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Production Externalities and the Efficiency of Parental Childcare Choices

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Production externalities and the efficiency of parental childcare choices

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Abstract. The economics of producing and consuming children is an immensely important but largely neglected area. We model the allocation of parents' time between market production and childcare, a choice driven by both consumption and investment motives. We identify two externalities in the provision of parental childcare. An *inter*generational externality stems from the effect of today's parents' childcare choices on the productivity of the next generation of workers. An *intra*generational externality arises when time spent away from productive labour affects the productivity of co-workers. The interaction of these externalities determines the efficiency properties of the equilibrium.

Effets externes dans la production et efficacité des choix des parents pour les soins aux enfants. L'analyse économique des décisions de production et de consommation pour ce qui a trait aux enfants est un sujet important mais relativement négligé. Les auteurs proposent un modèle d'allocation du temps des parents entre la production sur le marché et le soin aux enfants, un choix déterminé à la fois par des motifs de consommation et d'investissement. On identifie deux effets externes dans la fourniture de soins aux enfants par les parents. Un effet externe intergénérationnel émerge des effets des choix présents des parents quant aux soins aux enfants sur la productivité des travailleurs de la prochaine génération. Un effet externe intragénérationnel est engendré par les effets du temps passé hors du travail sur le marché par les parents sur la productivité de leurs collègues de travail. L'interaction entre ces deux effets externes détermine les propriétés d'efficacité de l'équilibre.

I. INTRODUCTION

In this paper we construct a simple overlapping generations model to examine a fundamental trade-off facing society: nurturing the adults of tomorrow versus pro-

viding physical sustenance for those alive today. Our work has two main objectives. The first is to characterize the motives and private trade-offs that underlie childcare decisions. We view childcare decisions as a two-stage process in which parents first decide how much time to spend away from their children in the paid labour force and then choose a method of non-parental care to provide while they are not with their children. In this paper we focus on the first stage of this decision: parental childcare versus paid labour force participation.[1]

Our second objective is to illuminate the nature and scope of the externalities associated with parental childcare decisions and the potential for inefficiency in childcare provision. We identify two externalities that can drive a wedge between the equilibrium level of parental childcare and the efficient level. The first is an *inter*generational externality that stems from the effect that childcare choices made by today's parents have on the productivity of the next generation of workers. The second is an *intra*generational externality arising from the impact that time spent away from productive labour has on the productivity of co-workers. The interaction between these externalities determines the efficiency properties of the equilibrium.

To capture and focus attention on parental childcare choices and their economic consequences we examine a simple model with five key elements. First, households are assumed to comprise a single genderless parent and a single child. We abstract entirely from both fertility choice and the possibility of two-parent households. This means that we also abstract from the distinction between parental and maternal care. We recognize that these are significant abstractions that immediately preclude the consideration of some important issues. In particular, our model does not say anything about the division of time and the distribution of costs and benefits within households. We have none the less taken the route we have because the main focus in this paper is on a set of insights that remain relevant in more general settings and because we believe the basic model we develop provides a useful basis on which to build an analysis of these issues. We return to this point in section V.

Second, we assume that parental childcare choices are motivated at least in part by *intergenerational altruism*. In the model we represent the degree of altruism that a parent feels towards his child by a parameter α, which we allow to range between zero and one.[2] The degree of intergenerational altruism plays an important role in our model in two respects: it has direct consequences for the amount of time allocated to parental childcare; and it has important implications for the efficiency

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1 We take it as given that paid productive labour and effective parental childcare are mutually exclusive. While cognizant of it, we are not entering the debate about whether it is possible to reorganize production to make the two activities simultaneously possible. See Folbre (1994a) and Leach (1994, 225–39) for discussions of this issue.

