
14. HOUSEHOLD PRODUCTION AND CHILDREN

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ABSTRACT

This paper adapts Mincer's ideas about informal training, best exemplified by on-the-job training (OJT), to investments that families make in children before formal schooling begins. Like OJT, in-home training (IHT) occurs in informal settings, requires costly time inputs and is complementary with formal schooling. In addition to choosing among home production, leisure and market work, parents also choose which particular home activities to pursue. That working mothers dramatically reduce the time they devote to leisure, sleep, and other home activities in order to preserve their time in human capital-building activities with children, illustrates and validates the home production framework.

When we consider all the important topics that have engaged Jacob Mincer's attention over the years—women's labor force participation and wages, schooling experience and earnings, migration—children were rarely an explicit focus. Yet I believe that the issue of children and investment in them was always implicitly in his work and that many of Mincer's breakthrough approaches opened up ways of thinking and studying important issues relating to children. This paper builds on Jacob Mincer's seminal work on the choices women make about how much time to supply to the market and how much to the home (Mincer 1962), his work relating to

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on-the-job training (Jacob Mincer, 1962), and Gary Becker's formulation of theories about home production (Becker 1965) in order to examine how a mother's time allocation choices affect her children.

Mincer's redirection of attention from the prevailing dichotomy of market work versus leisure to a consideration of a choice set that includes home production in addition to market work and leisure, provided the foundation for understanding fertility choices as well as women's labor supply to the market and, implicitly to understanding time inputs to children (Mincer, 1962). Since the time that Jacob Mincer first wrote about these issues in the early 1960's, a time when only one-third of married women participated in the paid work force, women's participation rates have doubled.

Many women adjusted to their rising opportunity costs of time in home production by reducing their fertility. But lower fertility only partially explains women's increased market work. Work outside the home is now prevalent, even for mothers of small children. By 2003, over half (56.5 percent) of married women whose youngest child was under three were in the labor force (US Bureau of the Census, 2004) and rates were even higher for unmarried mothers.

In an analysis of the CPS data, Jacob Klerman and I explored the reasons for the increases over the period 1971 to 1990 in labor force participation by married mothers whose child was under three years old (Arleen A. Leibowitz and Jacob Alex Klerman, 1995). For the period 1971–1990, we found that demographic characteristics (maternal education, maternal age, family size, paternal age) changed in ways that promoted labor supply of new mothers, but that these factors accounted for less than 20% of the observed growth in participation. Predicted wages of the husband and the wife (based on individual characteristics as well as local market conditions) were strong predictors of market labor supply and explained an additional 25% of the increased participation. Not only have women's own higher earnings prospects been a major factor pulling them into the work force, but the strength of this effect has also increased over time. By 1990, women were more responsive to their own wage prospects and less responsive to their husbands' (worsening) wage prospects than they had been 20 years earlier (Leibowitz and Klerman, 1995). Throughout the period, mothers of infants under one year old were less likely to be labor force participants than mothers of one and two year olds, but the inhibiting effect of newborns under 1 year old on their mothers' market work eroded significantly over these two decades.

14.1. HOUSEHOLD PRODUCTION OF CHILD HUMAN CAPITAL

In order to better understand what mothers' high levels of market work mean for their children's health and development, it is useful to expand the household production framework to distinguish among time spent in the labor market, in leisure, developing the human capital of children and in other household production.

