1,049	2,234
			Intermediate couples			
Labor outcome	0.065**	0.088**	0.079***	0.092**	1,254.21**	1,755.61**
	(0.030)	(0.042)	(0.026)	(0.040)	(608.92)	(881.78)
Mean control	0.770	0.786	0.811	0.814	18,663	18,655
Observations	595	1,225	595	1,225	704	1,352
			High wage gap couples			
Labor outcome	0.024	0.032	0.001	0.024	254.55	338.99
	(0.016)	(0.023)	(0.016)	(0.023)	(222.56)	(318.71)
Mean control	0.542	0.542	0.577	0.595	9,536	9,443
Observations	3,108	6,531	3,108	6,531	3,241	6,690
Bandwidth	3 months	6 months	3 months	6 months	3 months	6 months
Linear trend	N	Y	N	Y	N	Y
Quadratic trend	N	N	N	N	N	N

Note: The data source is Spanish Social Security administrative data (2015 sample). Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variables are: An indicator for maternal employment 12 (24) months after the birth of the reference child, and her accumulated earnings over the 24 months following the birth of the reference child. The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 2007). The sample includes women who had a child 3 to 6 months before or after March 2007. Controls include age and educational attainment of the mother, birth order, and mother's employment status 3 months before the birth of the reference child. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see section 4.3.5 for details). *** p<0.01, ** p<0.05, * p<0.1

TABLE VI: Effect of paternity leave introduction on parents' separation

	Schooling			Schooling & Age		
	(1)	(2)	(3)	(4)	(5)	(6)
			Full sample			
Separation	0.00828	0.00460	0.00345	0.00828	0.00460	0.00345
	(0.00933)	(0.0116)	(0.00885)	(0.00933)	(0.0116)	(0.00885)
Mean control	0.0703	0.0795	0.0858	0.0703	0.0795	0.0858
Observations	3,006	9,168	15,471	3,006	9,168	15,471
			Egalitarian couples			
Separation	-0.0318***	-0.0284*	-0.0116	-0.0327***	-0.0176	-0.0117
	(0.0109)	(0.0150)	(0.0112)	(0.0103)	(0.0146)	(0.0111)
Mean control	0.126	0.129	0.124	0.0442	0.0479	0.0558
Observations	994	2,857	4,680	1,107	3,180	5,222
			Intermediate couples			
Separation	0.0451***	0.0581***	0.0298**	0.0473***	0.0388**	0.0286**
	(0.0147)	(0.0178)	(0.0140)	(0.0163)	(0.0187)	(0.0145)
Mean control	0.0425	0.0650	0.0710	0.0455	0.0594	0.0692
Observations	1,043	3,166	5,282	956	2,927	4,916
			High wage gap couples			
Separation	0.00708	-0.0170	-0.0130	0.0171	-0.00754	-0.00656
	(0.0208)	(0.0255)	(0.0189)	(0.0214)	(0.0259)	(0.0193)
Mean control	0.0447	0.0411	0.0546	0.126	0.131	0.128
Observations	969	3,145	5,509	943	3,061	5,333
Bandwidth	1 month	3 months	5 months	1 month	3 months	5 months

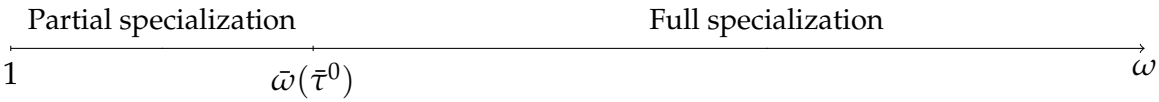
Note: The data source is the Spanish Labor Force Survey (2008-10). Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variable is an indicator for maternal separation (the mother not residing with a partner at the time of the survey). The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 2007). The sample includes women who had a child 1 to 5 months before or after March 2007. Controls include age and education level of the mother, and quarter fixed effects.The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the age and educational attainment of the mother.

*** p<0.01, ** p<0.05, * p<0.1

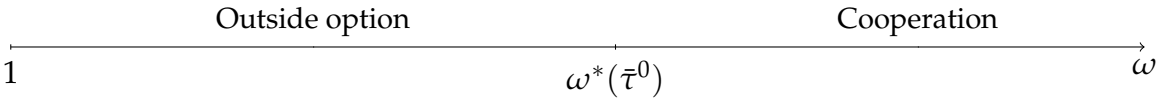
FIGURES

Figure I: Distribution of households along the gender wage gap axis

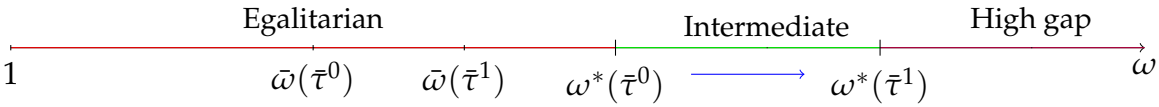
Panel A: Optimal specialization under cooperation given $\bar{\tau}^0$



Panel B: Optimal choice (Cooperation vs. Outside option) given $\bar{\tau}^0$

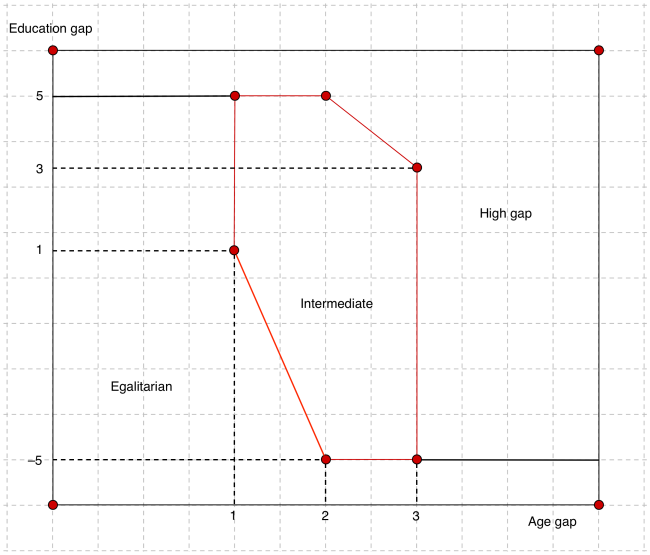


Panel C: Comparative statics - Paternity leave expansion $(\bar{\tau}^1 > \bar{\tau}^0)$



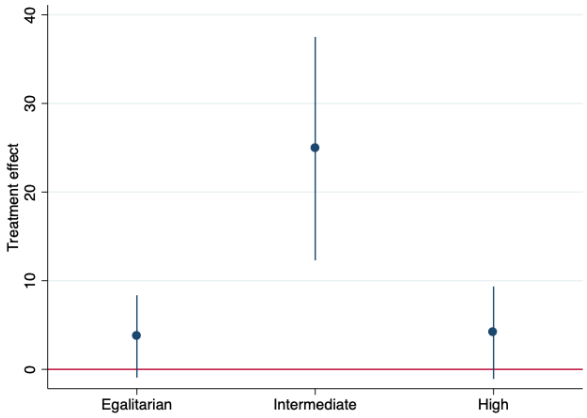
Note: Panel A describes optimal specialization under cooperation. Panel B describes the optimal choice between outside option and cooperation. Panel C describes comparative statics, following an increase in paternity leave. We define 3 groups: Egalitarian group (red), Intermediate (green) and High gap (purple).

Figure II: Endogenous classification of couples based on age and education gap

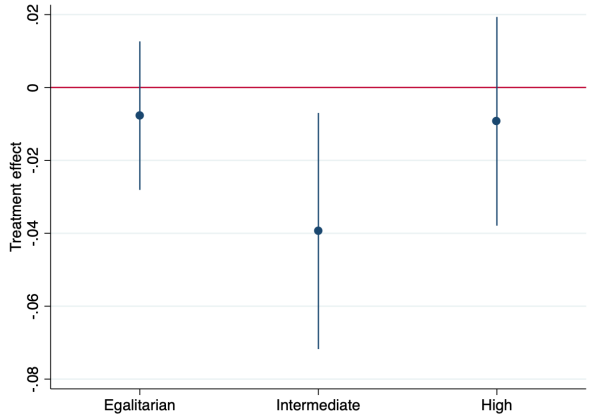


Note: The age and education gap between the partners are measured in years. The figure shows our classification of couples into three groups, based on our calibration exercise using the predictions of the model regarding take-up of paternity leave.