2 While our model is genderless, our pronouns are not. Initially we used the female pronoun throughout but a referee suggested that this may create the impression that we regard childcare as an issue of relevance only to women; we do not. In contrast, another referee suggested that we emphasize more strongly the significance of childcare issues to women. Faced with this conflict, we tossed a coin to decide the pronoun choice.

of that allocation. In particular, with respect to efficiency we show that intergenera-
tional altruism gives rise to an inefficiency-inducing externality in intergenerational
interaction even in the absence of transfer possibilities from young to old.[3]

Third, we model parental childcare as both *consumption* and *investment*.[4] It is a
consumption good in the sense that both parent and child derive immediate utility
from the time they spend together. It is an investment good in the sense that more
parental time devoted to a child today yields a more productive worker in the
future. The nature of this productivity link may be as vague as some notion of
'citizenship' (Spock 1957, 570) or adaptability on the job and in society (Leach
1994, 27–8, part two)), or as specific as 'the wiring of the neurons in the cerebral
cortex' (*Globe and Mail* 1994, A1). We model this positive developmental effect of
parental childcare in terms of its effect *relative* to other types of care. It is important
to be clear what we mean by this. We are not suggesting that exclusive parental
care always provides superior developmental benefits to non-parental care. On the
contrary, it seems reasonable to suppose that a diversity of care types and exposure
to a variety of caregivers may, up to a point, enhance the childcare experience. We
do assume, however, that the developmental benefits of any type of childcare can
always be enhanced by the presence of the parent, at least for very young children.
For example, an excursion to the park with a group of parents and children provides
a type of learning experience for a child that time spent alone with a parent cannot,
but that learning experience is enhanced when the parent is present to provide
a sense of comfort and security. Of course, this incremental benefit of parental
childcare is likely to exhibit diminishing returns and we explicitly allow for that
possibility in our model specification (although it turns out to be of no qualitative
importance).[5]

The fourth key element of our model is *increasing returns* to time spent in
the paid labour force. Increasing returns are due to a number of factors. First,
consider the long-term division of a parent's time between a childcaring phase and a
productive phase. A longer productive phase allows more scope to develop expertise
and productive relationships with other workers. This is especially important for
women, because the childcare phase usually falls early in their productive years
when the currency of their education is at its highest.[6] Browning (1992, 1456)
cites a number of studies that suggest a correlation between career interruptions to

3 Stark (1995) distinguishes between transfers between individuals that are motivated by 'pure'
  altruism and those that are part of an implicit exchange arrangement. Our parameter α refers to
  the former.
4 Strassman (1993, 61) points out that non-monetary investment in the human capital of one's
  children is frequently ignored in economic theory.
5 We do assume that the incremental benefit of parental childcare effect is always non-negative.
  This may not hold for older children, whose growth of independence and self-confidence may be
  inhibited by the continual presence of their parent. In this respect our analysis applies best to the
  care of young children.
6 Fuchs (1986, 60) suggests that one of the hidden costs of children (that falls particularly on
  women) is a reduction in wages relative to those of childless labourers. He identifies three reasons
  for this reduction: first, the lapse in labour force participation for childbearing and caring is dam-
  aging 'because three out of four births occur to women before the age of 30 – at the same time
  that men are gaining the training and experience that lead to higher earnings later in life'; second,

look after children on the one hand, and lower wages and a higher probability of a low-status job on the other. While this may be an equilibrium phenomenon due to a smaller investment in human capital by those who (correctly) anticipate time away from the labour force, it is also consistent with an in-the-work-force learning effect.

Increasing returns are also significant in the day-to-day division of time between paid work and parental childcare. For example, many types of work have substantial fixed set-up costs and require uninterrupted blocks of time. There are also substantial costs associated with coordination among workers that increase when workers are available for shorter periods or at less clearly synchronized times.[7] In addition, individuals who specialize more in paid work are likely to have greater flexibility to deal with the unpredictable demands of production (e.g., that might require unplanned overtime or job-related travel).

The fifth component of our model is a *production externality*. We assume that the output of any given individual in the labour market depends in part on the productivity of his co-workers. This idea is now well established in the endogenous growth literature, where the effectiveness of a worker's individual human capital is enhanced by the stock of knowledge of society as a whole.[8] At a more fundamental level this externality is a key reason for the formation of societies: the societal whole is greater than the sum of its parts.[9]

The rest of the paper is organized as follows. The model is set out in section II. In section III we characterize the Nash equilibrium in parental childcare provision. In section IV we then derive the efficient solution and examine the externalities that can cause the two solutions to diverge. In section V we conclude our discussion and comment on possible directions for further research.

