A MICROECONOMIC MODEL OF FATHER INVOLVEMENT

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Abstract

This paper proposes a simple microeconomic model of father involvement decision-making. The model developed is based on the Dynastic Utility Framework with a human capital technology that reflects recent changes in perceptions, expectations, and knowledge regarding the increasingly important role of fathers in child development. Using the model, the optimal child rearing time decision is derived and its properties examined. The model shows that there are no intergenerational effects on optimal child rearing time with respect to endowed education and past child rearing decisions, and that the optimal child rearing time is fully dependent on technological constants that reflects the relative importance of certain factors on the accumulation of human capital and the minimum required time for child rearing. It is argued that the most important factor to encourage greater paternal involvement is fathers' perception with regards to their parenting skills, responsibilities, and role. Work-related policies that aim to promote greater involvement would be ineffective if fathers are not aware of their important role in their children's development.

1. Introduction

Since the first edition of Michael Lamb's *The Role of the Father in Child Development*[1], perceptions, expectations and knowledge concerning the role and importance of paternal involvement have been changing and increasing.[2] Expectations on the role of the father have been evolving from a view that fathers are relatively detached providers or breadwinners to a "new nurturant father."[3] This change in perception and expectation most probably was and is encouraged by the accumulation of knowledge regarding the importance and benefits of active fathering. Numerous studies[4] have documented the benefits of paternal involvement on different aspects of child development primarily cognitive, emotional, and social development. Despite these, some still believe that the current level of paternal involvement is not enough[5] and that policy intervention is needed in order to encourage fathers to be more involved[6].

According to Rob Palkovitz, the relation between paternal involvement and men's adult development have been largely ignored by social scientists and thus he studies the possible effects of paternal involvement on adult development in his book, *Involved Fathering and Men's Adult Development.*[7] For example, a chapter in Palkovitz's book explores the possible effects of fathering on work and career development through a series of interviews of current fathers. Though the fathers interviewed were aware of the time costs associated with co-parenting, most of them believed that being more involved in child rearing actually had work-related benefits such as gaining certain skills through their fatherhood experiences that supported their career development and having greater motivation to work, advance their careers, and maintain job stability.[8] If there were indeed positive effects of paternal involvement on the fathers themselves, then awareness of these effects gives fathers a greater incentive to be more involved and therefore possibly address the problem of inadequate fathering mentioned previously.

Explicit modeling of father involvement decision-making virtually does not exist in the economics literature specifically in the human capital research area. This is expected since paternal involvement is often dwarfed when compared to the importance of maternal involvement and this somehow reflects the antiquated but still persistent view that fathers' *sole* responsibility is the provision of material resources. Even empirical work exhibits this gender bias though recent papers[9] have been exploring the role of fatherhood in children's outcomes. As greater interest in the role of fathers develops in empirical work in economics, traditional theoretical models of fertility, population dynamics, demography, or any topic related to the family need to be updated to reflect the changing perceptions, expectations and knowledge on fatherhood. Establishing the microeconomics behind involvement decision-making of fathers is a fruitful first step.

This paper attempts to build the microeconomic foundations of father involvement. We create a simple model of father involvement based on constrained utility-maximization in an altruistic setting that incorporates the belief that paternal involvement benefits both the child and the father. We derive the optimal level of involvement and examine its properties in order to answer why the current level of paternal involvement have been only slowly rising despite policies such as paternal leave and flextime work hours.[10] We also determine the effects on the optimal child rearing time of variables such as the level of paternal involvement of the father's father, endowed formal schooling, wife's employment and increasing working hours and labor participation, availability of alternative sources for child care, and finally belief and confidence in own child rearing skills.

The paper is structured as follows: Section 2 introduces the model and derives the optimality conditions. In section 3, the model's results are further examined and discussed vis-à-vis the issues raised in the previous paragraphs. The final section presents the limitations of the model, recommendations and finally the conclusion.

2. The Model

We assume a representative father who lives for only one period. At the beginning of each period, a father decides on how his limited time will be divided between market work and child rearing, and how much of his income earned from market work will be for his own consumption and for formal schooling of his children. Note that, contrary to most family models of altruistic behavior, fertility decisions are excluded from our model. The father takes as exogenous the number of children and considers them as one group, hence normalizing the quantity of children to unity. What our main concern is father involvement decisions and not fertility.

Our model's predictions are derived from utility-maximizing behavior constrained by time, budget and human capital technology. For the rest of this section, we briefly discuss the dynastic utility framework used, followed by a more in depth discussion of the human capital technology implemented. A discussion of the optimality conditions to the utility-maximization problem ends this section.