14.1.1. Sources of Utility

The utility framework is expanded as well to include the human capital of the child (H) as one of the arguments in the utility function, along with the consumption of goods and services, (X), and parental leisure (L).

$$U = U(X, L, H) \quad (1)$$

14.1.2. Production of Human Capital at Home

Human capital, in this case, encompasses children's physical health as well as cognitive and emotional development. A child is born with a certain stock of human capital, which may partially result from prenatal investments. Additions to this stock are produced through household production with inputs of parental time (t_h), child time (t_c), and purchased goods that affect child development (X_c). These purchased goods may include childcare supplied by someone other than the parent, as well as other goods, such as books. The goods include both those with a positive effect on human capital development and those, such as secondhand smoke, with negative effects. The productivity of time spent in human capital investment in any time period depends on the child's stock of capital at the beginning of the period H_{t-1} , as well as on genetic endowments (G) and the efficiency of parental time inputs in human capital production (E):

$$\Delta H_t = H(t_h, t_c, X_c; H_{t-1}, G, E) \quad (2)$$

Parents' time is strictly constrained: the sum of their time at work, with children, in other home production, and in leisure cannot exceed the total time available in the period:

$$T_{it} = t_{hit} + t_{oit} + t_{wit} + t_{lit} \quad (3)$$

Where T_{it} is the total amount of time available to parent i in time period t and t_{hit} is the time spent with children by parent i . The amount of time spent by parent i in other home production (including commuting to work) is t_{oit} , the amount of time spent at work is represented by t_{wit} and t_{lit} represents time spent in leisure activities.

Similarly, the family's expenditure on consumption goods in any period is limited by the amount of earned income, non-earned income available in the period and by the family's ability to borrow:

$$(\sum w_i t_{wit} + V_t) - C_{kt} = S_t \quad (4)$$

Where w_i is the wage rate of parent i so that $\sum w_i t_{wit}$ represents the sum of parents' earnings during period t . Income also includes non-labor income, V_t . Consumption expenditures in period t (C_{kt}) consist of all consumption expenditures, including spending on goods that affect child development and those that affect only parents. Although this formulation allows for positive or negative savings in

period t (S_t), it is likely that most parents are constrained by the amount of their earned and non-earned income because most are at the start of their earning lives, with few savings and facing substantial borrowing constraints.

This simplified model captures a number of relevant factors about child development:

1. Nurture in the form of investments in children combines with nature (the genetic endowment) in determining child human capital levels at any point in time.
2. Prior investments in human capital in the child affect the productivity of later investments.
3. Parental time contributes directly to the development of children's human capital.
4. Parental time devoted to developing child human capital has an opportunity cost in terms of market work, other home production, and parental leisure.
5. Child time inputs matter. Thus how children spend their time affects the development of their human capital.
6. Childcare is productive of child development, and therefore may be valued and purchased even if it is not required to free the mother for market work.
7. In choosing a particular source of childcare, parents trade-off its developmental potential against other considerations, such as its cost and convenience (Anne S. Johansen, Arleen A. Leibowitz, Linda J. Waite, 1996).

A child's human capital stock grows continuously throughout childhood since the investments that parents and children make typically exceed depreciation or loss due to accidents, which are generally negligible during this time. A child whose initial stock of human capital is low (perhaps as a result of preterm birth), is likely to have lower levels of human capital at age three than a child with full term birth who experiences the same level of parental investments (Peggy J. McGauhey, et al. 1991).

14.2. IN-HOME TRAINING

The production of human capital in the home has a great many parallels with on the job training (OJT). Like OJT, in-home training (IHT), occurs outside of the formal schooling sector and requires costly time inputs. Like OJT, IHT is complementary to schooling.

14.2.1. IHT is Informal Training

IHT is similar to OJT in that both develop human capital outside of a formal schooling setting. As their names suggest, IHT occurs primarily in the household and OJT in an employment situation. Mincer's work on OJT emphasized the continuing production of human capital in the informal sector after the completion of schooling. Equally important is the production of human capital in the informal, household sector, prior to acquiring formal schooling. Initially, the child has such low levels of

human capital that specialization in human capital production is likely to occur. Even activities that appear to be consumption—such as eating—contribute to the child’s development of human capital. For example, the responsiveness of the caretaker to the child’s cries for food build the child’s sense of competence and ability to control the environment (Barry Zuckerman and Robert S. Kahn, 2000) and the amount and quality of the caretaker’s communication affect the child’s mastery of verbal skills (Janellen Huttenlocher, et al, 1991; Jeanne Brooks-Gunn et al, 1996). This may be a classic example of “learning by doing”.