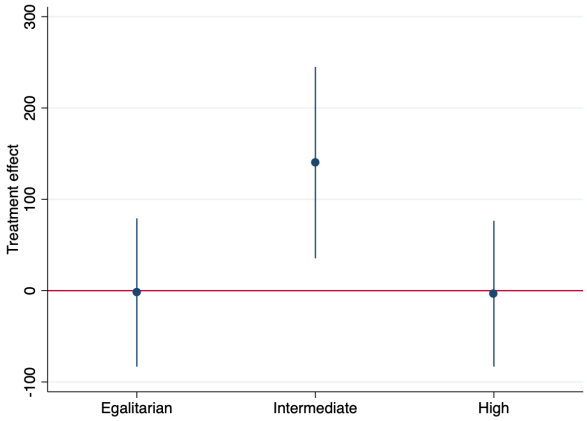
Figure III: Effects of the paternity leave eligibility:



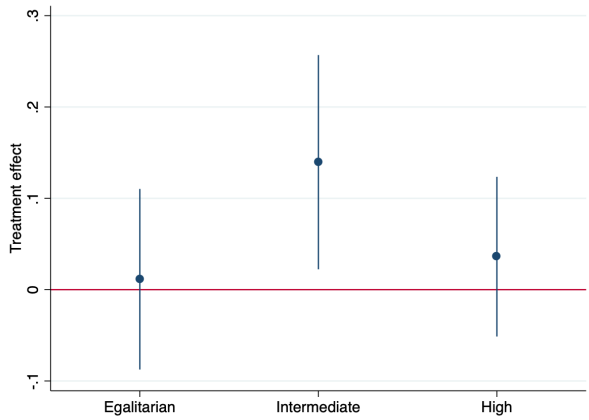
(a) On total time off by fathers in days



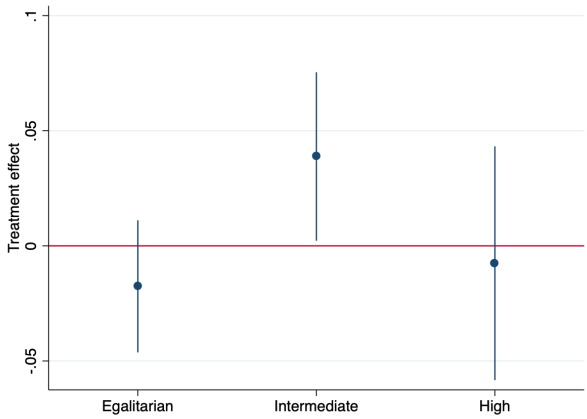
(b) On 6-years subsequent fertility



(c) On fathers' daily childcare and housework time in minutes



(d) On mothers' accumulated earnings in the following 24 months after giving birth



(e) On parents' separation

Note: Each panel shows the coefficients and 95% confidence intervals from three separate RD regressions that estimate the effect of the introduction of paternity leave on: (a) the number of days off taken by fathers after the birth of the reference child, (b) subsequent fertility (an indicator for having had another child in the 6 years following the birth of the reference child), (c) daily minutes of childcare and housework by fathers, (d) earnings of mothers (the coefficients are divided by mean earnings in the respective control group), and (e) parental separation. The data sources are: (a) the Madrid survey, (b) birth certificates, (c) the Time-Use Survey of 2009-2010, (d) Social Security data, and (e) the Labor Force Survey of 2008-10. The sample includes men who had a child in a window around March 2007 of: (a) 12 months, (b) 12 weeks, (c) 28 months, (d) 9 months, and (e) 3 months. We always control for a linear trend in month of birth that is allowed to change after the threshold. Additional controls include: (a) a dummy for first births, marital status of the mother, and mother's and father's age at birth, immigrant and labor market status, and educational attainment, (b) fixed effects for day of the week (of birth), (c) a dummy for first births, marital status of the mother, an indicator for weekdays (vs. weekend), as well as age, educational attainment, migrant status of mother and father, and region fixed effects (d) age and educational attainment of the mother, birth order, and mother's employment status 3 months before the birth of the reference child, and (e) age and education level of the mother, and quarter fixed effects. The sample is split into egalitarian, intermediate, and high wage-gap couples. This classification is based on: (a-c) the difference in age and educational attainment between the partners as shown in Figure II, (d) the age difference and maternal education (see section 4.3.5), and (e) the age and educational attainment of the mother (college education and age 40+ at first childbirth, high school graduates aged 22-39 at first childbirth, and less than high school and <40 at first childbirth OR high school and <27 at first childbirth).

APPENDICES

Appendix A

Details on classification procedure

Here we provide more details on the procedure that we follow to find our classification of couples into low, intermediate, and high wage-gap.

We start with the age difference between the partners. We look for two thresholds (t_1 and t_2) that split our couples into three groups: low, medium, and high age-difference (in favor of the husband). We want to find thresholds such that paternity leave has a significant effect on effective total leave (number of days off from work after childbirth) for the intermediate group, while the corner groups do not react.

We focus on the sample of couples who had a child within 12 months of the policy change (before or after). In this sample, the age difference between the partners ranges from -8 to 23. We set the lowest possible value for the lower threshold (t_1) at the 5^{th} percentile (-3), and the highest possible value for the upper threshold at the 95^{th} percentile (10). We restrict the upper threshold to be higher than the lower one ($t_2 > t_1$). See Figure A1 (Panel A) below for average leave length across different values of the age gap between the partners. Note that average length is highest in couples with a small age gap.

We then run RD regressions for the effect of paternity leave introduction on total leave length for low, medium, and high age-difference couples, where the samples are defined by all possible combinations of t_1 and t_2 that satisfy the restrictions above. Each set of regressions results in three coefficients of interest (β_1, β_2 and β_3), capturing the effect of the reform on leave length for the three groups of couples. We then select the combination of $t_1$and t_2 that leads to the largest difference between β_2 and the other two coefficients.[50] The resulting values of t_1 and t_2 are 2 and 3, leading to the following couple classification: i) Low age difference: < 2 years (50% of the sample); ii) Medium age difference: $[2-3]$ years (22%), and iii) High age difference: > 3 (28% of the sample). The second best classification is $t_1 = 1$ and $t_2 = 2$. The estimated effect of the policy on fathers' leave length is 23 days for intermediate couples based on our age-difference classification, compared with 5 and 3 days in low and high age-gap couples.

We then try to improve on our classification by adding the education dimension. For each couple, we calculate the difference in years of education between the spouses. The

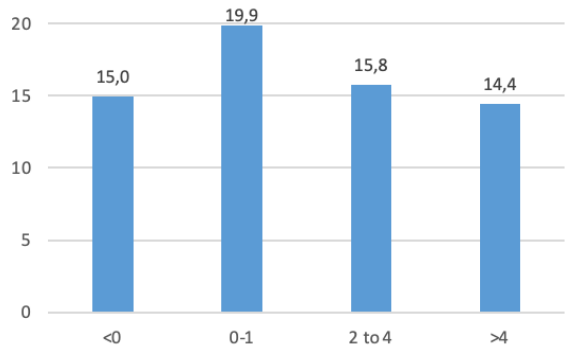
[50]The maximization problem is: $\max \min \{T_1, T_2\}$ whereT_1 and T_2 are the t-statistics of the treatment effect differences between intermediate and low-gap groups and between intermediate and high-gap groups, i.e. $T_1 = \frac{\beta_2 \beta_1}{\sqrt{s.e._2^2 + s.e._1^2}}$ and $T_2 = \frac{\beta_2 \beta_3}{\sqrt{s.e._2^2 + s.e._3^2}}$.

variable ranges from -10 to 8 years (in favor of the husband) in our sample. See Panel B of Figure A1 for average length of leave in couples with different education gaps. We again define two cutoffs, c_1 and c_2, for low, medium, and high education-difference. We restrict c_1 and c_2 to be between -8 and 6 (the 3^{rd} and 97^{th} percentiles), and again $c_2 > c_1$.

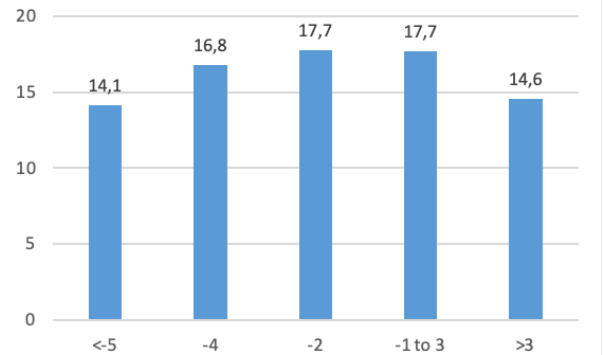
We now look for combinations of the age and education thresholds. Because the selected threshold for the age difference was $(2, 3)$ (followed by $(1, 2)$), we split the age difference space using thresholds 1, 2 and 3, and we look for the "best" thresholds for the education difference for the subsamples of couples with an age difference of $< 1, 1, 2$, and ≥ 3.