2.1 Dynastic utility and human capital

We assume that fathers are altruistic in the sense that they care about the utility derived from consumption of their direct descendants. Since we normalized the number of descendants, we modify the standard Dynastic Utility Function[11] by setting the degree of altruism as a constant, $a < 1$. Assuming time-consistency[12], the optimal solution for a father at time $t_1 \rightarrow t_2$ can be recovered by solving the problem of a dynastic father that starts at time *0* until eternity (∞) if $t_1, t_2 \in (0, \infty)$. Hence, we can interpret the individual problem encountered by successive generations of fathers as a problem of a social planner, which in our case is the dynastic father. The Dynastic Utility Function of our model is given by

$$V(c_t) = \sum_{t=0}^{\infty} a^t u(c_t) \tag{1}$$

where $u'(c) > 0$ and $u''(c) < 0$.

There are two types of dynastic fathers in our economy corresponding to two types of human capital technologies. Future generations adopt the same human capital technology as their dynastic father.

Human capital evolves through time by following the production function,

$$H_{t+1} = H_t^{\alpha} e_t^{\beta} \left(d_t - \underline{d}_t\right)^{\gamma} \left(1 + d_{t+1}\right)^{\gamma 1[AWARE]} \qquad \alpha, \beta, \gamma \leq 1 \tag{2}$$

where α, β, and γ are technological constants that reflect the relative importance of the corresponding factors on the accumulation of human capital, H is the quantity of human capital, e is the educational expenditure, d is the time allocated for child rearing or home-schooling, $\underline{d}$ is the required minimum time for child rearing[13], and *1[AWARE]* is an indicator function that equals one if the dynastic father is aware that his involvement in child rearing improves his own human capital and zero if otherwise. According to equation (2), human capital of children exhibits decreasing returns in all its arguments. Furthermore, note that formal and informal schooling are imperfect substitutes, meaning, both factors are essential. The technological constants, specifically β and γ measure the relative importance of formal and informal schooling respectively, in the accumulation of human capital[14]. The criticality of both formal and informal education is not uncommon in specifications of human capital technology in altruistic settings[15]. What is different with our specification is explicit awareness of the father that his child rearing efforts contributes to his own human capital accumulation through the acquisition of certain skills, actually allows him to "properly" and completely account for the benefits of paternal involvement and therefore, presents him with a greater incentive to be more involved in child rearing.

2.2 Father's optimization problem

We first identify the constraints faced by the dynastic head then propose some simplifications in order to make the model tractable. The father faces the following time and budget constraint:

$$1 = l_t + d_t \tag{3}$$

$$H_t l_t = c_t + e_t . \tag{4}$$

Based on equation (3), total time is allocated between market work, l_t, and child rearing, d_t. We normalize wage per effective labor time to one and takes this as exogenous. Hence, the father's total income from market work is $H_t l_t$. He exhausts all of his income by buying consumption goods for his own consumption and by "purchasing" formal education for his children as in equation (4)

For simplification, let $u(c_t)$ equal $\ln c_t$ and define a new variable,

$$h_t = \frac{H_t}{(1 + d_t)^{\gamma 1[AWARE]}} . \tag{5}$$

Equation (5) allows us to convert the human capital production function to a form that only includes current-valued variables. Equation (2) becomes

$$h_{t+1} = \left(h_t(1+d_t)^{\gamma 1[AWARE]}\right)^{\alpha} e_t^{\beta}(d_t - \underline{d}_t)^{\gamma}. \tag{6}$$

Incorporating all of the abovementioned simplifications, the father's optimization problem is choosing c_t, l_t, e_t, and d_t for $t = 0,\ldots,T$ that maximize equation (1) subject to equations (3), (4), and (6). Formally, the Lagrangean of this maximization problem is given by

$$L = \sum_{t=0}^{\infty}\left[a^t \ln c_t + \lambda_t\left(h_t(1+d_t)^{\gamma 1[AWARE]}(1-d_t) - e_t - c_t\right)\right]. \tag{7}$$

If *AWARE* is False (Type I), first order conditions are

$$\frac{c_{t+1}}{ac_t} = \frac{\lambda_t}{\lambda_{t+1}} \tag{8}$$

$$\lambda_t = \frac{\lambda_{t+1}\beta h_{t+1}(1-d_{t+1})}{e_t} \tag{9}$$

$$\lambda_t h_t = \frac{\lambda_{t+1}h_{t+1}(1-d_{t+1})\gamma}{d_t - \underline{d}_t}. \tag{10}$$

Optimality implies the following: equalization of the marginal rate of intertemporal substitution of consumption with the ratio of marginal utilities of income for the corresponding time periods (Equation (8)), equalization of the current-period marginal cost of education and its next-period marginal benefit (Equation (9)), and finally, equalization of the current-period marginal cost of child rearing time and its next-period marginal benefit (Equation (10)).