Both OJT and IHT occur as byproducts of other activities and these investments are difficult to measure. This may explain why their contributions to human capital have not received as much attention as the impact of formal schooling on human capital development (James J. Heckman and Lance Lochner, 2000; Pedro Carneiro et al., 2002).

14.2.2. IHT Requires the Parent’s Time

As Jacob Mincer wrote at the start of his book, *Schooling, Experience, and Earnings* (1974), “Investments in people are time consuming.” The difference between OJT and IHT is that IHT requires the time of at least two people—the child and the caretaker. The adult caretaker has to choose among alternative ways of spending time. First there is the choice between market work and remaining at home with an infant. Even if she is not participating in the labor market, a parent still must choose between spending time in home production with children (e.g., reading to the child), producing other goods at home (e.g., gourmet meals), and spending time in her own consumption (e.g., reading a novel or watching a soap opera on TV). The fact that, even within the home, the caretaker can choose to spend time in producing child development, in own consumption, or other household production, renders problematic the hiring of substitutes for parental time in caring for an infant. Parents who leave their child in someone else’s care while they work find it difficult to monitor whether the nanny or babysitter is spending her time investing in the child’s human capital or enjoying her own consumption at the expense of the child. This is particularly the case for newborns who cannot report on how they spent their day.

The IHT model suggests that the mother need not reduce her time with children by an hour for every hour she works, since there are other activities that can be substituted for work time as well. Indeed, time use data show that working mothers selectively reduce their own leisure time, sleep and time in producing commodities other than child care as compared to non-working mothers (Suzanne M. Bianchi, 2000). As a result, mothers working outside the home averaged nearly as many hours in direct child interaction as did non-employed mothers (27 versus 31 hours per week; see John F. Sandberg and Sandra L. Hofferth, 2001; Lindsay Chase-Lansdale, et al., 2003).

If working mothers value the human capital produced through interacting with children, they should preferentially preserve time in activities that promote human capital growth at the expense of other activities that do not. Time budget data from

the 1960's reveal that more educated women are better at allocating their time to the activities that produce human capital (Arleen Leibowitz, 1975). Mothers with more schooling spent more time in the labor market and less time in most household activities than less educated women, as one would predict from the opportunity cost of their time. However, they spent more time with children, particularly in activities that could be expected to produce human capital, such as reading with or talking to children. Several factors could account for this unexpected result: a high income elasticity for time with children, the difficulty of substituting purchased inputs for parental time, or the increased productivity of educated mothers in child care relative to other activities (Leibowitz, 1975).

Still today, more-educated mothers spend more time with children in activities that enhance the child's human capital. Data from the 1996 National Household Education Survey confirm that 3 to 5 year old children whose mothers are college graduates were more than twice as likely to be read to every day than children whose mothers did not have a high school degree (77% vs. 37%) (Lisa M. Lynch, 2000). More educated mothers also read more to their children who were less than 3 years old (Pia Rebelli Britto, et al., 2001).

These early experiences appear to have the greatest impact on child outcomes (Britto, et al., 2002). Direct measures of how mothers interact with children are strong predictors of children's verbal scores at age five and six. The National Commission on Reading concluded that reading with children is the factor most closely related to the development of literacy skills (as reported in Zuckerman and Kahn, 2000). Children whose mothers read to them daily have significantly greater verbal skills than children whose mothers do not read to them, as do children whose mother involves them in learning activities outside the home, and who have a mother with a less harsh and more nurturing disciplinary style (Meredith Phillips et al., 1998). Including these direct measures of time investments in children renders both maternal I.Q. and maternal and paternal education insignificant as predictors of a child's verbal skills (Phillips et al., 1998). This strongly suggests that the relationship between maternal education and child outcomes reflects educated mothers' greater allocation of time to human capital-enhancing activities and possibly their greater productivity in developing human capital in any particular activity, and not merely the genetic endowment passed on to the child.

