Prefatory Note

All papers, except the first, appearing in this, the second Supplement to the *Journal of Political Economy* devoted to the economics of fertility, were presented at a conference held June 4 and 5, 1973. The searching and critical discussion that followed the invited comment on each of these papers helped the authors appreciably in the revisions that most of them made prior to publication.

The National Bureau of Economic Research and the Population Council are the sponsors and provided the funds for both the 1972 conference, the proceedings of which appeared in the March/April 1973 Supplement, "New Economic Approaches to Fertility," and the 1973 conference, from which this Supplement evolved. In planning the 1973 program, I had the advice of Gary S. Becker, Victor Fuchs, Robert T. Michael, Marc Nerlove, T. Paul Schultz, and Robert J. Willis.

Once again I apologize to those who wished to attend the conference but for whom there was no room because of my decision to keep the number of participants small. Others who attended and took part in the conference, in addition to the authors and discussants listed in this Supplement, were Mary Jean Bowman, Harley Browning, Tomas Frejka, Victor Fuchs, H. Gregg Lewis, Robert T. Michael, Warren Sanderson, T. Paul Schultz, Joseph J. Spengler, Boone A. Turchi, and Robert J. Willis.

The favorable responses to the combined list of all references, as they were presented in the first Supplement, has led Mrs. Virginia K. Thurner and me to repeat the combined listing of all references in this Supplement.

As was true last time, the editorial quality of this Supplement owes much to the competent work of Mrs. Thurner.

THEODORE W. SCHULTZ

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The High Value of Human Time: Population Equilibrium

Theodore W. Schultz

University of Chicago

In the continuing economic dialogue between theory and data about fertility, we see once again that fertility is influenced by the differences in the opportunity costs of children associated with the stock of human capital of mothers. The quality of the sacrifices that parents make in acquiring the satisfactions they derive from children influences the quality of the children. But quality is expensive. On these and other important points, the core of the studies in this volume provides additional evidence supporting the first set of studies (T. W. Schultz 1973*c*). Mincer and Polachek evaluate the on-the-job training that women forego on leaving their jobs to have and to care for their children. Heckman examines the effects of child-care programs on the labor-force work efforts of women. Leibowitz, using a unique sample of children with data on them spanning virtually four decades, provides important new evidence on home investment in children. These studies are complemented by Becker's extensions of his theory of marriage and by Freiden's application of the theory to the U.S. marriage market. Benham advances a hypothesis for interpreting the effects of wives' education on the earnings of their husbands.

Turning to the marked decline in fertility in Japan, Hashimoto shows that much of it is explained by the economic variables that are featured in the household approach to fertility. But the sociologists who participated in the conference—Browning, Duncan, and Goode—challenged us repeatedly with the argument that we are not bold enough in extending and applying our economic theory to fertility.

Admittedly, except for the Taiwan study by T. Paul Schultz (1973), we have been shy in extending our theory to fertility behavior in low-

I am indebted to Gary S. Becker, Marc Nerlove, and T. Paul Schultz for their helpful comments on an early draft of this paper.

income countries. Then, too, with the exception of Nerlove's paper in this volume, we have been timid in developing a framework for analyzing the interactions between the micro behavior of households and the changing state of the economy.[1] Griliches's comment advances the inquiry, and the searching discussion that followed at the conference indicated clearly the importance of this neglected problem. Although boldness is called for in solving this problem, it alone will not suffice.

As the title of my paper implies, I shall examine issues that are related to Nerlove's analysis. The latter part of his paper opens an important new vista. Since his approach to the high price of human time parallels my recent work, as he notes in his paper, and since it has been in the forefront of my thinking, my aim is to supplement this part of his paper. I shall first consider two widely different population equilibrium concepts; in support of the second concept I shall extend the explanation of the secular increases in the value of human time. I will then take a critical look at the usefulness of the household model in analyzing fertility in countries characterized by high birth and death rates and by substantial increases in national income in a context where the level of the economic value of human time is very low and not increasing much.

I

The idea of a population equilibrium is here viewed strictly as an analytical concept to guide economic thinking in deriving testable propositions pertaining to fertility. As an analytical device there is no presumption that any population ever has arrived or will arrive at a precise equilibrium. In this respect the concept of a population equilibrium is on a par with the many other equilibrium concepts that abound in economic analysis.

Two very different concepts of a population equilibrium can now be formulated. They may be viewed as types at the two extremes with respect to the state of the economy. The first rests on the proposition that the equilibrium is basically a consequence of increases in the price of the services of natural resources relative to capital and labor (wages). The underlying proposition of the second concept is that the equilibrium is determined predominantly by increases in the price of human time relative to that of materials. The per capita income implication of the first is subsistence and that of the second a high standard of living.