The first order conditions for the case that *AWARE* is True (Type II) are similar to the above first order conditions except for the condition with respect to child rearing time. What differs is the additional current-period benefit derived from child rearing which is the first term on the right hand side of this equation:

$$\lambda_t h_t(1+d_t)^{\gamma} = \lambda_t h_t(1+d_t)^{\gamma-1}(1-d_t)\gamma + \lambda_{t+1}h_{t+1}(1+d_{t+1})^{\gamma}(1-d_{t+1})\gamma\Psi \tag{11}$$

where

$$\Psi = \left(\frac{\alpha}{1+d_t} + \frac{1}{d_t - \underline{d}_t}\right). \tag{12}$$

Upon solving the two systems (for each type) of first order conditions, the main optimality condition is the equality of the intertemporal MRS, the ratio of next-period marginal benefit and current marginal net effect (cost) of child rearing, and finally the ratio of next-period marginal benefit and current marginal cost of education. The main optimality condition shows us the tradeoff between current consumption and investment in the form of child rearing and education for future (indirect) consumption.

3. Model Results and Discussion

Two complementary approaches are used to solve the optimization problem. The first approach is to simplify the model into a three-generation (*t = 0, 1, 2*) recursive problem and solve by backward induction. This approach will

give us analytical solutions of the variables of interest for the whole dynasty and thus we can observe the evolutionary properties of these variables from the dynasty's beginning to its end. The second approach entails solving the Lagrangean for times *t* and *t+1*, deriving general (time *t*) analytical forms of the variables of interest by using the first order conditions presented in the previous section, and finally using these analytical forms to run simple simulations to have a glimpse of the behavior of these variables. The main limitation of this approach is that we do not solve the optimization problem completely and only look at a particular segment of the dynasty—not its complete dynamics.

3.1 Three-generation recursive problem

Assume that the dynasty ends at $t = 2$. By definition, this means that the person in $t = 2$ will not have any children and that for both types of fathers,

$$e_2^* = d_2^* = 0 \tag{13}$$

$$c_2^* = H_2 . \tag{14}$$

Moving back by one generation, the following are the optimal solutions for type I fathers:

$$d_1^* = \frac{\gamma + \beta\eta_1 \underline{d}_1}{\gamma + \beta\eta_1} \tag{15}$$

$$e_1^* = \frac{H_1(1 - d_1^*)}{\eta_1} \tag{16}$$

$$c_1^* = H_1(1 - d_1^*)\left(1 - \frac{1}{\eta_1}\right) \tag{17}$$

where

$$\eta_1 = 1 + \frac{1}{a\beta} . \tag{18}$$

For type II fathers, the optimal solutions are the same as above except for the optimal child rearing time. It is difficult to arrive at an explicit equation for the optimal d_1 but we know that it solves

$$\frac{1 - d_1^*}{\eta_1} = \frac{\beta[(d_1^* - \underline{d}_1)(1 + d_1^* - \gamma(1 - d_1^*)]}{\gamma[1 - \alpha\underline{d}_1 + d_1^*(1 + \alpha)]} \tag{19}$$

and that we can examine its properties using the implicit function theorem. Examining equations (15) and (19), we see that for both father types, optimal child rearing time is independent of past values of education and paternal involvement and therefore there are no systematic intergenerational effects on child rearing time decisions. Paternal involvement is completely dependent on technological constants and the minimum required child rearing time. This implies that the quantity of time involvement of the father's father, *per se*, would not be a good predictor of father involvement of the present father. However, past involvement might serve as a proxy for the unobserved technical constant, γ and therefore would still be useful in empirical work.

The technical constant γ reflects the relative importance of informal schooling on human capital production *as perceived by the father*. For both types, the optimal child rearing time increases with γ and thus implies that belief and confidence in one's informal schooling and child rearing skills increases paternal involvement. Lack of

confidence in parenting skills has been recognized as a very important barrier to increasing father involvement and might be the key solution to the persistently low levels of involvement.[16]

A unit increase in minimum child rearing time only raises actual involvement by a fractional amount, the magnitude of which is dependent on the other parameters. The minimum required child rearing time reflects factors such as whether the wife is employed and how long she works, presence of very young children or infants (both of which is predicted to increase paternal involvement by a fractional amount), and availability of alternative sources of child care (*e.g.* grand parents or other non-working relatives present in the household, child care services that can be purchased in the market, *etc.*) which is predicted to decrease paternal involvement.

