Maternal-Biased Parental Leave*

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Abstract

The division of parental leave time between parents is in most countries extremely skewed towards mothers. In this paper we argue that, although it may be rational for a family to let the mother take the main part of the parental leave, the division is too skewed towards the mother even from the family's own perspective. The reason for this inefficiency is that parents have present-biased preferences, which make them place too much weight on the immediate utility effects of childcare. Time-consistent welfare can therefore be improved by increasing fathers' share of the family's parental leave time. In the light of recent regulations in the parental leave system in many countries, we argue that provision of commitment devices is more preferable than regulation when preferences are heterogeneous or uncertain.

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1 Introduction

The last three decades have seen a substantial increase in the votes for more equal participation of fathers and mothers in the care for children. This development can be seen in light of the remarkable increase in female labor force participation that has taken place in most industrialized countries. It is argued that as women gradually have taken a larger responsibility for the breadwinning, also taking the full responsibility for childcare and the household is unsustainable in the long run. Psychological research also point at the benefits for child development that comes from having fathers taking a larger responsibility for children's upbringing (see Russell and Hwang, 2004, and Haas and Hwang, 1999).

The trend towards more equal parenthood is also reflected in the family policies conducted in modern industrialized countries. Today most European countries offer fathers the possibility of parental leave.[1] However, in practice, moving from maternity to parental leave has only had a modest impact on the division of parental leave between the parents (Bruning and Plantega, 1999). In order to further encourage fathers to take time off for parenting, many countries have recently reconstructed their parental leave system so to specifically provide stronger incentives for fathers to stay home with their children. In 1995, Sweden introduced a daddy-month which was offered on a "use it or lose it" basis. If the father fails to take the leave, it simply becomes unavailable to the family. This daddy-month was extended to two months in 2002. In Iceland three months of parental leave are specifically devoted to each of the parents, and only three out of the total nine months can freely be allocated between the parents. In Italy the family is given an extra month if the father uses at least three months of the family's ten months of entitled parental leave. Other countries that have introduced individual non-transferable components in their parental leave system are Austria, Belgium, Croatia, Denmark, Finland, Greece, Netherlands, and Norway (Council of Europe, 2005).

The effects on paternal behavior of most of these targeted reforms have not yet been evaluated. The Swedish daddy-month reforms are exceptions. Ekberg et al. (2004) investigate the first daddy-month reform. They find that it increased fathers' leave time with 15 days on average. In particular, the share of fathers taking zero days decreased from 54 to 18 percent, and the

[1] In 1997 the then 15 EU member states signed the Amsterdam Treaty on European Union, which included an agreement on social policy that obliged all EU members to provide at least three months of unpaid parental leave to both fathers and mothers (Haas, 2003).

number of fathers using around one month increased from 9 to 47 percent. Eriksson (2005) investigates the second daddy-month reform. He finds that it increased the share of fathers taking between 30 and 70 days of parental leave with 6.1 percent. However, although there is a trend towards more equal parenting in many countries, the pace may be regarded as low. For example, mothers still take about 90 percent of the family's parental leave in Sweden.

There is a number of arguments for why it is optimal for a family to let the mother take the main part of the parental leave. It could be because the father has a higher income when working than the mother, or because society expects the mother to take the largest share and it is socially costly for the family to break that tradition. Moreover, it may be because the mother derives a higher utility from being on parental leave.[2]

This paper does not dispute that these factors make it rational for the individual family to choose a parental leave distribution which is skewed towards the mother. We do, however, argue that families tend to choose a parental leave division which is too skewed towards the mothers even from its own perspective. The reason for this inefficiency is that parents have present-biased preferences.