Following the same procedure as before,[51] we come up with the education cutoffs for each age-difference range. The resulting combination of age and education thresholds is displayed in Figure Figure II.[52]

Figure A1: Length of paternity leave by age and education gap



Panel A. Average length of paternity leave by age difference between the partners



Panel B. Average length of paternity leave by difference in years of schooling between the partners

Source: Madrid survey, sample of couples who had a child after the introduction of paternity leave in 2007. We include the days of paternity leave plus any other sources of leave taken immediately after the birth of the child.

[51] We run take-up regressions for low, medium, and high education-difference couples (for each given age difference), where the samples are defined by all possible combinations of c_1 and c_2. Each set of regressions results in three coefficients of interest (β_1', β_2' and β_3'), capturing the effect of the reform on leave length for the three groups of couples. We then select the combination of c_1 and c_2 that leads to the largest difference between β_2' and the other two coefficients (for each given age difference: $< 1, 1, 2$, and > 2).

[52] We also conducted the same procedure in reverse order, i.e. starting with the education difference and then adding the age dimension.

Appendix B

B.1 Tables

TABLE B1: Summary of previous studies on the effects of paternity leave

Outcomes	Country	Reform	Empirical design	Average effect
Take-up				
Bartel et al. (2018)	US (California)	2004	DiD	Positive
Cools et al. (2015)	Norway	1992, 1993	DiD	Positive
Dahl et al. (2014)	Norway	1993	RD	Positive
Ekberg et al. (2013)	Sweden	1995	RD	Positive
Patnaik (2019)	Canada	2006	DiD	Positive
Fertility				
Cools et al. (2015)	Norway	1992, 1993	DiD	Zero
Dahl et al. (2014)	Norway	1993	RD	Zero
Hart et al. (2022)	Norway	2009	RD	Zero
Farré and González (2019)	Spain	2007	RD	Negative
Fontenay and Tojerow (2020)	Belgium	2002	RD-DiD	Negative
Cygan-Rehm (2016)	Germany	2007	RD-DiD	Negative
Raute (2019)	Germany	2007	DiD	Positive
Fathers' home production				
Ekberg et al. (2013)	Sweden	1995	RD	Zero
Farré and González (2019)	Spain	2007	RD	Positive
Kotsadam and Finseraas (2011)	Norway	1993	pre-post	Positive
Patnaik (2019)	Canada	2006	DiD	Positive
Wray (2020)	Canada	2006	DiD	Positive
Kluve and Tamm (2013)	Germany	2007	RD	Zero
Schober (2014)	Germany	2007	DiD	Positive
Tamm (2019)	Germany	2007	Father fixed-effects	Positive

TABLE B1 (continued): Summary of previous studies on the effects of paternity leave

Outcomes	Country	Reform	Empirical design	Average effect
Mothers' employment				
Andersen (2018)	Denmark	1989, 1997, 1998, 2002	IV	Positive
Druedahl et al. (2019)	Denmark	1998	DiD	Positive
Cools et al. (2015)	Norway	1992, 1993	DiD	Zero
Dahl et al. (2014)	Norway	1993	RD	Zero
Rege and Solli (2013)	Norway	1993	DiD	Zero
Hart et al. (2022)	Norway	2009	RD	Zero
Patnaik (2019)	Canada	2006	DiD	Positive
Dunatchik and Özcan (2021)	Canada	2006	DiD	Positive
Ekberg et al. (2013)	Sweden	1995	RD	Zero
Farré and González (2019)	Spain	2007	RD	Zero/positive
Tamm (2019)	Germany	2007	Father fixed-effects	Positive
Divorce				
Cools et al. (2015)	Norway	1992, 1993	DiD	Zero
Dahl et al. (2016)	Norway	1993	RD	Zero
Hart et al. (2022)	Norway	2009	RD	Zero
Farré and González (2019)	Spain	2007	RD	Zero
Avdic and Karimi (2018)	Sweden	1995, 2002	RD-DiD	Positive/zero
Margolis et al. (2021)	Canada	2006	DiD	Negative
Olafsson and Steingrimsdottir (2020)	Iceland	2001	RD	Negative

TABLE B2: Balance in covariates, take-up sample

	Full Sample	Egalitarian	Intermediate	High gap
Age gap	-0.838	0.113	-0.036	0.741
	(0.681)	(0.430)	(0.221)	(1.265)
Education gap	-1.049***	-1.405**	-0.039	0.040
	(0.300)	(0.559)	(0.547)	(0.582)
Age of father (at child's birth)	-1.103	-0.533	0.043	-0.444
	(1.060)	(0.835)	(1.685)	(1.912)
Age of mother (at child's birth)	-0.266	-0.646	0.079	-1.185
	(1.011)	(0.826)	(1.740)	(1.718)
High school or more (father)	-0.180***	-0.184*	-0.169	-0.127
	(0.057)	(0.102)	(0.138)	(0.085)
High school or more (mother)	-0.015	0.019	-0.071	-0.134
	(0.030)	(0.064)	(0.114)	(0.113)
Foreign (father)	-0.071*	0.011	-0.130	-0.105
	(0.041)	(0.068)	(0.098)	(0.097)
Foreign (mother)	-0.014	0.031	0.024	-0.060
	(0.043)	(0.046)	(0.112)	(0.101)
Government employee (father)	0.035	0.042	0.031	0.008
	(0.043)	(0.088)	(0.109)	(0.102)
Government employee (mother)	-0.045	-0.017	-0.084	-0.103
	(0.054)	(0.080)	(0.120)	(0.083)
Self-employed (father)	-0.029	-0.011	-0.093	-0.037
	(0.037)	(0.053)	(0.085)	(0.071)
Self-employed (mother)	-0.016	-0.047	-0.004	0.016
	(0.034)	(0.056)	(0.057)	(0.071)
Employed (father)	-0.034*	-0.020	-0.084	-0.044
	(0.019)	(0.026)	(0.066)	(0.048)
Employed (mother)	0.021	-0.011	-0.041	0.028
	(0.060)	(0.069)	(0.118)	(0.121)
Permanent contract (father)	0.013	0.035	0.041	-0.023
	(0.064)	(0.085)	(0.109)	(0.111)
Permanent contract (mother)	0.039	-0.001	0.210*	-0.099
	(0.071)	(0.094)	(0.106)	(0.145)
Married	0.053	0.038	0.159	-0.059
	(0.060)	(0.067)	(0.186)	(0.144)
First born	-0.009	0.038	-0.044	-0.143
	(0.064)	(0.083)	(0.131)	(0.129)
N	724	352	163	209

Sample: Parents with a child born between 18 months before and after March 2007. Madrid survey. Each coefficient comes from a different RD regression, where the dependent variable is the characteristic in the row header, and the main explanatory variable is an indicator for the reference child born after March 2007. We control for a linear trend in month of birth that is allowed to change after the threshold.*** p<0.01, ** p<0.05, * p<0.1.