For $t = 0$, the optimality conditions are similar to the conditions for $t = 1$ with the exception of η_t, and therefore, the second approach of using general time t analytical forms is valid. The behavior of the variables with respect to γ and $\underline{d}$ are preserved and hence the analysis is the same.

3.2 Simple simulation

To see the difference between the optimal child rearing decisions of the two types of fathers, we parameterize the first order conditions in section 2 and run simulations based on these. For both types, we use two sets of parameters.[17] Assuming increasing returns to scale in human capital production, each set of parameters refers to a specific situation in the economy. The first set of parameters (Figure 1) depicts a "growth" economy where the levels of human capital and education are high and continuously growing. The second set of parameters (Figure 2) refers to a "decay" economy with low human capital and education. Human capital in this case decays to the origin through time. In both situations, the optimal child rearing time corresponding to each type of fathers remains relatively stable at almost the same value (0.37 and 0.43 for types I and II respectively) hence confirming our observation in the previous subsection that there are no intergenerational effects in child rearing decisions. The reason for stability in our simulations is that parameters do not change as we run the simulations.

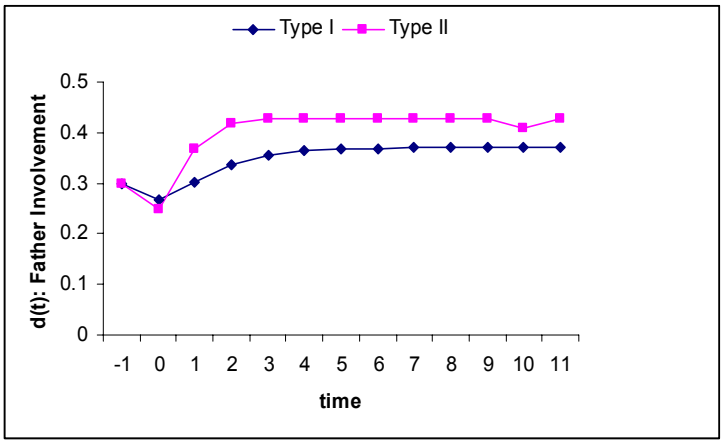

Figure 1: Father Involvement (High Human Capital)

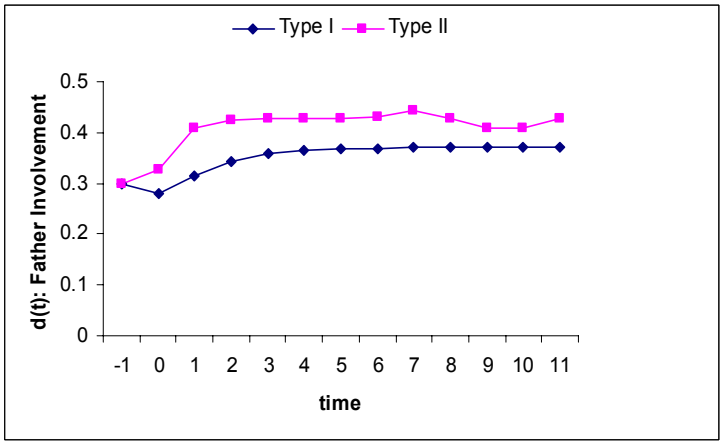

Figure 2: Father Involvement (Low Human Capital)

As can be seen from the graphs above and ignoring the transient period, type II fathers always have higher optimal involvement compared to type I. This is as expected since the former type have more incentive to be involved compared to the latter.

3.3 Further discussion

Based on our model, elimination of barriers to father involvement such as inflexible working hours would allow fathers to choose what they perceive as the optimal amount of involvement. If the previous barrier prevents the father from being more involved, then we expect a "self-correcting" rise in paternal involvement. However, if the barrier is non-binding, then there will be no rise in paternal involvement and therefore, paternal leave and flextime arrangements would be deemed as ineffective.

What is actually more crucial is the perception and belief of fathers themselves regarding their parenting skills. If fathers were aware of their wider role in child development, then we expect them to increase their involvement. Going back to the issue of paternal leave and flextime arrangements, strict working hours and lack of support from the employer can be seen by the father as a manifestation of the wider belief that fathers have no role in child rearing. This in turn will influence their perception of their own parenting skills and hence will lead them to low levels of involvement. Therefore, paternal leave and flextime arrangements, if implemented properly and with complete support of the employer, might change fathers' beliefs and increase their involvement, albeit slowly.