II. THE MODEL

Agents live for two periods. In the first period of their lives agents are children. Children make no decisions and produce nothing; they simply consume output and receive care in accordance with their parents' decisions. In the second period of life each agent is a (single) parent. Each parent has one child. Each parent has one unit of time to divide between *childcare* and *production*. Let z_t denote the time a parent devotes to childcare and let $x_t = 1 - z_t$ denote the time devoted to production.[10]

The output of a parent, y_t, is a function of three variables: the time he devotes to production, his innate productivity π_t, and an index of the productivity of other

'even when mothers stay in the labor force, responsibility for children frequently constrains their choice of job: they accept lower wages in exchange for shorter or more flexible hours, location near home, limited out-of-town travel, and the like. Third, women who devote a great deal of time and energy to childcare and associated housework are often less able to devote maximum effort to market work,' in part owing to absenteeism resulting from the need to care for a sick child.

7 This observation is due to an anonymous referee.

8 The first formal treatment of this idea is Lucas (1988).

9 The last point is due to an anonymous referee.

10 We have assumed that agents take no leisure (except to the extent that parental childcare constitutes leisure).

workers P_t. These variables are defined in equations (1) to (3). We assume the following production function:

$$y_t = x_t \pi_t P_t^\epsilon, \tag{1}$$

where $\epsilon \geqq 0$.[11] This production function reflects a production externality in this economy: the output of any worker depends on both his innate productivity π_t, and the productivity of his co-workers, as reflected in P_t. The strength of the externality is measured by the parameter ϵ. The larger is ϵ, the stronger is the externality. If $\epsilon = 0$, then there is no externality. We assume a very simple specification for P_t: for a particular agent i, P_{ti} is taken to be the average productivity of productive agents other than agent i:

$$P_{ti} = [\Sigma_{j \neq i} \pi_{tj}]/(n - 1), \tag{2}$$

where n is the number of productive agents in each generation (constant across time). We do not believe that our results are particularly sensitive to this specification of P_t; the key property embodied in (2) is that the index of economy-wide productivity is increasing in the innate productivities of the individual productive agents in that economy.

The innate productivity of an agent is assumed to depend on both the amount of parental childcare the agent received as a child and the degree to which the agent specializes in production. Specifically,

$$\pi_t = z_{t-1}^\gamma x_t^\delta, \tag{3}$$

where z_{t-1} is the parental childcare time received as a child, and $\gamma \geqq 0$ and $\delta \geqq 0$ are parameters.[12] A high value of γ implies that parental childcare is very important for future productivity. If $\gamma = 0$, then there is no link between the two. If there are diminishing productivity returns to parental childcare, then $\gamma < 1$. The dependence of π_t on x_t reflects increasing returns to time spent in production. Increasing returns are significant if δ is large and absent entirely if $\delta = 0$. Note that $\pi_t = 1$ if $\delta = \gamma = 0$.

Now consider preferences. Let c_t^0 denote the consumption by a child in period t and let c_t' denote consumption by his parent in period t. Consumption is measured in units of output. The lifetime utility of a child born in period t is given by

$$v_t^0 = \log(c_t^0) + \theta^0 \log z_t + u_{t+1}', \tag{4}$$

where u_{t+1}' is his utility as a parent in period $t+1$. (To simplify notation we assume no discounting of future utility.)[13] The parameter $\theta^0 \geqq 0$ reflects the direct utility

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11 The key parameters of the model are collected in table 1 below.
12 We make no distinction between quantity and quality of childcare time in this model. This is an area worthy of attention in future work.
13 Our choice of functional form for utility is motivated mainly by the need for tractability. The logarithmic form ensures the existence of closed-form solutions for both the equilibrium and efficient solutions and thereby allows a straightforward comparison of the two. This tractability makes the logarithmic form especially popular in dynamic problems; see, for example, Becker and Barro (1988).