In our model, two kinds of concerns affect the parental leave division: immediate and long-run concerns. There is a trade-off between these two concerns. Upon the child's birth, the family decides upon an intended ex ante division for the period after the very first period in which the mother stays home for exogenous biological reasons. When that period comes, the family decides upon an actual ex post division. If preferences are present-biased as assumed, we show that the actual ex post choice is time-inconsistent with, and biased toward the mother compared to, the ex ante intention. The intuition is that a disproportionate high weight is given to immediate relative to future concerns. When it comes to parental leave division, we argue that the traditional factors explaining the skewed distribution towards mothers are also factors affecting the immediate concerns. For example, there is an immediate income loss, or an immediate social cost of breaking the social norms, by letting the father take a larger share of the parental leave. The time-inconsistent behavior due to these immediate concerns will induce the family to underinvest in paternity and overinvest in maternity leave. The logic is analogous to the standard examples of how present-biased prefer-

[2] There is a large literature on the causes and consequences of the large female bias in the provision of "caring labor" in general (in market and within households). For important contributions see e.g. Himmelweit (1999) and England and Folbre (2003).

ences may induce too much smoking, drinking, eating unhealthy food, not exercising, or any other activity that carries immediate benefits at the expense of future costs.

It is important to note that this bias towards mothers is fundamentally different from using traditional factors explaining why we could expect a skewed distribution towards mothers. While the traditional skewness towards the mother is individually rational (though maybe not socially optimal), the maternal bias we reveal is irrational from the family's initial and time-consistent perspective. And this internality opens up for welfare-improving policy.

2 The basic model

In order to study the division of parental leave between two parents, we need to consider a model of family decision making. Clearly there are a number of different and plausible ways in which such a decision could be made. In this paper we consider various cases of family decision making, such as having the mother act as the sole decision maker with and without accounting for her husband's wellbeing. In addition we consider a family consensus model as well as allowing the father to act as the family's sole decision maker. To get a clear understanding of the mechanism, however, we first work through the model in the simplest stylized case where the sole decision maker is assumed to be the mother. Section 3 deals with the other cases of family decision making. If switching towards paternity leave is associated with an immediate financial or social cost for the family, the results of the basic model will carry over also to other models of family decision making.

In addition to simplicity, there are a number of reasons why a set-up with the mother acting as the sole decision maker is a plausible benchmark case. According to attitude surveys, it is not a just story to say that it is the fathers' unwillingness to take larger responsibility for their children in order to explain the skewed distribution of parental leave towards the mothers. The Swedish Social Insurance Administration asked parents about their own division of paid parental leave between the parents. The answers show that fathers were the least pleased with the uneven distribution between the parents. And when the mothers were asked about the main cause of the distribution, the most frequent answer – marginally more important than economic factors – was that it was their own preference (Swedish Social Insurance Administration, 2003). The view that the mother's position within the family plays a crucial role in skewing the distribution is substantiated

by Australian research; see Lupton and Barclay (1997) who use in depth interviews with fathers to examine how couples share the care giving and breadwinning in the family.[3] This empirical evidence lends support to an assumption of having the mother acting as the sole decision maker.

2.1 Assumptions

Our key assumption is that the decision maker's intertemporal preferences are characterized by hyperbolic time-discounting. Intertemporal decisions are normally modeled with the discounted utility model (DU) introduced by Samuelson (1937). Empirical research has, however, documented various inadequacies of this model and concluded that time-discounting is approximately hyperbolic (see. e.g. Ainslie 1992, Cairns 2000, and Lazaro et al. 2002). Hyperbolic discounting yields present-biased preferences, i.e. the present is given a disproportional weight, and leads to time-inconsistent behavior. There is by now a large number of applications on hyperbolic discounting, e.g. Laibson (1997) shows how the phenomenon leads to undersaving and O'Donoghue and Rabin (2006) show how it makes us overconsume unhealthy goods such as potato chips. See Fredrick et al. (2002) for an introduction to this field.