TABLE B3: Balance in covariates, birth certificates sample

	Full Sample	Egalitarian	Intermediate	High gap
Age gap	-0.022	0.026	0.000	0.052
	(0.047)	(0.042)	(0.012)	(0.078)
Education gap	-0.024	-0.014	-0.052	0.017
	(0.022)	(0.043)	(0.042)	(0.038)
Weekend: birth on	0.062	0.060	0.072	0.058
Saturday or Sunday	(0.123)	(0.122)	(0.122)	(0.125)
N	182 305	79 860	41 984	60 461

Sample: The data source is Spanish birth certificates (Spanish Statistical Institute), 2006-2013. Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variable is shown in the row headers. The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 23, 2007). The sample includes women who had a child 12 weeks before or after March 2007. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see Figure III for details). *** p<0.01, ** p<0.05, * p<0.1

TABLE B4: Balance in covariates, time-use survey (fathers)

	Full Sample	Egalitarian	Intermediate	High gap
Age gap	-0.610	-0.635	-0.316	-0.002
	(0.785)	(0.572)	(0.204)	(1.580)
Education gap	-0.234	-0.238	1.719**	-1.253
	(0.449)	(0.673)	(0.771)	(0.872)
Age (father)	-0.005	0.112	-1.355	-0.095
	(0.759)	(1.062)	(1.718)	(1.353)
Age (mother)	-0.616	-0.523	-1.671	-0.098
	(0.937)	(0.994)	(1.740)	(1.894)
Primary school (father)	-0.057	0.028	-0.129	-0.053
	(0.073)	(0.116)	(0.163)	(0.129)
Secondary school (father)	0.015	0.064	-0.065	-0.018
	(0.072)	(0.102)	(0.172)	(0.133)
College (father)	0.042	-0.092	0.194	0.071
	(0.062)	(0.101)	(0.119)	(0.116)
Primary school (mother)	-0.201***	-0.343***	-0.157	0.043
	(0.068)	0.104)	(0.155)	(0.129)
Secondary school (mother)	0.007	0.057	0.060	-0.059
	(0.074)	(0.116)	(0.167)	(0.124)
College (mother)	0.043	-0.040	-0.137	0.213**
	(0.065)	0.110)	(0.145)	(0.101)
Foreign (father)	-0.068	-0.077	0.053	-0.115
	(0.053)	(0.073)	(0.111)	(0.105)
Foreign (mother)	-0.058	-0.015	0.011	-0.086
	(0.056)	(0.076)	(0.113)	(0.112)
Married	-0.012	0.035	-0.065	-0.032
	(0.044)	(0.067)	(0.095)	(0.082)
Workday	-0.001	0.080	-0.320*	0.172
	(0.075)	(0.117)	(0.164)	(0.134)
First born	0.026	-0.113	0.145	0.093
	(0.071)	(0.105)	(0.148)	(0.136)
N	730	345	160	224

Note: The data source is the Spanish Time-Use Survey of 2009-10. Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variable is shown in the row header. The main explanatory variable is an indicator for the reference child being born after March 2007. We control for a linear trend in month of birth that is allowed to change after the threshold. The sample includes men living in a couple at the time of the survey who had a child up to 28 months before or after March 2007. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see Fig. III for details).

*** p<0.01, ** p<0.05, * p<0.1.

TABLE B5: Balance in covariates, maternal employment and earnings sample

	Full Sample	Egalitarian	Intermediate	High gap
Age gap	0.180	0.107	0.011	0.312
	(0.190)	(0.195)	(0.122)	(0.276)
Education of mother (1–4)	-0.005	0.022	0.010	-0.024
	(0.036)	(0.062)	(0.085)	(0.025)
Age of mother	0.176	-0.044	0.205	0.233
	(0.198)	(0.300)	(0.429)	(0.263)
Number of children	0.024	0.105*	-0.082	0.013
	(0.033)	(0.057)	(0.085)	(0.044)
Employment after 3 m	-0.001	0.004	-0.007	-0.004
	(0.019)	(0.025)	(0.040)	(0.025)
Permanent employment after 3 m	0.000	0.001	-0.073	0.012
	(0.020)	(0.034)	(0.053)	(0.026)
Public employment after 3 m	0.003	0.051	-0.029	-0.012
	(0.012)	(0.031)	(0.047)	(0.011)
High education level	-0.007	-0.028	-0.006	0.000
	(0.012)	(0.033)	(0.045)	(0.007)
Medium high education level	0.004	0.001	0.049	-0.003
	(0.014)	(0.032)	(0.049)	(0.014)
Medium low education level	0.008	0.009	-0.050	0.020
	(0.020)	(0.040)	(0.058)	(0.026)
Low education level	-0.005	0.018	0.008	-0.016
	(0.017)	(0.011)	(0.016)	(0.025)
N	10 317	2 561	1 225	6 531

Note: The data source is Spanish Social Security data (2015 sample). Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variables is indicated in row headers. The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 2007). The sample includes women who had a child 6 months before or after March 2007. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the difference in age and educational attainment between the partners (see Figure III for details). *** p<0.01, ** p<0.05, * p<0.1

TABLE B6: Balance in covariates, Labor Force Survey (parental separation)

	Full Sample	Egalitarian	Intermediate	High gap
Age of mother (first child's birth)	-0.520***	0.169	-0.251	-0.821***
	(0.170)	(0.242)	(0.234)	(0.310)
Education of mother (0–4)	-0.077*	0.051	0.064**	-0.014
	(0.046)	(0.042)	(0.028)	(0.027)
Age of the child	-0.017	-0.118**	-0.017	0.096*
	(0.031)	(0.051)	(0.055)	(0.054)
N. of children	-0.133***	-0.180***	-0.158***	-0.065
	(0.026)	(0.045)	(0.039)	(0.049)
N	15 741	5 222	4 916	5 333

Sample: The data source is the Spanish Labor Force Survey (2008-10). Each coefficient comes from a different regression. Robust standard errors are shown in parentheses. The dependent variable is indicated in row headers. The main explanatory variable is an indicator for paternity leave eligibility (reference child born after March 2007). The sample includes women who had a child within 5 months before or after March 2007. The full sample is split into egalitarian, intermediate, and high wage-gap couples based on the age and educational attainment of the mother (see Figure III).

*** p<0.01, ** p<0.05, * p<0.1.

Appendix C: Proofs

C.1 Optimization of the problems

Outside Option

Proof. The husband solves the maximization problem:

$$\max_{t_m,\tau} U_m = \log c_m + \alpha \log n$$
$$\textbf{s.t. } c_m = w_m(1 - t_m),$$

with $\tau + t_m \leq 1$, $t_m \geq 0$, $\tau \in [0; \bar{\tau}]$, while the wife solves the maximization problem:

$$\max_{t_f} U_f = \log c_f + \alpha \log n$$
$$\textbf{s.t. } c_f = w_f(1 - t_f),$$

with $0 \leq t_f \leq 1$.

Given the log-linear form of utility, wage does not influence the optimal decisions of spouses in t_i (or τ, for husband).

$$U_i = \ln(w_i(1 - t_i)) + \alpha * \ln(\tau + t_i + t_{-i}) = \ln(w_i) + \ln(1 - t_i) + \alpha * \ln(\tau + t_i + t_{-i})$$

Thus, spouses will choose symmetric responses. Only the time constraint involves τ, as we assume that monetary compensation is full: $t_m + \tau \leq 1$. Husband's utility strictly increases in τ:

$$U_m = \ln(w_m(1 - t_m)) + \alpha * \ln(\tau + t_m + t_f)$$

Whenever $t_m < 1$, paternity leave take-up is full. If $t_m + \bar{\tau} < 1$, full take-up is trivially optimal, as the constraint is not binding. If $t_m < 1$, but $t_m + \bar{\tau} \geq 1$, it is optimal to set $t_m = 1 - \bar{\tau}$, as paternity leave offers the same amount of time for housework, without a reduction in husband's consumption.

$\forall \tau$ the interior best response in t_i is:

$$t_i = \frac{\alpha - \tau - t_{-i}}{1 + \alpha}$$

From symmetry we obtain:

$$t_i = \frac{\alpha - \tau}{2 + \alpha} < 1$$

Therefore, as it is never optimal for husband to allocate $t_m = 1$ for housework, so that the take-up of paternity leave will be full, and we obtain:

$$t_i = \frac{\alpha - \bar{\tau}}{2 + \alpha}$$

Next, we compare this interior solution with possible corner cases.

$$t_m = t_f = 0$$
$$U_i^O = \ln\left(w_i \frac{\bar{\tau}+2}{\alpha+2}\right) + \alpha * \ln\left(\frac{\alpha(\bar{\tau}+2)}{\alpha+2}\right) > \ln(w_i) + \alpha * \ln(\bar{\tau}) = U_i(t_m = 0; t_f = 0)$$
$$\left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{\alpha+1} \left(\frac{\alpha}{\bar{\tau}}\right)^{\alpha} > 1$$

The condition holds, provided that $\alpha > \bar{\tau}$.

$$t_m = t_f = 1$$
$$U_i^O = \ln\left(w_i \frac{\bar{\tau}+2}{\alpha+2}\right) + \alpha * \ln\left(\frac{\alpha(\bar{\tau}+2)}{\alpha+2}\right) > \ln(w_i * 0) + \alpha * \ln(2) = -\infty = U_i(t_m = 1; t_f = 1)$$

It is never optimal to allocate zero time on labor market work.