14.2.3. Substituting for Parental Time

In terms of the substitutability of purchased inputs for parental time, childcare centers appear to be as productive or more productive than mothers in developing human capital for children between the ages of two to four. The evidence indicates that toddlers in day care settings develop better both socially and cognitively than children raised entirely at home (Allison Clarke-Stewart, 1991; Elizabeth Harvey, 1999; Jennifer Hill, Jane Waldfogel, and Jeanne Brooks-Gunn, 2002).

However, the findings on substitution are less positive for children under one year of age—the group for whom maternal employment has been growing most rapidly. Several studies find that maternal employment negatively affects children's outcomes

in the first year of life (Sonalde Desai, et al., 1989; Nazli Baydar and Jeanne Brooks-Gunn, 1991; Francine Blau and Adam J. Grossberg, 1992; Jane Waldfogel et al., 2002). In understanding the factors underlying this result, it is useful to consider the work of psychologists who find that a key factor in children's later social behavior and school achievement is the quality of the relationship with a supportive adult in infancy (Martha Erickson, L. Alan Stroufe, Byron Engeland, 1985; Martha F. Erickson, Karen Kurz-Riemer, 1999). Neurobiologists have recently documented a physiological basis for these findings. Caretaking that is sensitive to a child's needs alters neural pathways in the brain (Rima Shore 1997). Experiences in the early years determine which of a child's neural connections are reinforced and which are pruned as no longer necessary (Sharon L. Ramey and Craig Ramey, 2000). Thus, a child who experiences an environment that is rich in stimuli builds a better physiologic basis for later learning. This applies not only to the acquisition of verbal skills, but also to the child's ability to regulate emotional responses. (Jack P. Shonkoff and Deborah Phillips, 2000). The metaphor "investment in human capital" has proved to be very apt because imaging studies can now document that early stimulation of infants results in physical changes in the structure of the child's brain (Heidelise Als, et al., 2004; Paul M. Thompson, et al., 2000).

The fact that newborns absorb lessons from the way routine caretaking is performed suggests that substitutes for parental time are even harder to find for infants than for toddlers, where physical care and educational activities can be more clearly delineated. Differences between the types of learning done by infants and by toddlers perhaps contribute to the negative impact of maternal work during the first year of a child's life, in contrast to the neutral or benign effect of work when the child is older.

14.2.4. IHT Requires the Child's Time and Human Capital as Inputs

A child builds human capital over time by participating in activities that enhance knowledge or health. Much empirical evidence suggests that certain types of activities (e.g., reading with children) enhance children's verbal and cognitive skills. Other activities (e.g., watching T.V.) are presumed to have neutral or negative effects on a child's human capital.

Economists have tended to ignore the time input by young children to the development of their own human capital because markets for children's labor are limited in this country. In developing countries, the trade-off between children's work and human capital investments is more apparent (Duncan Thomas, et al., 2004; Rajjeev Dehejia, 2005)

In the United States, there has been concern that adolescents' market work detracts from their ability to accumulate human capital. Time spent in employment by teenagers is negatively correlated with time spent studying (see Christopher Ruhm, 1997) for a review and critique of the selection problems). Surprisingly, moderate amounts of work during high school are positively associated with future earnings (Ruhm, 1997; Audrey Light, 2001), indicating that some employment experience during high school may enhance human capital.

Like adults, children have a fixed amount of time available in a day and must choose among a variety of ways to spend the time that they are not in school or at work. Studies of children's time use suggest a trade off between educationally productive uses of time and educationally unproductive uses of time. These studies show parental education has a strong positive effect on the amount of time a child allocates to reading or studying and strong negative effect on time watching television (Suzanne Bianchi and John Robinson, 1997). Time budget studies of children's time use have found that the amount of time children spend in "productive" activities such as reading correlates positively with their scores on standard achievement tests (Sandra L. Hofferth and John F. Sandberg, 2001). Drawing causal inferences from this type of cross-sectional data is hazardous. However child care interventions that employ random assignment of children to different treatments provide a more persuasive means of assessing the effects of increasing the amount of time children spend in more structured, educationally oriented environments.