The mother's only decision variable is how the parental leave should be allocated between the parents. There are three periods. The first two periods take place when the child is very little and need parental care. The third period is the rest of the child's life. In the first period, the mother will be on parental leave the full period due to strict biological and/or traditional reasons. In the second period, the division of parental leave between parents is made exclusively at the mother's discretion. The third period is the rest of the child's life in which no decisions are modeled. However, the mother has a prior notion of how e.g. the child's future wellbeing is affected by the preceding division of parental leave between the parents. The explicit assumptions regarding the three periods are presented below.

The first period – the first x months: The first period lasts x months where x is exogenously given. Let m_1 denote the mother's number of months in parental leave during this first period. Since the mother is the sole care-

[3] Their research was discussed in The Sydney Morning Herald 2002: "When a number of men, some of whom earned less than their partners, raised the possibility of being the ones to stay home, the attitude of their wives was 'no way'. There are many women who are still resistant to allowing men that option. The whole of the discourse is that it is a woman's choice. It is never assumed to be a man's choice. It is a very rare guy who is going to be able to sit there and argue 'Hey, it is my turn'".

taker during this period $m_1 = x$. No decisions are made concerning the present but a plan for the future division of responsibility in the second period is traced out. Whether this intended division will hold depends on whether there is a commitment device at hand or not.

The second period – the next y months: The second period lasts y months where y is exogenously given as well. During this period both parents can be potential care givers. The mother experience positive instantaneous utility from being on parental leave. This is the direct net wellbeing she experiences from staying home with the child instead of working and includes e.g. financial, normative, and pleasure concerns. Let this instantaneous utility from staying home with the child be given by $u_2(m_2)$ where m_2 is the number of months she stays home with the baby in this period. $u_2(.)$ is increasing and strictly concave, i.e. $u_2'(.) > 0$ and $u_2''(.) < 0$.

The third period – the rest of the child's life: The mother has a subjective opinion concerning how the division of parental leave in the first $x+y$ months affects the child's future life in the third period. Let the belief about the optimal maternity leave in the first two periods on the child's behalf be $m^* \equiv x + m_2^*$, where m_2^* is the optimal division in the second period. m^* is an exogenous preference parameter that is determined outside the model, and could be formed by personal beliefs, public experts' opinions, and society in general. This parameter may also capture a broader measure of long-run concerns, e.g. the future relation between the parents and child or more fundamental principles regarding gender equality. The formation of such a deep preference parameter is beyond the scope of this treatment.

The residual long-run optimal time spent with the father is $d^* = d_2^* = y - m_2^*$. We assume that the mother believes that the child will benefit in its future life from having spent time with both its parents, i.e. $m^* > 0$ and $d^* > 0$, but do not further restrict this belief about the long-run optimal division. Deviation from the long-run optimal division results in utility loss for the mother. The mother's decision utility over this third period is $u_3(m_2) = -L(m_2 - m_2^*)$. $L(.)$ is a positive convex loss function with $L'(.) > 0$ for $(m_2 - m_2^*) > 0$ and $L'(.) < 0$ for $(m_2 - m_2^*) < 0$. The Inada conditions are $L'(0) = 0$, $L(0) = 0$ and $\lim_{m_2 \to y} L'(m_2 - m_2^*) = \infty$. The last condition guarantees $m_2 < y$ and provides an interior solution by letting the marginal expected future damage to the child approach infinity as the father's parental leave approaches zero.

2.2 Maternal-Biased Parental Leave

Two features of the model simplify the calculations. First, the exogenously given division of parental leave in the first period makes the calculation of the decisions for the latter periods straightforward. Second, no actual decisions are made in the third period, even if the mother is accounting for the consequences of her earlier decisions on the third- period utility. The only variable to decide upon is the second-period division of the parental leave. This decision can be made in the first or the second period. The first-period intention is realized in the second period if she, in the first period, can and do commit to a division. Otherwise her revised second-period decision, which differs from the first-period intention when her intertemporal preferences are hyperbolic, will be carried out.