Therefore, under the assumption of $\alpha > \bar{\tau}$, we obtain the solution:

$$t_i = \frac{\alpha - \bar{\tau}}{2 + \alpha}$$
$$\tau = \bar{\tau}$$
$$c_i = w_i(1 - t_i) = w_i \frac{\bar{\tau}+2}{\alpha+2}$$
$$n = t_m + t_f + \bar{\tau} = \frac{\alpha(\bar{\tau}+2)}{\alpha+2}$$
$$U_i^O = \ln\left(w_i \frac{\bar{\tau}+2}{\alpha+2}\right) + \alpha \ln\left(\frac{\alpha(\bar{\tau}+2)}{\alpha+2}\right)$$

■

Cooperation

Proof. The cooperative problem of a household is given by:

$$\max_{t_m, t_f, \tau} \theta U_f + (1-\theta) U_m = \theta \ln(c_f) + (1-\theta) \ln(c_m) + \alpha \ln(n)$$
$$\textbf{s.t. } c_m + c_f = w_f(1 - t_f) + w_m(1 - t_m),$$

with $\tau + t_m \leq 1$, $t_m \geq 0$, $\tau \in [0; \bar{\tau}]$ and $0 \leq t_f \leq 1$.

First we derive optimal division of budget between c_f & c_m. From first order condition we obtain:

$$\frac{\theta}{c_f} - \lambda * B = 0$$
$$\frac{1-\theta}{c_m} - \lambda * B = 0$$
$$\theta c_m = (1-\theta) c_f,$$

where λ is the respective Lagrange multiplier. In any solution $c_f = \theta B$ and $c_m = (1-\theta)B$.

Further, as W strictly increases in τ, whenever $t_m < 1$, paternity leave take-up will be full. If $t_m + \bar{\tau} < 1$, full take-up is trivially optimal, as the constraint is not binding. If $t_m < 1$, but $t_m + \bar{\tau} \geq 1$, it is optimal to set $t_m = 1 - \bar{\tau}$, as paternity leave offers the same amount of time for housework, without a reduction in husband's consumption.

Interior solution for t_i is:

$$t_i = \frac{\alpha - \tau - t_{-i}}{1+\alpha} + \frac{w_{-i}}{w_i}(1 - t_{-i})\frac{\alpha}{1+\alpha}$$

Both spouses cannot choose such solution, this case fails to satisfy the time constraint:

$$w_i > w_{-i}$$
$$t_i = \frac{w_{-i}(\tau+1) + w_i}{w_i - w_{-i}} > 1$$
$$w_{-i}(\tau + 2) > 0$$

Now we consider the remaining cases and discuss the assumptions on parameters are necessary to leave out all cases but 2: with partial specialization (the wife combines child-raising and working) and with full specialization (the wife spends her full unit time on raising children). In both cases the husband works full-time and allocates only his paternity leave to raising children.

The partial specialization case:

$$t_m = 0$$
$$t_f = \frac{\alpha - \bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha}$$
$$W_{partial} = \theta \ln\left(\theta * \left(w_m + \left(\frac{1 - \alpha\omega + \bar{\tau}}{1+\alpha}\right) w_f\right)\right) +$$
$$+(1-\theta)\ln\left((1-\theta)\left(w_m + \left(\frac{1-\alpha\omega+\bar{\tau}}{1+\alpha}\right)w_f\right)\right) + \alpha\ln\left(\alpha\frac{1+\bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha}\right),$$

where ω denotes w_m/w_f. The full specialization case is:

$$t_m = 0$$
$$t_f = 1$$
$$W_{corner} = \theta \ln(\theta * w_m) + (1-\theta)\ln((1-\theta) * w_m) + \alpha \ln(\bar{\tau} + 1)$$

For every solution where $t_f > t_m$ there exists symmetric solution where $t_m > t_f$, which is more preferable under certain assumptions, due to an increase in budget size. Consider symmetric solution to the partial specialization case:

$$t_f = 0$$
$$t_m = \frac{\alpha - \bar{\tau}}{1+\alpha} + \frac{1}{\omega}\frac{\alpha}{1+\alpha}$$
$$W = \theta \ln\left(\theta * \left(w_f + \left(\frac{1 - \frac{\alpha}{\omega} + \bar{\tau}}{1+\alpha}\right) w_m\right)\right) +$$
$$+(1-\theta)\ln\left((1-\theta) * \left(w_f + \left(\frac{1 - \frac{\alpha}{\omega} + \bar{\tau}}{1+\alpha}\right) w_m\right)\right) +$$
$$+\alpha \ln\left(\bar{\tau} + \frac{\alpha - \bar{\tau}}{1+\alpha} + \frac{1}{\omega}\frac{\alpha}{1+\alpha}\right)$$

Directly comparing the joint utilities, we obtain the condition when it is preferable for husband, not wife, to work full-time:

$$\ln\left(\frac{\omega + 1 + \bar{\tau}}{\omega(1+\bar{\tau}) + 1}\right) > \alpha \ln\left(\frac{\bar{\tau} + 1 + 1/\omega}{\omega + 1 + \bar{\tau}}\right)$$
$$(\omega + 1 + \bar{\tau})^{1+\alpha} > \omega^{-\alpha}(\omega(1+\bar{\tau}) + 1)^{1+\alpha}$$
$$\omega^{\alpha/(\alpha+1)}(\omega + 1 + \bar{\tau}) - \omega(1+\bar{\tau}) > 1$$

Note that the expression on the left hand strictly increases in ω. At $\omega = 1$ we have $\omega^{\alpha/(\alpha+1)}(\omega + 1 + \bar{\tau}) - \omega(1+\bar{\tau}) = 1$, therefore, for any $\omega > 1$ in partial specialization case it is optimal for a husband, to work full-time, for any $\omega < 1$ – for a wife. Hence, we assume $\omega \in (1, +\infty)$.

Next, full specialization case ($t_f = 1, t_m = 0$) is preferable over the following symmetric solution for $\omega > 1$:

$$t_f = 0$$
$$t_m = 1$$
$$W = \theta \ln(\theta * w_f) + (1-\theta)\ln((1-\theta) * w_f) + 0$$

Comparing the full specialization cases, it is optimal for a husband to work full-time when:

$$\omega > \left(\frac{1}{\bar{\tau}+1}\right)^{\alpha}$$

As $\left(\frac{1}{\bar{\tau}+1}\right)^{\alpha} \leq 1$, solution $t_f = 0; t_m = 1$ is never optimal for $\omega > 1$.

Further, we prove that $t_m = 0$, $t_f = \frac{\alpha-\bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha}$ is preferred over $t_m = 0$, $t_f = 1$ when it is available: $\frac{\alpha-\bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha} < 1$[53].

$$W_{interior} = \theta \ln\left[\frac{\theta}{1+\alpha}\left(w_m + w_f(1+\bar{\tau})\right)\right] +$$
$$+(1-\theta)\ln\left[\frac{1-\theta}{1+\alpha}(w_m + w_f(1+\bar{\tau}))\right] + \alpha\ln\left[\frac{\alpha}{1+\alpha}\left(1+\bar{\tau}+\frac{w_m}{w_f}\right)\right]$$
$$W_{corner} = \theta\ln[\theta(w_m)] + (1-\theta)\ln[(1-\theta)(w_m)] + \alpha\ln(\bar{\tau}+1)$$
$$\left(\frac{\omega+\bar{\tau}+1}{\alpha+1}\right)^{\alpha+1} - \frac{\omega(\bar{\tau}+1)^{\alpha}}{\alpha^{\alpha}} \geq 0$$

Keeping other parameters fixed, we can obtain ω such that the left side of inequality reaches its minimum, and then check whether inequality holds even at this, conservative, point:

FOC:

$$\left(\frac{\omega+\bar{\tau}+1}{\alpha+1}\right)^{\alpha} - \frac{(\bar{\tau}+1)^{\alpha}}{\alpha^{\alpha}} = 0$$
$$\omega = \frac{(\bar{\tau}+1)(\alpha+1)}{\alpha} - (1+\bar{\tau}) = \frac{1+\bar{\tau}}{\alpha}$$

Second order condition shows that we have obtained minimum. The left side of inequality value is then:

$$\left(\frac{\omega+\bar{\tau}+1}{\alpha+1}\right)^{\alpha+1} - \frac{\omega(\bar{\tau}+1)^{\alpha}}{\alpha^{\alpha}} \geq \left(\frac{(\bar{\tau}+1)}{\alpha}\right)^{\alpha+1} - \frac{((\alpha+1)/\alpha-1)(\bar{\tau}+1)^{\alpha+1}}{\alpha^{\alpha}} = 0$$

Next, we rule out the case in which spouses do not allocate any time for child care, apart from the paternity leave.

$$t_f = t_m = 0$$
$$W = \theta\ln(\theta * (w_m + w_f)) + (1-\theta)\ln((1-\theta) * (w_m + w_f)) + \alpha\ln(\bar{\tau})$$

This solution is trivially non-optimal if $\bar{\tau} = 0$. If $\bar{\tau} > 0$ we compare it to the cases of partial and full specialization.