4. Conclusion

Since the model is very basic, it suffers from several limitations. The parameters in the model are too general and endogenizing some of them might improve the model. Furthermore, the model assumes that marriage and fertility decisions are exogenous. A richer and more useful model needs to incorporate these.

The model has given us some interesting insight regarding father involvement. Notable results are the lack of intergenerational effects on father involvement and the behavior of the optimal child rearing decision with respect to minimum child rearing time and perceived importance of informal schooling on human capital accumulation. These results need to be empirically tested and this is the goal of the next paper.

In conclusion, let us keep in mind that the most important lesson from the model is that policies that aim to promote involvement amongst fathers will not succeed if fathers are not aware that they have a greater role in child development. This calls for more education regarding the role of fathers and a change in the antiquated belief that fathers are mere breadwinners.

Endnotes:

[1] Lamb, Michael E. (Ed.) (1976), *The Role of the Father in Child Development* (1st edition), New York: J. Wiley

[2] Lamb, Michael E. and Catherine S. Tamis-Lemonda (2004), "The Role of the Father: An Introduction," in M. E. Lamb (Ed.), *The Role of the Father in Child Development* (4th Edition), New York: J. Wiley.

[3] *Ibid.*

[4] For a review, see Allen, Sarah and Kerry Dale (2002), "The Effects of Father Involvement: A Summary of the Research Evidence," *The FII-ONews*, Vol. 1, 1-11.

[5] Lamb, Michael E. and Catherine S. Tamis-Lemonda, "The Role of the Father: An Introduction."

[6] Some examples are George W. Bush's "Promoting Fatherhood" Initiative (http://fatherfamilylink.gse.upenn.edu/policy/recent/2007/2007.htm) and Bill Clinton's Fatherhood Initiative (see "Improving Children's Well-Being: Understanding, Nurturing Fatherhood," in *Today's Issues*, issue no. 9, Center for Population Research, National Institute of Child Health and Human Development, October 1998).

[7] Palkovitz, Robin J. (2002), *Involved Fathering and Men's Adult Development: Provisional Balances*, Mahwah, N.J.: Lawrence Erlbaum Associates.

[8] *Ibid.*

[9] For example, see Ruhm, Christopher J. (2000), "Parental Employment and Child Cognitive Development," *NBER Working Paper Series*, No. 7666, and Yeung, W. Jean, Greg J. Duncan and Martha S. Hill (1999), "Putting Fathers Back in the Picture: Parental Activities and Children's Adult Attainments," *Journal of Family and Marriage Review*, Vol. 29, No. 2.

[10] See Stancanelli, Elena (2003), "Do Father's Care?" (Paper presented at the International Conference for Time Use Research, September 2003).

[11] Becker, Gary S. and Robert J. Barro (1986), "A Reformulation of the Economic Theory of Fertility," *NBER Working Paper Series*, No. 1793.

[12] Becker Gary S. (1991), "A Reformulation of the Economic Theory of Fertility," Supplementary chapter in *Treatise on the Family*, Cambridge, Mass.: Harvard University Press; de la Fuente, Angel (2000), *Mathematical Methods and Models for Economists* (Enlarged edition), Cambridge: Cambridge University Press.

[13] Factors such as wife employment, presence of other (extended) family members to help with child care, *etc*. can be incorporated in $\underline{d}$. The father treats this as exogenous and thus no form of bargaining occurs.

[14] From a father's point-of-view, we expect β to be greater than γ.

[15] For example, see Becker, Gary S., Kevin M. Murphy and Robert F. Tamura (1990), "Human Capital, Fertility and Economic Growth," *Journal of Political Economy*, Vol. 98, No.5; Yang, Hsiu-ling (2000), "Education, Married Women's Participation Rate, Fertility and Economic Growth," *Journal of Economic Development*, Vol. 25, No. 2.

[16] See Andrews, Arlene Bowers, *et al.* (2004), "Public Perceptions about Father Involvement," *Journal of Family Issues*, Vol. 25, No. 5.

[17] For both "growth" and "decay" economies, the following parameters were used: $a = 0.2$, $\alpha = 0.8$, $\beta = 0.7$, $\gamma = 0.3$, $\underline{d}_t = 0.1$. Initial conditions for the "growth" economy are $d_{-1} = 0.3$, $e_{-1} = 2$, and $H_{-1} = 16.23$ while for "decay" economy, $d_{-1} = 0.3$, $e_{-1} = 0.9$, and $H_{-1} = 5.05$.