Commitment solution: We derive the mother's first-period intention on how the parental leave should be split between the parents in the second period. As the instantaneous utility in the first period, $u_1(x)$, is exogenously given, this term can be ignored when formalizing the mother's problem. The mother's division problem may be written as

$$\max_{m_2} U_1 \equiv \beta u_2(m_2) - \beta L(m_2 - m_2^*), \tag{1}$$

where $\beta < 1$ is the hyperbolic component attached to all future as in the standard (β, δ)-model first used by Phelps and Pollak (1968). The (β, δ)-model catches the qualitative features of hyperbolic preferences. δ represents the traditional constant discount factor component, whereas β is the present-bias component giving the present (future) too much (little) weight. For simplicity we set δ to unity throughout our analysis since it does not affect the qualitative results.

The FOC to (1) with respect to m_2 gives

$$u_2'(m_2^c) = L'(m_2^c - m_2^*), \tag{2}$$

which implicitly solves for m_2^c where c denotes commitment in period 1. Since u_2' is positive, L' also has to be positive and thus $m_2^c > m_2^*$. The mother's first-period intention implies that she overspend time with the child compared to what she finds optimal for the child's future. The reason is that she also accounts for the instantaneaous utility she receives from spending time with her child. This trade-off is perfectly rational to account for and the resulting division is not intertemporally suboptimal in any way.

Non-commitment solution: If the mother do not commit to a division in the first period, she faces a new division problem in the second period:

$$\max_{m_2} U_2 \equiv u_2(m_2) - \beta L(m_2 - m_2^*). \tag{3}$$

The FOC to (3) with respect to m_2 gives

$$u_2'(m_2^{nc}) = \beta L'\left(m_2^{nc} - m_2^*\right), \tag{4}$$

which implicitly solves m_2^{nc} where nc denotes non-commitment. This is similar to (2) except for the β-term.

Comparison of (4) and (2) shows that:

$$m_2^{nc} > m_2^c \text{ as } \beta < 1. \tag{5}$$

The mother is time-inconsistent since her second-period non-commitment choice differs from her first-period commitment choice, unless $\beta \to 1$.

When no prior commitment has been made the division of parental leave is biased toward the mother from the perspective of her initial first-period intention. Note that this is a bias caused by present-biased preferences, in addition to whatever initial first-period bias there might already be in place (including unmodeled biases caused by e.g. economic factors). The reason is the following. β introduces no distortion between the benefit in the second period and the loss in the third period when the mother is standing in the first period, since the it is attached to both future periods. However, when standing in the second period, β applies only to the perceived future (third-period) disutility from spending (too much) time with the child. Finally, we see from (4) that we approach the corner solution $m_2 \to y$ and the mother takes the whole parental leave as $\beta \to 0$. It is natural to regard the first-period intention as the intertemporal benchmark and the second-period choice as a bias from the mother's perspective, as a time-consistent individual with $\beta = 1$ would have chosen the first-period intention even when standing in the second period.

Comparative statics of (4) with respect to β gives

$$\frac{dm_2^{nc}}{d\beta} = \frac{\underset{+}{L'}}{\underset{-}{u_2''} - \beta \underset{+}{L''}} < 0, \tag{6}$$

which means that higher bias towards the present (lower β) increases m_2^{nc} while it has no effect on m_2^c (see (2)). The bias becomes more severe the more present-biased preferences she have.

Which mothers would choose the commitment solution and which would not? In answering this, it is useful to distinguish between two types - naifs

and sophisticates.[4] The naifs are unaware of that their preferences are time-inconsistent while the sophisticates know this and take account of future decisions in the present decision. The outcome for the naifs is the non-commitment solution. Even if there is a commitment device available, they would not use it. The sophisticates on the other hand realize the problem and their first-period selves would like to commit to the commitment solution that they perceive to be optimal at that time. The outcome depends however on whether there is a commitment device available. When such a device is available, they would choose to use it. Otherwise, they have to let the non-commitment solution take place, although they perceive it to be inferior when in the first period. The bias toward mothers caused by present-biased preferences applies exclusively to naifs when there is a commitment device available, but to both types when no such device is available.