The first concept, as it was envisaged by the early English economists, has long been a standard part of economics. It assumes that the supply of land is fixed and that diminishing returns gradually increase the price of food as a consequence of population growth. Gains in productivity from

[1] For concern about aspects of this problem, see Yoram Ben-Porath (1973), T. Paul Schultz (1973), and Marc Nerlove and T. Paul Schultz (1970).

capital are exhausted by this process. This concept can, of course, be extended to encompass the results of the recent macrosystem models that purport to show the limits of the earth in accommodating population growth. These models are not restricted solely by the availability of land to produce food, since they also include the physical limits set by the availability of minerals, energy, and space for people. The fertility behavior of people in these models is crudely Malthusian; population growth stops (suddenly) as a consequence of the inevitable food, energy, and space crisis. Within the Ricardian framework, this concept is a logical conception of a population equilibrium. It is a dismal view of human behavior that has long been an important idea in social thought.

The foundation of the second concept is the high price of human time relative to the price of the services of material factors and goods. The concept rests on the proposition that the state of the economy is such that the economic role of the services of natural resources and of intermediate material products is small relative to the role of the services of human agents in production and in consumption, in the sense that the value of the contribution of materials to human satisfactions is small compared with that of human agents. In the context of such an economy, the opportunity cost of bearing children is high and the investment in their human capital is large. The welfare implications of this concept are unmistakably optimistic because the gains in productivity from the accumulation of human and nonhuman capital are transformed into high standards of living supported by high per capita income. Advances in useful knowledge, embodied in human and nonhuman capital, have gradually destroyed the assumption of the fixed supply of the "original properties of the soil." In the process, it is the scarcity of human time and its high value that dominate, and it is the "fixed supply of human time" consisting of 24 hours per day and of a man's lifetime that becomes the critical factor in analyzing the economic behavior of people, including their fertility.

Empirically, there is an abundance of evidence which shows that the price of human time accounts for most of the costs in a modern economy. The upward tendency of real wages and salaries, including fringe benefits, of earnings foregone by mature students, and of the value of the time of housewives relative to the price of materials is well documented.[2] Economic theory implies, and we observe, that material goods are substituted for human time by firms and by households. Received theory,

[2] Evidence, for example, on long-term changes in wages and salaries relative to rent paid for the services of farmland in the United States shows that the total real compensation per hour at work of all manufacturing-production workers increased between 1929 and 1970 more than four times as much as did the rent on farm real estate per acre, similarly adjusted, under the assumption that rents tended to parallel the changes in the price of farm real estate per acre (T. W. Schultz 1972*b*).

however, is silent on the effects of the high and rising price of human time on pure consumption, although consumption obviously entails time. In my thinking, the ultimate economic limit of affluence (economic growth) is not in the scarcity of material goods but in the scarcity of human time for consumption.[3]

Theoretically, the critical postulate assumes that there is a dynamic process that determines the increases in the price of human time relative to the price of the services of the nonhuman factors and that this process tends toward an equilibrium. The dynamic part is the economic key to the following four issues: (1) the relative increase in investment in human capital augmenting the quality of human beings, (2) the relatively high price of all labor time–intensive goods and other sources of labor–intensive satisfactions, including children, thus leading to the substitution of quality for numbers of children, (3) the relatively cheap material goods that are not labor-intensive, and (4) the scarcity of the time for consumption, setting the ultimate limit to the satisfactions that can be derived from materials provided by economic growth.

Although it is obvious that the economic value of human time is high in the affluent countries that have a modern economy, it is not obvious why these economies have developed the demand for and supply of human abilities that have such a high value in terms of earnings and satisfactions that people derive from them. I shall elaborate on these developments (see T. W. Schultz 1972*b*, 1973*a*) and examine some of their basic aspects.

My approach to the persistent secular increase in the economic value of human time consists of a highly simplified framework to get at the supply and demand developments that appear to be determining the rise of the price of human time in the context of the modernizing processes. The developments explaining the increases in the supply of the quality attributes of human agents are fairly clear, whereas the developments underlying the increases in the demand for these quality attributes are still not clear. Recent advances in economic analysis (summarized in T. W. Schultz 1972*a* and 1973*b*) provide the major parts of the theory for determining the supply of these quality attributes. They treat the useful abilities that people acquire as forms of human capital. The investment in these abilities is taken to be in response to favorable investment opportunities, and thus the increases in the supply depend on current expenditures (sacrifices) made by individuals, by families, and by public bodies on education, health, job training, the search for information, and geographical migration to take advantage of better jobs or of better consumption opportunities. These expenditures (sacrifices) are

[3] The approach outlined in this paragraph and a considerable part of the argument that follows appear in my Woody Thompson lecture to the Midwest Economics Association, "Explanation and Interpretations of the Increasing Value of Human Time" (T. W. Schultz 1973*a*).

presumably made deliberately with an eye to future satisfactions and earnings. The theory of the allocation of time and the household production model are of special importance in analyzing the incentives and responses of people in acquiring education and job training, in enhancing their health, in searching for information, and in altering their fertility, including the substitution of quality for numbers of children. Thus, these supply responses to the increases in the economic incentives associated with modernization are not hard to comprehend. The human capital literature abounds with studies dealing with aspects of these supply responses.