The Infant Health and Development Program found that children born at low birth weight who were randomly assigned between age one to three to receive high-quality child care had significantly greater cognitive development than the control group of low birth weight infants (Marie McCormick et al, 1992; Jeanne Brooks-Gunn et al, 1994). In the Perry Preschool Project, black children who were already developmentally delayed at age 3 or 4 were assigned to receive an intensive program of stimulation in a developmental nursery school or usual care. At age nineteen the intervention group scored higher on school achievement tests, compared to the control group, even though there were no differences in measured IQ between the two groups.

Working with healthy, full-term infants from economically disadvantaged families, the Abecedarian Project randomly assigned the children to either an intensive developmental intervention or to a control group. Children remained in the study until they reached kindergarten. Even during infancy, children in the Abecedarian intervention group were able to learn new tasks more quickly than children randomly assigned to the control group (Sharon Ramey and B.J. Smith, 1977). Intensive, early investments appear to have long-lasting effects on educational outcomes, consistent with the idea that early additions to a child's human capital increase the productivity of later schooling investments. For example, the Abecedarian Project documented long-run declines in special education placement and grade retention (Ramey and Ramey, 2000), despite a reduction of the IQ advantage for the intervention group by age 14.

A recent evaluation of the Early Head Start Program documented that the 3000 children randomly assigned to attend Early Head Start from birth to age 3 had better cognitive and language development as well as greater ability to concentrate, compared to a control group of children (Administration for Children and Families, 2002).

Choices that parents make even prior to the child's birth can affect an infant's initial stock of capital. For example, a pregnant woman may or may not choose to forgo pleasurable consumption activities such as smoking or drinking alcohol that have

could have a negative impact on the child's health, but provide utility to the mother. Children born with greater stocks of human capital in terms of birth weight have a health advantage over low birth weight infants that persists through at least age 11 (McGauhey, et al., 1991). However, there is evidence that low birth weight infants with more educated parents receive health investments that compensate for their children's initially low levels of health capital. Low birth weight infants in moderate and high socio-economic status families catch up to their normal birth weight peers, whereas low birth weight children in high-risk social environments have increased likelihood of poor health outcomes that persists throughout childhood (McGauhey, et al., 1991).

14.3. IHT IS COMPLEMENTARY TO SCHOOLING

The allocation of time in early childhood is important because the human capital developed through human-capital-enhancing time use affects the productivity of a child's time in later investments. Thus, children tend to follow developmental trajectories that are higher over time if they benefited from substantial early human capital development, and lower if their initial stocks were low due either to poor genetic endowment or to lack of early investment (Janet Currie and Rosemary Hyson, 1999; Neal Halfon et al., 2000; Anne Case et al., 2002). Not only does the child with greater endowments and early investments have more human capital at all ages, but the stock also grows more in each period because the child's own human capital is a necessary input to producing increments to the stock.

For the school-age child, the quality of the school inputs affects the amount of human capital development. However, educators have been disappointed to find that, although enhancing school inputs improve outcomes, the effects are not large quantitatively. A production function framework helps to make sense of the finding that simply increasing school inputs may yield only modest improvements in school outcomes. The production of human capital in schools requires both school inputs and a student with sufficient levels of human capital (both cognitive and behavioral) to absorb what the school provides. Some psychologists have postulated that only 10% of today's elementary school students are motivationally ready and able to learn (Howard Adelman and Linda Taylor, 1994). The remainder of children face deficiencies in prerequisite skills, disabilities, or motivation to learn. It is not surprising that the marginal product of the school inputs is low if the levels of human capital that the students bring to the process remain fixed.