3 Extension - Accounting for the Fathers

Assuming that the mother is the sole decision maker and that she does not internalize the father's direct net wellbeing from spending time with the child does not capture the full story. We here generalize the model to a household model that also accounts for the father's instantaneous utility of spending time with the child. We derive a key condition under which the mother (father) stays home longer (shorter) than what the family's long-run preference would prescribe. And we argue that this condition is likely to hold in practice for an average household.

3.1 A Household Model

Let index m and d denote the mother and the father, respectively. Moreover, let α^i denote the weight parent i is given in the family welfare function, W, where $u_2^i(t_i)$ (where $t_i = m_2, d_2$) represents that parent's instantaneous utility function from spending time with the child in period 2. We make the simplifying assumption that the preference parameter m_2^* is a family consensus view of what is believed to be best for the child's future.[5]

Commitment solution: The family's first-period division problem of how the parental leave should be split between the parents in the second

[4] Strotz (1956) and Pollak (1968) were the first to formalize this distinction.

[5] Even though we recognize that there may be systematic differences in mothers' and fathers' views on how the parental leave division affects a child's future, we consider such topic beyond the scope of the paper.

period is:

$$\max_{m_2} W_1 \equiv \beta \left[\alpha^m u_2^m(m_2) + \alpha^d u_2^d(y - m_2) \right] - \beta L(m_2 - m_2^*), \tag{7}$$

where we have made use of $d_2 = y - m_2$. The FOC to (7) with respect to m_2 gives

$$\alpha^m u_2^{m\prime}(m_2^c) - \alpha^d u_2^{d\prime}(y - m_2^c) = L'\left(m_2^c - m_2^*\right), \tag{8}$$

which implicitly solves for the commitment division m_2^c. Based on (8) we may derive the following key condition for $m_2^c > m_2^*$:[6]

$$\alpha^m u_2^{m\prime}(m_2^*) > \alpha^d u_2^{d\prime}(y - m_2^*). \tag{9}$$

Thus, the mother overspends time with the child compared to what the family finds optimal for the child's future if the mother's weighted marginal utility, evaluated at m_2^*, is higher than the father's weighted marginal utility at $y - m_2^*$.

Non-commitment solution: If the family does not commit to a division in the first period, it faces a new division problem in the second period:

$$\max_{m_2} W_2 \equiv \alpha^m u_2^m(m_2) + \alpha^d u_2^d(y - m_2) - \beta L(m_2 - m_2^*), \tag{10}$$

The FOC to (10) with respect to m_2 gives

$$\alpha^m u_2^{m\prime}(m_2^{nc}) - \alpha^d u_2^{d\prime}(y - m_2^{nc}) = \beta L'\left(m_2^c - m_2^*\right), \tag{11}$$

which implicitly solves for the non-commitment division m_2^{nc}. Again, a sufficient condition for $m_2^{nc} > m_2^*$ is (9).[7]

Comparison of (8) and (11) shows that the family is time-inconsistent since its second-period choice differs from its first-period intention, unless $\beta \to 1$. Furthermore, for a time-inconsistent family ($\beta < 1$) we get that our key condition (9) will imply $m_2^{nc} > m_2^c$.

We thus get the intuitive result that, the mother stays home too long compared to the first-period intention if the mother, ceteris paribus, 1) has a higher marginal utility of childcare (at m_2^*), than the father, and/or 2) has a larger saying in the family when it comes to the parental leave decisions. There is an opposite bias if the reverse holds.