[53]The condition $t_f > 0$ can be expressed as $\alpha(1+\omega) > \bar{\tau}$ and satisfied, following $\alpha > \bar{\tau}$ and $\omega > 1$.

As we have shown, $W_{interior} > W_{corner}$, if and only if, $\omega > (1+\bar{\tau})/\alpha$.

First we compare $t_f = t_m = 0$ with the interior solution which is always preferred:

$$W_{interior} > \theta \ln(\theta * (w_m + w_f)) + (1-\theta)\ln((1-\theta) * (w_m + w_f)) + \alpha \ln(\bar{\tau})$$
$$\ln\left(\frac{\omega + (1+\bar{\tau})}{(\omega+1)(1+\alpha)}\right) > \alpha \ln\left(\frac{\bar{\tau}(1+\alpha)}{\alpha(1+\bar{\tau}) + \omega\alpha}\right)$$
$$\alpha^\alpha(\omega + 1 + \bar{\tau})^{\alpha+1} - (\alpha+1)^{\alpha+1}\bar{\tau}^\alpha(\omega+1) > 0$$

The left side of the inequality strictly increases in ω and strictly decreases in $\bar{\tau}$, hence it is sufficient to evaluate the inequality at a corner values: $\omega = 1$, $\bar{\tau} = \alpha$ to prove that inequality holds in general. We obtain:

$$\alpha^\alpha((2+\alpha)^{\alpha+1} - 2(\alpha+1)^{\alpha+1}) > 0$$
$$\left(\frac{\alpha+2}{\alpha+1}\right)^{\alpha+1} > 2$$

The left side strictly increases for positive α and is equal to 2 at $\alpha = 0$. Therefore, a couple will always prefer partial specialization over allocating only $\bar{\tau}$ for children. Now, we consider $\omega > (\bar{\tau}+1)/\alpha$, so that partial specialization case is not available and show that a couple prefers corner specialization case over $t_m = t_f = 0$:

$$W_{corner} > \theta \ln(\theta * (w_m + w_f)) + (1-\theta)\ln((1-\theta) * (w_m + w_f)) + \alpha \ln(\bar{\tau})$$
$$\ln\left(\frac{w_m}{w_m + w_f}\right) + \alpha \ln\left(\frac{\bar{\tau}+1}{\bar{\tau}}\right) > 0$$
$$\alpha > \frac{\ln(1 + 1/\omega)}{\ln(\frac{\bar{\tau}+1}{\bar{\tau}})}$$

The right side of the inequality strictly decreases in ω and in order to show that the inequality holds, we evaluate it at a $\omega = (1+\bar{\tau})/\alpha$.

$$\alpha - \frac{\ln(1 + \frac{\alpha}{1+\bar{\tau}})}{\ln(1 + \frac{1}{\bar{\tau}})} > 0$$

The left side of the expression strictly decreases in $\bar{\tau}$. Following the assumption $\alpha > \bar{\tau}$, we evaluate it at the $\bar{\tau} = \alpha$:

$$\alpha - \frac{\ln(\frac{1+2\alpha}{1+\alpha})}{\ln(\frac{1+\alpha}{\alpha})} > 0$$

The expression on the left side strictly increases when $\alpha > 0$ and equals 0 only if $\alpha = 0$.

Thus, we have shown that the solution $t_m = t_f = 0$ can never be optimal if $\alpha > \bar{\tau}$ and $\omega > 1$.

Next, we evaluate the remaining cases. The solution where spouses spend all the time at home is trivially non-optimal:

$$t_f = t_m = 1$$
$$W = -\infty$$

The following solution is not feasible if we assume $\alpha < 1 + \bar{\tau}$:

$$t_m = \frac{\alpha - \bar{\tau} - 1}{\alpha + 1} < 0$$
$$t_f = 1$$
$$W = \theta \ln\left(\theta \frac{2 - \bar{\tau}}{1 + \alpha} w_m\right) + (1 - \theta) \ln\left((1 - \theta) \frac{2 - \bar{\tau}}{1 + \alpha} w_m\right) + \alpha \ln\left(\frac{2\alpha - \bar{\tau}}{\alpha + 1}\right)$$

The following solution is feasible only for $\alpha > 1$. We assumed $\alpha < 1 + \bar{\tau}$ and this solution then is not optimal:

$$t_f = \frac{\alpha - 1}{\alpha + 1}$$
$$t_m = 1$$
$$W = \theta \ln\left(\theta * \frac{2w_f}{\alpha + 1}\right) + (1 - \theta) \ln\left((1 - \theta) * \frac{2w_f}{\alpha + 1}\right) + \alpha \ln\left(\frac{2\alpha}{\alpha + 1}\right) <$$
$$< \theta \ln(\theta * w_m) + (1 - \theta) \ln((1 - \theta) * w_m) + \alpha \ln(\bar{\tau} + 1) = W(t_f = 1; t_m = 0)$$

Simplifying, we get the condition on ω which is satisfied under $\omega > 1$:

$$\omega > 1 > \left(\frac{\alpha}{\bar{\tau} + 1}\right)^{\alpha} \left(\frac{2}{\alpha + 1}\right)^{\alpha + 1}$$
$$1 - \left(\frac{\alpha}{\bar{\tau} + 1}\right)^{\alpha} \left(\frac{2}{\alpha + 1}\right)^{\alpha + 1} > 0$$

The left side strictly increases in α. We evaluate it at $\alpha = 1$ as for lower α the solution is not feasible.

$$1 - \left(\frac{1}{\bar{\tau} + 1}\right) > 0$$
$$\bar{\tau} > 0$$

If $\omega > 1$ and $\alpha < 1 + \bar{\tau}$, this solution is not optimal.

We conclude that only 2 cooperative cases remain, under $\omega > 1$ and $\bar{\tau} < \alpha < 1 +$

$\bar{\tau}$. Further, the partial specialization case is optimal, when feasible. Thus the following holds:

$$t_m = 0$$
$$\tau = \bar{\tau}$$
$$t_f = \min[\frac{\alpha - \bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha}; 1]$$
$$n = t_f + \bar{\tau},$$

$$U_f^C = \begin{cases} \ln\left[\frac{\theta}{1+\alpha}[w_m + w_f(1+\bar{\tau})]\right] + \alpha \ln\left[\frac{\alpha}{1+\alpha}(1+\bar{\tau}+\omega)\right], t_f < 1 \\ \ln[\theta(w_m)] + \alpha \ln(\bar{\tau}+1), t_f = 1 \end{cases}$$

$$U_m^C = \begin{cases} \ln\left[\frac{1-\theta}{1+\alpha}[w_m + w_f(1+\bar{\tau})]\right] + \alpha \ln\left[\frac{\alpha}{1+\alpha}(1+\bar{\tau}+\omega)\right], t_f < 1 \\ \ln[(1-\theta)(w_m)] + \alpha \ln(\bar{\tau}+1), t_f = 1 \end{cases}$$

■

C.2 Proofs of propositions and lemmas

Proposition. *1 Under cooperation spouses specialize. If $\omega < \bar{\omega}$, the wife works part time. Alternatively, if $\omega \geq \bar{\omega}$, the wife raises kids full time.*

Proof. Previously we have derived the optimal choice in t_f:

$$t_f = \min[\frac{\alpha - \bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha}; 1]$$

We have $\alpha/(1+\alpha) > 0$, therefore, wife gradually increases time allocated on housework, if household's ω increases, keeping other parameter fixed. Wife allocates the whole time to child care at $\omega = \bar{\omega}$:

$$\frac{\alpha - \bar{\tau}}{1+\alpha} + \omega\frac{\alpha}{1+\alpha} = 1$$
$$\bar{\omega} = \frac{\bar{\tau}+1}{\alpha} > 1$$

■

Assumption.1 $\theta < \bar{\theta}$, where $\bar{\theta} = \left(\frac{\alpha(\bar{\tau}+2)}{(\alpha+2)(\bar{\tau}+1)}\right)^{1+\alpha}$.