TABLE 1
Key parameters

ϵ	Production externality parameter
γ	Children-productivity parameter
δ	Increasing returns to time spent in production
α	Altruism parameter
θ'	Consumption value of childcare time for parent
θ^0	Consumption value of childcare time for child

derived by the child from the childcare time provided by his parent. The utility of a parent in period t is given by

$$u'_t = \log(c'_t) + \theta' \log z_t + \alpha v^0_t.$$
(5)

The parent derives utility from personal consumption, time spent with his child, and the lifetime utility of his child. The parameter $\theta' \geqq 0$ captures the value of childcare time as a consumption good for the parent.[14] His intergenerational altruism is measured by the parameter $\alpha \epsilon$ [0, 1]. Note that a purely selfish parent for whom $\alpha = 0$ may still devote time to childcare if that time is valued by the parent as a consumption good; that is, if $\theta' > 0$.[15]

There are two points to note about our assumptions on familial preferences. First, the altruism is 'non-paternalistic,' like that assumed by Gary Becker in his work on the economics of the family.[16] This means that the parent derives utility from the lifetime happiness of his child rather than from what the child consumes. This specification implies that the sequence of generations can be represented by a dynasty; recursive substitution of equation (4) into equation (5) yields the following expression for the utility of a parent in period t:

$$u'_t = \sum_{\tau=0}^{\infty} \alpha^\tau [\log(c'_{t+\tau}) + (\theta' + \alpha\theta^0)\log z_{t+\tau} + \alpha \log(c^0_{t+\tau})].$$
(6)

Second, children are assumed not to feel altruistic towards their parents: intergenerational altruism is something that develops only in parenthood. This sharp dichotomy between selfishness and altruism is a convenient way of capturing the likely relative degrees of altruism between parent and child, especially when the early stages of childhood are considered.

The key parameters of the model are summarized in table 1.

14 We recognize that θ' may not be positive at all times; caring for a child does not always make for a good time. Time allocation decisions are based on expected values, however, and we assume that $\theta' \geqq 0$ on average. We have also assumed that θ' and all other preference parameters are independent of z. This may not hold in reality, since it is likely that tastes are affected by upbringing. We have not attempted to deal with the possibility of endogenous preferences here because it is too large (and too difficult) an issue to address within the context of our simple model. See Stark (1995, ch. 6) for a discussion of this issue.

15 Note also that, for a purely selfish parent, childcare is virtually identical to 'leisure,' where θ' reflects the disutility of work. We comment further on this point in footnote 21.

16 See the summary in Becker (1993).

Because children make no decisions in this economy, the equilibrium is determined exclusively by the decisions of the parents. The choice problem for a representative parent in period t can be usefully split into two stages.[17] In the first stage the parent chooses the consumption allocation between himself and his child, taking income as given:

$$\max_{c_t^0, c_t'} \sum_{\tau=0}^{\infty} \alpha^\tau [\log (c_{t+\tau}') + (\theta' + \alpha\theta^0)\log z_{t+\tau} + \alpha \log(c_{t+\tau}^0)] \tag{7}$$

$$\text{s.t. } c_t^0 + c_t' = y_t.$$

This problem is straightforward to solve because all terms beyond period t are taken as given by the parent in period t. (The parent cannot influence the output allocation decisions of his descendants.) The solution is $c_t^0 = \alpha y_t/(1 + \alpha)$ for the child and $c_t' = y_t/(1 + \alpha)$ for the parent.

In the second stage the parent chooses z_t, anticipating correctly that each succeeding generation of parents will allocate output according to the solution to (7). Substituting this solution into the maximand in (7) then yields

$$\max_{z_t} \sum_{\tau=0}^{\infty} \alpha^\tau [\log (y_{t+\tau}/(1 + \alpha)) + (\theta' + \alpha\theta^0) \log (z_{t+\tau}) + \alpha \log (\alpha y_{t+\tau}/(1 + \alpha))] \tag{8}$$

$$\text{s.t. } y_t = (1 - z_t)[z_{t-1}^\gamma (1 - z_t)^\delta]P_t^\epsilon$$

$$y_{t+1} = (1 - z_{t+1})[z_t^\gamma (1 - z_{t+1})^\delta]P_{t+1}^\epsilon,$$

where $(1 - z_t)$ has been substituted directly for x_t in both the maximand and the constraints. All terms not involving z_t (including z_{t-1}) are taken as given by the parent in period t.[18] Solving this problem yields

$$\hat{z}_t = [\alpha\gamma + \phi)]/[1 + \delta + \alpha\gamma + \phi], \tag{9}$$

where $\phi \equiv (\theta' + \alpha\theta^0)/(1+\alpha)$. This expression can be interpreted in terms of childcare as investment and childcare as consumption.