[6] The proof is by contradiction. Assume that $\alpha^m u_2^{m\prime}(m_2^*) > \alpha^d u_2^{d\prime}(y - m_2^*)$ holds while $m_2^c \leq m_2^*$. Then $\alpha^m u_2^{m\prime}(m_2^*) > \alpha^d u_2^{d\prime}(y - m_2^*)$ implies $\alpha^m u_2^{m\prime}(m_2^c) - \alpha^d u_2^{d\prime}(y - m_2^c) > 0$ (since $u_2^{j\prime\prime} < 0$). But then (8) gives $L'\left(m_2^c - m_2^*\right) > 0 \to m_2^c > m_2^*$ which contradicts the assumptions.

[7] The proof follows the same logic as in the previous footnot.

It is ultimately an empirical issue whether the condition (9) holds in practice. However, we argue for several reasons why it is likely to hold for an average family. This will be discussed in the next subsections.

3.2 Marginal Utility of Parental Leave

In this subsection we provide general arguments for why mothers on average may derive higher instantaneous utility from additional parental leave than fathers do. Our argumentation is along four different margins: financial, social, addiction, and status quo bias.

- *Financial considerations.* Men tend to earn a higher income than women on average. When the father stays at home instead of the mother, most families therefore make a financial loss. This financial loss becomes larger the longer leave time the father takes as it is roughly proportional to the income (depending to some degree on the construction of the parental leave system). It is then not farfetched to describe such loss as an immediate cost of increased parental leave time of the father since perfect consumption smoothing hardly ever applies in reality.

- *Social costs.* It is an unarguable fact that the traditional division of parental leave has been extremely skewed towards mothers. Breaking such traditions may often be associated with social stigma and other immediate costs. The pressure to maintain in work from both peers and employers may indeed be much greater on fathers than on mothers. Thus the father may experience a utility loss from taking additional parental leave for this reason. Even if he does not necessarily have a negative marginal utility of paternal leave, he may for this reason have a lower marginal utility of parental leave than mothers do.

- *Addiction to parental leave/work.* The fact that the mother stayed at home with the child in the first period may create an additicon to maternity leave for her that manifests in her deriving more pleasure from staying home with the child in the second period. Along the same line of argument, the father may experience disutility from leaving work as he had to work in the first period. This impact on preferences tends to increase the mother's marginal utility of parental leave while it reduces that of the father's. Similar stories of addiction can be found in the hyperbolic discounting literature. Most of the earlier literature on addiction relied on habit formation, which

captures the reinforcement aspect of addiction since present consumption affects tomorrow's taste. The main paper on this is Becker and Murphy (1988) in which addiction is formed and maintained by fully rational and forward-looking individuals. Gruber and Koszegi (2001) and O'Donoghue and Rabin (2001) recognize however that this kind of addiction does not capture the time-inconsistent behavior embodied in addiction (Most addicts are after all not rational, they can at some point in time rationally desire to quit in the future, but fail to do that when the future arrives). In their model, habit-formation thus yields preference for consumption of the addictive product, but the actual decision to consume those products is explained by hyperbolic preferences. It would be a straightforward modeling exercise to endogenize the addiction formation along the lines of the discussed papers on addiction. But since the mother is home for exogenous reasons in the first period, such an exercise would be trivial and not add much to our model.

- *Status quo bias.* The mother's instantaneous disutility from leaving maternity leave for work and the father's instantaneous disutility from leaving work for parental leave could also be caused by "status quo bias" or "change aversion". The psychological intuition is that potential losses of leaving status quo loom larger than potential gains. A change from the known everyday life to the somewhat unknown everyday life is therefore associated with an instantaneous utility loss. This phenomenon is frequently observed empirically in behavioral economics, although difficult to justify on purely economic rationales. See e.g. Kahneman et al. (1991) for empirical evidence and Kahneman and Tversky (1979) for a seminal paper on prospect theory which is a broader term for related phenomena.

3.3 The Decision Weights

Our extended model does not restrict the weights given to the parents in the family welfare function. By adjusting the weights a number of different family decision models can be nested. In the basic model we assumed that the mother was the sole decision maker, which corresponds to the case where $\alpha^m = 1$ and $\alpha^d = 0$. In this case we showed that the mother would always choose to stay home longer than her initial intention and her time-consistent equivalent.