Lemma.1 *Under Assumption 1, there exists a threshold level of the wage gap between the spouses, ω^*, such that*

- *the woman chooses her outside option for* $\omega < \omega^*$
- *the woman chooses to cooperate by fully specializing in raising children for* $\omega \geq \omega^*$

Proof. Couples choose full specialization case over partial specialization if their $\omega > \bar{\omega}$, as shown in Proposition 1. Lemma 1 states that couples in full specialization actually cooperate if $\omega > \omega^*$ (as we should prove now). Therefore, if $\bar{\omega} < \omega^*$, all couples in the economy either specialize fully or choose the outside option.

$$\bar{\omega} < \omega^*$$
$$\frac{\bar{\tau}+1}{\alpha} < \left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{1+\alpha}\left(\frac{\alpha}{\bar{\tau}+1}\right)^{\alpha}\frac{1}{\theta}$$
$$\theta < \left(\frac{\alpha(\bar{\tau}+2)}{(\alpha+2)(\bar{\tau}+1)}\right)^{1+\alpha}$$

Wife from a household with partial specialization would prefer not to cooperate if her utility from the outside option is larger:

$$\ln\left[w_f\frac{\bar{\tau}+2}{\alpha+2}\right] + \alpha * \ln\left[\frac{2\alpha+\bar{\tau}*\alpha}{\alpha+2}\right] > \ln\left[\frac{\theta}{1+\alpha}[w_m + w_f(1+\bar{\tau})]\right] +$$
$$+\alpha\ln\left[\frac{\alpha}{1+\alpha}(1+\bar{\tau}+w_m/w_f)\right]$$
$$\omega < \frac{(\alpha+1)(\bar{\tau}+2)}{(\alpha+2)\theta^{\frac{1}{\alpha+1}}} - (1+\bar{\tau})$$

$$\frac{(\alpha+1)(\bar{\tau}+2)}{(\alpha+2)\theta^{\frac{1}{\alpha+1}}} - (1+\bar{\tau}) > \frac{\bar{\tau}+1}{\alpha}$$
$$\theta < \left(\frac{\alpha(\bar{\tau}+2)}{(\alpha+2)(\bar{\tau}+1)}\right)^{1+\alpha}$$

So, we need to assume that $\theta < \left(\frac{\alpha(\bar{\tau}+2)}{(\alpha+2)(\bar{\tau}+1)}\right)^{1+\alpha}$. Under this assumption, households will never specialize partially in the economy. So, it remains to prove that when $\omega < \omega^*$, wife will prefer not to cooperate, following the definition of ω^* and strict monotonicity of the utilities' difference in ω and when $\omega \geq \omega^*$, wife will prefer to fully specialize on a housework.

In the full specialization case wife obtains:

$$U_f^C = \ln[\theta(w_m)] + \alpha\ln(\bar{\tau}+1)$$

While in the outside option her utility equals:

$$U_f^O = \ln\left[w_f\left(\frac{\bar{\tau}+2}{\alpha+2}\right)\right] + \alpha * \ln\left[\frac{2\alpha+\bar{\tau}*\alpha}{\alpha+2}\right]$$

$$U_f^C - U_f^O = \ln(\omega) + \ln\left[\theta\frac{\alpha+2}{\bar{\tau}+2}\right] + \alpha\ln\left(\frac{(\bar{\tau}+1)(\alpha+2)}{(\bar{\tau}+2)\alpha}\right)$$

We derive the formula for ω^* directly from equalizing the utilities:

$$\omega^* = \left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{1+\alpha}\left(\frac{\alpha}{\bar{\tau}+1}\right)^{\alpha}\frac{1}{\theta}$$

This wage gap is defined uniquely: $U_f^C - U_f^O$ strictly increases in ω, and $\bar{\omega} > 1$. ■

Proposition. *2 The couple chooses the non-cooperative outside option if $\omega < \omega^*$, and chooses to cooperate (specialize) otherwise.*

Proof. Following the result of Lemma 1, we only need to prove that husband agrees to cooperate when $\omega > \omega^*$ (as wife agrees to cooperate in this case). When $\omega < \omega^*$, wife chooses the outside option. Therefore, spouses do not cooperate.

It suffices to compare husband's utility in outside option and in full specialization, as we showed that wife will never agree to cooperate with a part-time housework.

$$U_m^C = \ln((1-\theta)w_m) + \alpha\ln(\bar{\tau}+1)$$
$$U_m^O = \ln\left(w_m\frac{\bar{\tau}+2}{\alpha+2}\right) + \alpha * \ln\left(\frac{2\alpha+\bar{\tau}*\alpha}{\alpha+2}\right)$$

Difference of utilities is independent from wages:

$$U_m^C - U_m^O = \ln\left((1-\theta)\frac{\alpha+2}{\bar{\tau}+2}\right) + \alpha\ln\left(\frac{(\bar{\tau}+1)(\alpha+2)}{(\bar{\tau}+2)\alpha}\right)$$

Husband will agree to cooperate $\forall\omega > 1$ when:

$$\ln\left((1-\theta)\frac{\alpha+2}{\bar{\tau}+2}\right) + \alpha\ln\left(\frac{(\bar{\tau}+1)(\alpha+2)}{(\bar{\tau}+2)\alpha}\right) > 0$$
$$\theta < 1 - \left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{\alpha+1}\left(\frac{\alpha}{\bar{\tau}+1}\right)^{\alpha}$$

Finally, this condition is satisfied under the assumption 1:

$$\left(\frac{\alpha(\bar{\tau}+2)}{(\alpha+2)(\bar{\tau}+1)}\right)^{1+\alpha} < 1 - \left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{\alpha+1} (\frac{\alpha}{\bar{\tau}+1})^{\alpha}$$
$$\left(\frac{\alpha}{\bar{\tau}+1}\right)^{\alpha} * \left(\frac{\bar{\tau}+2}{\alpha+2}\right)^{\alpha+1} \left(\frac{\alpha}{\bar{\tau}+1}+1\right) < 1$$
$$\alpha + 1 < \frac{[(\bar{\tau}+1)(\alpha+2)]^{\alpha+1}}{(\bar{\tau}+2)^{\alpha+1}\alpha^{\alpha}} - \bar{\tau}$$

Following previously introduced assumption $\alpha > \bar{\tau}$ we can notice that the right side of inequality strictly decreases in $\bar{\tau}$. Therefore, if the inequality holds with $\bar{\tau} = \alpha$ it holds $\forall\bar{\tau}$. We obtain the inequality which holds for $\forall\alpha > 0$:

$$(\alpha+1)^{\alpha+1} - 2\alpha^{\alpha+1} - \alpha^{\alpha} > 0$$

Therefore, husband agrees to cooperate under the assumption 1. ■

Proposition. *3 An increase in paternity leave increases the fraction of couples choosing the outside option. Formally,* $\frac{\partial\omega^*}{\partial\bar{\tau}} > 0$.

Proof.

$$\omega^* = \left(\frac{\bar{\tau}+2}{2+\alpha}\right)^{1+\alpha} \left(\frac{\alpha}{1+\bar{\tau}}\right)^{\alpha} \frac{1}{\theta}$$
$$\frac{\partial\omega^*}{\partial\bar{\tau}} = \frac{\alpha+1}{\alpha+2}\left(\frac{\bar{\tau}+2}{2+\alpha}\right)^{\alpha} * \left(\frac{\alpha}{1+\bar{\tau}}\right)^{\alpha} \frac{1}{\theta} + \left(\frac{\bar{\tau}+2}{2+\alpha}\right)^{1+\alpha} * \left(-\frac{1}{\theta}\right) * \left(\frac{\alpha}{1+\bar{\tau}}\right)^{\alpha+1} =$$
$$= \frac{1}{\theta} * \frac{(\bar{\tau}+2)^{\alpha}}{(2+\alpha)^{\alpha+1}} * \left(\frac{\alpha}{1+\bar{\tau}}\right)^{\alpha} *$$
$$* \left[\alpha + 1 - \frac{\alpha(\bar{\tau}+2)}{\bar{\tau}+1}\right]$$

As we concentrate on a sign of the derivative, we can continue with expression in square brackets and conclude:

$$\alpha + 1 - (\bar{\tau}+2) * \frac{\alpha}{\bar{\tau}+1} = 1 - \alpha * \left(\frac{1}{\bar{\tau}+1}\right) > 0$$

Hence, if $\alpha < \bar{\tau} + 1$, paternity leave introduction leads to the increase in ω^*.