1. Childcare as investment

If childcare time provides no consumption benefit to either the parent or the child ($\theta' = \theta^0 = 0$), then there remains only a pure investment component:

$$\hat{z}_t^I = \alpha\gamma/[1 + \delta + \alpha\gamma]. \tag{10}$$

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17 This sequential decision-making is also assumed in the discursive model in Haveman and Wolfe (1993).

18 The equilibrium choice of z_t (see equation (9)) is independent of z_{t-1}. Thus, the expectation that $z_{t+\tau}$ is independent of z_t (for $\tau > 0$) is fulfilled in equilibrium.

The key properties of this investment-based childcare are summarized in the following proposition.

PROPOSITION 1. *Investment-based parental childcare is*
a) *equal to zero if there is either no childcare-productivity link ($\gamma = 0$) or no parental altruism ($\alpha = 0$); and otherwise is*
b) *increasing in the productivity of childcare, γ;*
c) *decreasing in the degree of increasing returns to production time, δ; and*
d) *increasing in the degree of altruism, α.*

These properties follow directly from (10); only property (d) requires further comment. It states that a more altruistic parent will devote more time to investment-based childcare than will a less altruistic parent. The reason is as follows. A higher degree of altruism means that more of the parent's time is devoted to what pleases the child. Because both current and future consumption are normal goods for the child with respect to the parent's time, the child benefits most if any extra time devoted to the child is split between providing more current consumption *and* more future consumption. Providing more future consumption in turn requires a greater investment in childcare.

2. Childcare as consumption

If $\gamma = 0$, then childcare has no investment component. Pure consumption-based childcare is

$$\hat{z}_t^c = \phi/[1 + \delta + \phi]. \tag{11}$$

Its key properties are summarized in proposition 2.

PROPOSITION 2. *Consumption-based childcare is*
a) *equal to zero if childcare time provides no direct utility to either parent or child ($\theta' = \theta^0 = 0$), or if the parent has no altruism and derives no direct utility from childcare time ($\alpha = \theta' = 0$); and otherwise is*
b) *increasing in the direct value of childcare time to parent and child, θ' and θ^0;*
c) *decreasing in the degree of increasing returns to production time, δ; and*
d) *increasing (decreasing) in the degree of altruism if θ^0 is greater than (less than) θ'.*

These properties follow directly from (11). Again, only property (d) requires an explanation. If the child derives more enjoyment from the care time than the parent does ($\theta^0 > \theta'$), then, for a given degree of altruism, the parent will tend to devote less time to childcare than the child would like. So, when $\theta^0 > \theta'$, greater altruism, which causes the parent to put more weight on what pleases the child, will lead the parent to devote more time to childcare. The converse is true when $\theta^0 < \theta'$.

It is easily shown and intuitively clear that the comparative static results in propositions 1 and 2 also apply directly to the combined consumption and invest-

ment childcare $\hat{z}_t$, except as they relate to the altruism parameter α. If $\theta^0 > \theta'$, then greater altruism affects investment- and consumption-based childcare in the same direction; thus, greater altruism unambiguously leads to more childcare. But if $\theta^0 < \theta'$, then the net effect of greater altruism could be negative at low levels of altruism. That is, a small increase in altruism from a low initial level could lead to a reduction in overall childcare time. It is straightforward to show that a sufficient condition for a positive altruism effect at all levels of altruism is $(\theta^0 + \gamma) > \theta'$.[19] This condition has an intuitive interpretation. It means that the altruistic motives for childcare (giving the child time that he enjoys today and investing in the child's future, reflected in θ^0 and γ, respectively) outweigh the 'selfish' motive for childcare (personal enjoyment from time spent with the child, reflected in θ'). When this condition holds, an increase in altruism must translate into more childcare provided.

IV. EFFICIENCY

We derive the efficient solution from a planning problem in which the time devoted to parental childcare is chosen to maximize the utility of a representative parent. That is, we solve for the childcare allocation that each parent would like all other parents to choose. We take as given the output allocation rule chosen by the parent.[20]

Noting that $P_t = z_{t-1}^{\gamma} x_t^{\delta}$ in any symmetric solution, we can formulate the planning problem in period t as

$$\max_{z_t} \sum_{\tau=0}^{\infty} \alpha^{\tau}(\log(y_{t+\tau}/(1+\alpha)) + \alpha \log (\alpha\gamma_{t+\tau}/(1+\alpha)) + (\theta' + \alpha\theta^0) \log (z_{t+\tau})) \quad (12)$$

s.t. $y_t = z_{t-1}^{\gamma(1+\epsilon)}(1-z)_t^{\delta(1+\epsilon)+1}$

$y_{t+1} = z_t^{\gamma(1+\epsilon)}(1-z_{t+1})^{\delta(1+\epsilon)+1}.$

The solution to this problem is

$$z_t^* = [(1 + \epsilon)\alpha\gamma + \phi]/[1 + (1 + \epsilon)(\delta + \alpha\gamma) + \phi]. \quad (13)$$

Comparing equations (9) and (13) yields the following proposition.