By letting $\alpha^m = 1$ and $0 < \alpha^d < 1$, we can account for a situation

where the mother still is the sole decision maker, but she now have altruistic feelings toward the father. Also in this case will the mother stay home longer than her initial intention and her time-consistent equivalent as long as the father does not have a substantially higher marginal utility of parental leave than the mother do (evaluated at m_2^*); formally $u_2^{m\prime}(m_2^*) > \alpha^d u_2^{d\prime}(y - m_2^*)$ guarantees a bias towards the mother. Another interpretation of this case is that the family takes a joint decision, but the mother has a larger saying in the matter ($\alpha^m > \alpha^d > 0$, where α^m can be normalized to unity). As we argued for in the introduction to the basic model, there is some evidence that the mother has the largest decisive power when it comes to parental leave decisions.

Now consider the other, arguably unrealistic, extreme, with the father as the sole decision maker. Technically, we then have $\alpha^m = 0$ and $\alpha^d = 1$. In this case we require $u_2^{d\prime}(y - m_2^*) < 0$ for there to be a bias towards the mother. Admittedly restrictive, the requirement may be less restrictive than it seems. Firstly, we do not require that he would experience an instantaneous *disutility* of spending time with the child (i.e., $u_2^d(y - m_2^*) > 0$ may hold); it is sufficient that the *marginal* utility of spending additional time with the child is negative at $d_2^* = y - m_2^*$. Secondly, the rationales provided in the previous sub-section suggest that high immediate costs associated with paternity leave could offset the pleasure he receives from spending more time with the child per se.

4 Policy Implications

The mechanism presented in this paper has welfare implications beyond the traditional arguments why the parental leave distribution is skewed towards the mother. The fundamental difference lies in that the bias caused by present-biased preferences is irrational from an impartial time-consistent self's perspective – the skewness caused directly by traditional factors is not. When discussing policy we focus only on the internality caused by a bias towards the present. Whether society should strive to break free of the traditional skewness towards maternity leave is beyond the scope of the paper. Furthermore, our discussion of policy will be presented in an informal non-technical manner. For a more formal treatment see Engström et al (2006).

Parents with $\beta = 1$, that do not suffer from bias towards the present, make intertemporally optimal choices by definition. This follows from the standard assumption in the hyperbolic discounting literature as it is the

only value on β that gives time-consistent behavior; see e.g. O'Donoghue and Rabin (1999). In our case, the first-period intention and commitment solution then gives the intertemporally optimal division, because the decision in the first period only concerns future periods which are discounted the same.

Parents may be naive or sophisticated and may or may not have a private (optional) commitment device at hand. The laissez-faire solution is potentially not welfare maximizing because only the sophisticates with a private commitment device available choose the optimal commitment division. We discuss three policies that may be welfare improving: regulation of the division of parental leave, public provision of a forcing commitment device which forces everyone to commit to an individually chosen division in the first period, and public provision of an optional commitment device which provides commitment possibilities for parents who want to commit but do not have a private commitment device available.

Consider first the case of homogenous parents. Regulating the division of the parental leave between the parents by setting the division to the commitment solution reaches first best since it alters the division from the non-commitment to the commitment solution for everyone. Provision of a forcing commitment device produces the same outcome since everyone would choose the commitment solution in the first period when forced to commit. Provision of an optional commitment device is also welfare improving. It alters the division from the non-commitment to the commitment solution for sophisticates without a private commitment device available, i.e. those who want to commit but cannot. It is however inferior to regulation and provision of a forcing commitment device since the naifs do not choose to use it.