Like OJT, IHT is complementary to formal schooling. Just as employees with more schooling are also more likely to obtain OJT (Jacob Mincer, 1997), there is evidence of a virtuous circle between IHT and schooling—with greater levels of IHT related to more schooling. Because the child's existing stocks of human capital are an input to the production of additional capital, early investments in the child's human capital enhance the value of later schooling. Katarina Nordblom (2003) argues that the complementarity between formal schooling and private, home investments in children may lead to the perverse result that increasing public schooling may widen

disparities in outcomes because those children with the greatest home investments can benefit most from additional formal schooling.

One might argue that the positive relationship between IHT and schooling is not causal, but results from the influence of omitted variables, such as family income, or genetically determined intelligence, that are common determinants of IHT and formal schooling levels. However, the interventions that employ random assignment indicate that at least part of the effect is causal. For example, when tested at age nineteen, children in the Perry Preschool Project intervention group not only scored higher on school achievement tests but they also exhibited better behavioral outcomes. Intervention participants were significantly more likely to have graduated from high school and significantly less likely to have been arrested or to have received welfare. The girls were half as likely to have been pregnant (John R. Berrueta-Clement et al, 1984).

Lynn A. Karoly et al. (1998), reviewing a number of developmental programs with young children, conclude that the interventions produced cognitive gains during or immediately following the intervention, but these gains were short-lived. However, the intensive, early interventions appear to have developed human capital that was complementary to formal schooling and related to longer run outcomes such as high school completion.

Because of the relationship between early investments and completed schooling, some of the gains to early investments are captured by the child in the form of returns to schooling. However, the benefits to society may be even greater than the individual returns. For example, an analysis of the Perry Preschool Project finds that half of the total discounted present value of the program's benefits accrue to the public sector. Not only are there reductions in schooling expenses, welfare, and criminal justice costs, but there are also increased tax revenues derived from higher levels of earnings and employment. These public benefits amount to twice the cost of the program. An additional 21% of total benefits is attributable to a reduction in losses by victims of crime (Karoly, 1998). Private returns to the child account for about 27% of total returns, for a benefit/cost ratio only slightly greater than one. These estimates suggest that early investments in children may yield significant positive externalities. Investments in human capital directly enhance the wellbeing of children, and they also make current school investments more productive by reducing grade retention and special education costs. Early investments also appear to reduce juvenile crime and teen pregnancy—some of the most intractable problems our society faces (Leibowitz, 1995).

14.4. CONCLUSION

The idea that human capital can be developed in informal settings—outside of school—was originally articulated by Jacob Mincer in his case for on-the-job training. This paper has argued that there is a parallel set of investments that occurs before formal schooling begins. Infants provide a classic example of “learning by doing.” Like OJT, IHT not only occurs in informal settings, but it also requires costly

time inputs and is complementary with formal schooling. The fact that working mothers, particularly highly educated working mothers, dramatically reduce the time they devote to leisure and to other types of home production in order to preserve their time with children, illustrates and validates the home production framework.

In the past 40 years, mothers of preschool children have returned to the labor market in large numbers. What does this substantial transfer of time away from childcare and into market work portend for children? Although increasing hours in the labor market have led women to reduce their time inputs to most household tasks, mothers act to protect their time with children in human capital-producing activities, even at the expense of their own sleep and leisure.

Purchased substitutes for the mother's time, such as formal childcare, appear not to harm most children and may enrich the environment for some, particularly children from less privileged families. Additions to family income brought about by mothers' work increase the available market goods to both parents and children. Thus, there is little evidence to date that working mothers disadvantage their children. However, there is a need for more thorough investigation of how effects on children differ with the timing and intensity of maternal work. Emerging research suggests later cognitive and behavioral difficulties among children whose mothers returned to work full time during the child's first year of life. Thus, it is a concern that such a large percentage of mothers work before their child's first birthday, a time when children are building the foundation for their later human capital development.

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