PROPOSITION 3.   When $\epsilon > 0$, the equilibrium is efficient if and only if $\alpha[1 + \alpha]\gamma = \delta[\theta' + \alpha\theta^0]$. There is too little (too much) parental childcare in equilibrium relative to the efficient level if $\alpha[1 + \alpha]\gamma$ is greater than (less than) $\delta[\theta' + \alpha\theta^0]$.

19 Differentiating (9) with respect to α yields $\partial\hat{z}_t/\partial\alpha = [\gamma+(\theta^0-\theta')/(1+\alpha)^2](1+\delta)/[1+\delta+\alpha\gamma+\phi]^2$. This derivative is positive at $\alpha > 0$ if $(\gamma + \theta^0) > \theta'$.
20 It should be noted that a child would choose a different allocation rule from that chosen by his parent. In particular, the child would choose to consume the entire output himself. However, this is purely a question of distribution; there is no inefficiency associated with the parent's output allocation rule. Relatedly, Robinson (1987) examines the optimal taxation of a family when parental leisure is a public good within the household. In a static model, he illustrates that a planner with a social welfare function that includes the child's utility as a separate argument would, in general, choose a different distribution of time and goods than is chosen by the parent.

The root of the potential inefficiency is the production externality. An individual parent acting in his own self-interest does not take into account the impact that his childcare decision has on other parents and on the children of those parents. It is clear that the equilibrium outcome is efficient when there is no production externality ($\epsilon = 0$), since in this case individual decisions have no impact outside the family. Of more interest is the direction of inefficiency when $\epsilon > 0$. The LHS and RHS of the efficiency condition in proposition 3 correspond to two potentially offsetting externalities associated with parental childcare. Consider first the LHS. This reflects an *intergenerational externality* associated with childcare as investment. When a parent devotes time to his child it has a positive impact on that child's future productivity if $\gamma > 0$. This productivity effect in turn has a positive impact on the productivity, and hence the well-being, of other future workers, through the production externality. This boost to the well-being of future workers bestows a benefit on the parents of those future workers if those parents are altruistic ($\alpha > 0$). Thus, if $\gamma > 0$ and $\alpha > 0$, then the time one parent devotes to the care of his child bestows a positive externality on other parents.[21] We have called this an 'intergenerational' externality to highlight the fact that the externality operates through an intergenerational mechanism. It is important to bear in mind, however, that the external benefit is actually bestowed on other parents within the *same generation*. If those parents do not care about the well-being of their children ($\alpha = 0$), then there is no externality associated with the productivity effect of childcare even when $\epsilon > 0$.[22]

Now consider the RHS of the efficiency condition in proposition 3. This reflects an *intragenerational externality* associated with childcare as consumption. When a parent devotes time to childcare, he necessarily devotes less time to production, and if $\delta > 0$, the productivity of the time he does spend in production is thereby reduced. This, in turn, reduces the productivity of his co-workers if $\epsilon > 0$. The time he devotes to childcare therefore imposes a negative intragenerational externality on his co-workers. This tends to offset the positive intergenerational externality that operates through the investment aspect of childcare. The two externalities are exactly offsetting when the condition in proposition 3 holds.[23] ???? The relative strengths of the two externalities we identify is ultimately an empirical issue. Our theoretical model indicates only that the positive externality is most likely to dominate (giving rise to too little parental childcare in equilibrium) when the investment