Now, consider the case of heterogeneous (with respect to parameters or functional forms) parents. A regulated division can no longer reach the first-best solution. This follows because different parents find different divisions optimal from the impartial self's view and a single regulated level cannot capture such heterogeneity. A forcing commitment device can, however, still reach first best since it allows everyone to commit to their individual optimum, and is the preferred policy. Provision of an optional commitment device is also still welfare improving compared to laissez-faire since the sophisticates without a private commitment device would choose to use it and reach their individual first-best solution. In sum, forced commitment reaches the first-best solution while both regulation and optional commitment generally do not, although optional comitment is always welfare improving relative to laissez-faire. The attractiveness of an optional

commitment device relative to regulation is generally ambiguous – loosely speaking, an optional commitment (regulation) is preferred when the number of naifs are low (high) and the heterogeneity is high (low).

Another important aspect is that preferences might change over time and there might be uncertainty about future preferences. If some parents have committed to a future division, they may find it optimal to deviate when the future arrives because of changed preferences, which is fundamentally different from deviations induced by time-inconsistency. Ideally, we would like to separate the deviation tendencies and allow for deviations due to altered preferences but not due to time-inconsistency. It is, however, unrealistic to assume that the government is able to separate the two types of deviations. It also seems infeasible to come up with some commitment device that somehow manages to separate the two. Uncertainty makes first-best solution impossible to attain for any policy.

Uncertainty reduces the attractiveness of a forcing commitment device and regulation since such policies rule out welfare improving deviations. To the extent that parents have more knowledge about the distribution of their future preferences than anyone else, provision of a forcing commitment device is preferable to regulation since the parents' guess of the optimal commitment solution would be better than the government's guess. If we also assume that parents have correct anticipation of the probability distribution of their future preferences, the provision of an optional commitment devise may improve welfare. It allows sophisticates, that lack a private commitment devise but find the optimal commitment solution in expectation better than the non-commitment solution, to improve their expected utility. The comparison between the three policies is however ambiguous. In any case, the attraction of provision of commitment devices, forcing or optional, increases relative to regulation when there is uncertainty and when parents have more knowledge about their future preferences than the government.

Taking such real world complications into account would thus opt for provision of commitment devices, at least optional ones, as opposed to hard regulations. The optional device could also be provided privately (informal such may already exist in practice; such as promising the employer in advance when you will return to work, etcetera), although legal enforcement would make the device more powerful. In practice, the device could consist of a requirement to pre-announce a return-to-work date by parents entering parental leave, with a nominal fine associated with lapse. The provision of such a simple device need not require much resources, if any. An added benefit would be to decrease the uncertainty of the availability of workers experienced by the employers.

5 Summary and Conclusions

Family policy in general and parental leave in particular has indeed been hot topics in the last three decades' European policy debates. Considering the massive increase in female labor supply this comes as no surprise. Despite recent reforms to increase fathers' share of the parental leave, mothers still take the main responsibility for childcare. There are a number of traditional arguments why this is the case, for example the wage differential argument. This paper has left all such issues aside per se and focused on another mechanism that may make parents take too long maternity leave in relation to paternity leave from their own prior and time-consistent perspectives.

The model presented here provides a stylized and simple story of parents' choice of parental leave division. Assuming present-biased preferences, we showed, under reasonable assumptions, that the family tend to overinvest in maternity leave. The key mechanism is based on the argument that paternity leave is associated with higher immediate costs than maternity leave. Present-biased preferences give excessive evaluation of the immediate utility in relation to future utility streams. A family that values paternity leave from a long-run perspective (e.g. the child's psychological wellbeing) will thereby underinvest in it by the same logic as present-biased individuals will underinvest in exercise – you resist taking a small immediate loss to make a large future gain. We do not, however, claim that this is the main reason why the parental leave division is extremely skewed towards the mother. We acknowledge all traditional arguments for this; indeed, the traditional arguments help explain why paternity leave carries heavy immediate costs.

Furthermore, we argued that different policies may improve welfare. We find public provision of commitment devices to be attractive policies when there is heterogeneity or uncertainty in parental preferences.

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