However, we note that $\frac{\partial\bar{\omega}}{\partial\bar{\tau}} = \frac{1}{\alpha} > \frac{\partial\omega^*}{\partial\bar{\tau}}$ if θ is close to the assumed upper bound $\bar{\theta}$. To

show this, we plug in the formula for $\bar{\theta}$:

$$\frac{\partial \omega^*}{\partial \bar{\tau}}(\bar{\theta}) = \frac{1-\alpha+\bar{\tau}}{\alpha(\bar{\tau}+2)} < \frac{1}{\alpha}$$
$$1-\alpha+\bar{\tau} < \bar{\tau}+2$$

Clearly, if $\theta \to 0$, then we have $\frac{\partial \bar{\omega}}{\partial \bar{\tau}} < \frac{\partial \omega^*}{\partial \bar{\tau}}$ as $\frac{1}{\theta} \to \infty$. ■

Proposition. *4 For intermediate wage-gap couples, an expansion in paternity leave leads to:*
(i) An increase in fathers' time at home (beyond the paternity leave period),
(ii) a reduction in fertility,
(iii) an increase in women's employment at the expense of childcare time, and
(iv) an increase in men's childcare time at the expense of their employment.

Proof. We assume that paternity leave increases from $\bar{\tau}^0$ to $\bar{\tau}^1$ and denote $\bar{\tau}^1 - \bar{\tau}^0$ as $\Delta\tau$. Before the paternity leave increase the entire population have consisted of two groups: either in the outside option or in the cooperation with full specialization.

1. In Outside option: $t_i = \frac{\alpha-\bar{\tau}^0}{2+\alpha}$, $l_m = 1 - t_m - \bar{\tau}^0 = \frac{2+\bar{\tau}^0-(2+\alpha)\bar{\tau}^0}{2+\alpha}$, $l_f = 1 - t_f = \frac{2+\bar{\tau}^0}{2+\alpha}$, $n = 2 * \frac{\alpha-\bar{\tau}^0}{2+\alpha} + \bar{\tau}^0 = \alpha\frac{\bar{\tau}^0+2}{\alpha+2}$
2. In corner solution: $t_m = 0$, $t_f = 1$, $l_m = 1 - \bar{\tau}^0$, $l_f = 0$, $n = 1 + \bar{\tau}^0$

Following Proposition 3, paternity leave increase moves some couples from cooperation to the outside option. Now we calculate directly how time allocation and fertility changes in every group:

1. In Egalitarian:
$$\Delta t_m = \Delta t_f = -\frac{\Delta\tau}{\alpha+2} < 0$$
$$\Delta l_m = -\Delta\tau\frac{\alpha+1}{\alpha+2} < 0$$
$$\Delta l_f = -\Delta t_f = \frac{\Delta\tau}{2+\alpha} > 0$$
$$\Delta n = \Delta\tau\frac{\alpha}{\alpha+2} > 0$$
2. In High-gap:
$$\Delta t_m = \Delta t_f = 0$$
$$\Delta l_m = -\Delta\tau < 0$$
$$\Delta l_f = 0$$
$$\Delta n = \Delta\tau > 0$$

3. In Intermediate group (here we use the assumption $\alpha > \bar{\tau}^1$):

$$\Delta t_m = \frac{\alpha - \bar{\tau}^0 - \Delta\tau}{2+\alpha} > 0$$
$$\Delta t_f = -\frac{2 + \bar{\tau}^0 + \Delta\tau}{2+\alpha} < 0$$
$$\Delta l_m = -\Delta\tau - \frac{\alpha - \bar{\tau}^0 - \Delta\tau}{2+\alpha} = \frac{\bar{\tau}^0 - \alpha - \Delta\tau(\alpha+1)}{2+\alpha} < 0$$
$$\Delta l_f = \frac{2 + \bar{\tau}^0 + \Delta\tau}{2+\alpha} = \frac{2 + \bar{\tau}^0 + \Delta\tau}{2+\alpha} > 0$$
$$\Delta n = \Delta\tau + \frac{\alpha - \bar{\tau}^0 - \Delta\tau}{2+\alpha} - \frac{2 + \bar{\tau}^0 + \Delta\tau}{2+\alpha} = \frac{(\Delta\tau+1)\alpha - 2(\bar{\tau}^0+1)}{2+\alpha} < 0$$

Once we have established effects in the 3 groups, we might conjecture which will be the largest. We assume that both $\bar{\tau}^0$ & $\Delta\tau$ are close to 0, in order to assess effect sizes apart from these variables. Then, we have that in Egalitarian and High-gap groups changes in t_i, l_i, n approach 0, while in Intermediate we have:

$$\Delta t_m \approx 0 < \frac{\alpha}{2+\alpha} < \frac{1}{3}$$
$$\Delta t_f \approx -1 < -\frac{2}{2+\alpha} < -\frac{2}{3}$$
$$\Delta l_m \approx -\frac{1}{3} < -\frac{\alpha}{2+\alpha} < 0$$
$$\Delta l_f \approx \frac{2}{3} < \frac{2}{2+\alpha} < 1$$
$$\Delta n \approx -1 < \frac{\alpha - 2}{\alpha + 2} < -\frac{1}{3}$$

Therefore, we can conclude, that effects in Intermediate group are the largest in size among three groups. Families in Intermediate group are expected to have lower fertility. Wives reallocate time towards labor market, while husbands – towards child care. ■

Appendix D: The case with partial specialization

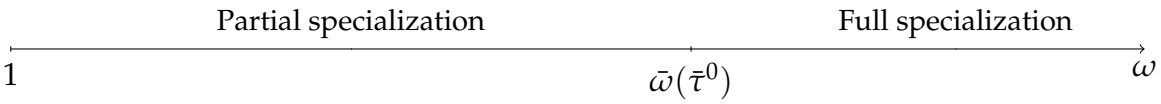
In this appendix, we describe the case where $\bar{\omega} > \omega^*$. As Figure D1 shows, in this case, the model still predicts that couples with a sufficiently low gender wage gap choose the outside option. However, as Panel B shows, there are two qualitatively different groups that choose to cooperate: Those who partially specialize (middle gender wage gap) and

those who fully specialize (sufficiently high gender wage gap). Finally, Panel C Shows the effect of paternity leave expansion. While the model still predicts egalitarian, intermediate and high wage-gap couples, the high gap couples consist of fully and partially specialized couples.

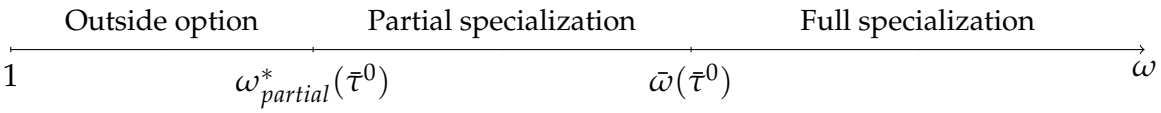
Panel C shows that since both thresholds increase with paternity leave, the model produces two effects: couples switch from partial specialization to their outside options, while others who keep the agreement to specialize but move from full specialization to partial one. Finally, we can show that our main results, that paternity leave has a meaningful and significant effect, applies to the intermediate wage-gap couples.

Figure D1: Distribution of households along the gender wage gap axis with partial specialization case

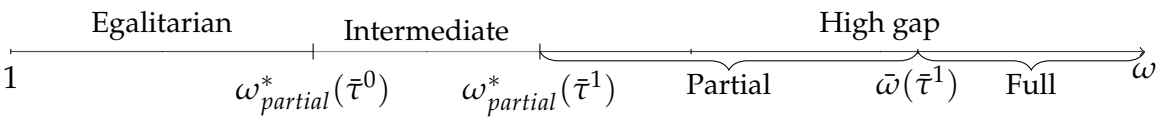
Panel A: Optimal specialization under cooperation given $\bar{\tau}^0$



Panel B: Optimal choice (Cooperation vs. Outside option) given $\bar{\tau}^0$



Panel C: Comparative statics - Paternity leave expansion ($\bar{\tau}^1 > \bar{\tau}^0$)



Note: Panel A describes optimal specialization under cooperation. Panel B describes the optimal choice between outside option and cooperation. Panel C describes comparative statics, following an increase in paternity leave. We define 3 groups: Egalitarian group (red), Intermediate (green) and High gap (purple). Within the high gap group, more spouses choose partial specialization after the policy change.