21 The LHS expression involves $\alpha(1 + \alpha)$ because the positive effect on the future worker is both direct and indirect through that future worker's concern for his own child. Hence the $(1 + \alpha)$ term. This overall effect on the well-being of the future worker is then weighted by the concern that his parent has for him. Hence the α term.
22 The absence of intergenerational transfer possibilities is important here. We comment further on this issue in section V.
23 It is worth noting that a reinterpretation of our model that interprets consumption childcare as leisure, and sets $\gamma = 0$, indicates that there is too much leisure taken when $\epsilon > 0$. Leisure also has an investment component, however, in the sense that leisure taken today can boost productivity tomorrow; the productivity effect of childcare can be reinterpreted along those lines. Under this interpretation our model suggests that there could be too much or too little leisure taken in equilibrium.

effect of parental childcare is large relative to its consumption benefits and relative to the degree of increasing returns in the paid labour force. Even this simple comparative result, however, provides some useful insights into empirical phenomena. For example, it can be argued plausibly that the current pace of technological change and 'globalization' is leading to an increased importance of personal adaptability relative to specialization in a particular skill set in the determination of productivity. In terms of our model, this may be reflected as an increase in γ relative to δ. This will tend to raise the benefits of investment childcare relative to its costs and at the same time exacerbate the positive externality associated with childcare relative to the negative externality. This suggests that too little parental childcare may be an increasingly likely equilibrium outcome.

V. CONCLUDING REMARKS

We believe our model provides a number of useful insights into the issue of childcare provision. We are none the less aware that we have abstracted from many important factors relevant to the issue and that our analysis will be able to shed further light when expanded to incorporate these factors. We see at least four directions in which our work needs to be extended. First, we have characterized the childcare decision as a two-stage process involving a parental childcare/labour-force-participation decision followed by a non-parental childcare choice, but we have focused exclusively on the first stage. The non-parental childcare question is clearly important in its own right and at the same time feeds back to the parental care choice; the cost and quality of non-parental care matters for the parental care decision.[24]

Second, we have modelled the household as comprising a single parent and child. This model is directly applicable in only a small number of cases. In most cases there are two parents who can potentially contribute to the care and support of children. This raises a number of important issues. First among them is the question of specialization within a two-parent household and the associated implications for efficiency and distribution within that household. Specialization by one parent in parental childcare and home maintenance, while the other specializes in market production, may be an efficient arrangement within the household and at the same time may diminish the negative production externality we have identified.[25] On the other hand, the same specialization effect means that the parent who stays at home with the children closes, at least to some extent, the option to enter market production in the future should circumstances change or as the children get older.

24 See Cleveland, Gunderson, and Hyatt (1996) for a recent empirical analysis of this interdependence. A natural way to extend our model to incorporate non-parental care is to include a third multiplicative variable in equation (3) to capture the impact of non-parental care on future productivity.

25 It might also be possible for one parent to specialize in a market activity in which specialization is very important, while the other divides his or her time between parental childcare and a market activity in which specialization is less important.

Efficiency may in fact call for the preservation of that option despite the associated costs.[26]

Third, we have neglected entirely questions of sex and gender roles, and the distinction between parental and maternal care. The distinction is undoubtedly an important one with respect to the care of very young children. Biological differences between men and women *may* give women a comparative advantage in the care of very young children, and this has implications for the question of specialization raised earlier. (It is crucial, however, that we distinguish between comparative and absolute advantage before drawing any conclusions in that regard). In any case, a host of fundamental efficiency and distributional questions need to be addressed with respect to gender and childcare.

A fourth direction in which our analysis needs to be extended relates to intergenerational transfers. Recall from our discussion of proposition 3 that the *intergenerational* externality we identify is actually an externality between parents within the same generation, even though it operates through an intergenerational mechanism. There is no associated inefficiency if parents do not care about the productivity benefit bestowed on their children by the childcare that other children receive. This story is clearly incomplete. If childcare does have a future productivity effect, then the parents of today still bestow an unpriced positive benefit on the workers of tomorrow when they care for their own children, even if the parents of those future workers derive no benefit from it. This does not show up as an externality in our model because there is no possibility of intergenerational transfers from the young to the old. This would not be true in an economy in which agents live for three periods. In such an economy there will arise an inefficiency associated with childcare as investment, even in the absence of altruism.[27]

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26 A preference for variety in lifetime activities may also argue against complete specialization.
27 Extending consideration to three-period-lived agents would also allow us to address the implications of a *temporary* withdrawal from the production sector to specialize in childcare provision.

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