But these human capital studies have not explained the secular increases in the demand for these quality attributes of human agents. The clue to this unresolved puzzle is concealed in two basic factual issues. The first of these is that diminishing returns to capital have not occurred generally, despite the vast accumulation of capital in the advanced economies. The second is the relatively high rate at which the formation of human capital has occurred. Of the two, the first is fundamental, and the resolution of it provides a solution for the second. In my thinking, the key to both is in that part of the economic process that increases the stock of useful knowledge.[4] It is the acquisition, adoption, and efficient utilization of this knowledge that have provided *the decisive new sources of investment opportunities* that have maintained the growth process and have kept the returns to capital from diminishing over time. Furthermore, these additions to the stock of knowledge have been relatively more favorable in increasing the investment opportunities in the quality attributes of human agents than in the quality components of material agents of production. The investment incentives that are revealed by the inequalities in these investment opportunities, as they occur over time, are the mainspring in this process.

In an all-inclusive view of these investment opportunities, the knowledge-producing sector must also be included. It is not a trivial sector in modern countries, nor is it exogenous. Research is an organized activity that requires specific, expensive, scarce resources. Although research is costly, recent studies, most of them devoted to analyzing the rates of return to investment in organized agricultural research, show very high social rates of return.

With respect to this investment process, economists could have been spared much aimless wandering had they perceived the implications of

[4] Simon Kuznets in his Nobel Prize lecture, which appeared in the June 1973 *American Economic Review* under the title "Modern Economic Growth: Findings and Reflections" (Kuznets 1973), also attributes a major role to the additions in knowledge in this context. He argues that the last two centuries have been periods during which there has occurred "enormous accumulation in the contribution to the stock of useful knowledge by basic and applied research" (p. 251).

the concept of capital as Marshall sketched it for us. His predecessors had formulated the concept of the "state of the productive arts," and they then proceeded to develop the core of economic theory under the assumption that these arts remained constant. It was an ingenious simplification, and their theory was in general relevant to a wide array of problems of their day. But industrialization undermined this simplifying assumption, and Marshall saw it clearly and cogently. In his treatment of the agents of production, he extended the concept of labor to include work with our hands and our heads. It should be noted with care that his concept of capital "consists in great part of knowledge and organization; and of this some part is private property and the other part is not. *Knowledge is our most powerful engine of production.* . . . Organization aids knowledge. . . . The distinction between public and private property in knowledge and organization is of great and growing importance: in some respects of more importance than that between public and private property in material things."[5] In not seeing the implications of Marshall's remarkable insights, economists have wandered for years in the wilderness of capital confined to material goods.

Thus, in a nutshell, the persistent increase in the demand for the high-quality services of human agents is a function of the additions to the stock of useful knowledge.[6] The complexities of the additions to this knowledge have been much greater in recent, modern economic growth than during early, relatively simple industrialization. The rate at which the stock of useful knowledge has increased has also been higher than the rate at which it grew during the early stages of industrialization.

This approach has broad integrative power in that it provides a unifying principle for a consistent explanation of the allocation of investment resources encompassing both human and nonhuman capital as modernization proceeds. From it we derive important empirical implications that can be tested against data. It implies that the value of human time increases relative to the cost of investment resources.[7] It implies that the relative share of national income accruing to labor increases over time.[8] It implies that there is a special premium for the allocative ability of both

[5] Marshall (1930, bk. 4, chap. 1, pp. 138–39); the italics are mine.

[6] The argument in support of this summary statement appears in previous works (T. W. Schultz 1972*b*, 1973*a*). It is anticipated in chaps. 1 and 2 in my *Investment in Human Capital: The Role of Education and Research* (1971). Chapter 12 treats the "Allocation of Resources to Research."

[7] A simplified approach to this implication is to treat the cost of investment resources as constant under the assumptions that the "normal" long-term real rate of interest remains constant and that, from an increasing amount of capital embodied in human beings, people derive earnings and satisfactions commensurate with the going rate of interest.

[8] As the earnings from the increasing stock of human capital rise relative to income acquired from property assets.

males and females in managing firms[9] and households and in allocating their own time, including investments in themselves. It also implies that as the value of the time of mothers increases, fertility declines.[10] These implications are derived from the dynamic process, not from a model of the economy that has arrived at a general equilibrium.

The concept of a general economic equilibrium in this context is necessary, however, as an analytical guide. It is an assumed economic state toward which this modernization process tends. Given this state, there are no inequalities among investment opportunities. The high price of human time is stable in the sense that it is no longer increasing relative to other factor service prices. There is no incentive to make additional investments in human capital or in the knowledge-producing sector, as a consequence of the completion of the modernization process, and advances in knowledge no longer augment the productivity of human time within firms and households; presumably, virtually all of the value added in production is contributed by the input of human time. The basic economic constraint that determines the upper limits of modernization (economic growth) in this equilibrium model is the increasing scarcity of human time for consumption. The underlying logic can be put very simply: modernization increases the consumption stream; consumption requires human time; advances in knowledge, whether they are embodied in material capital or in human capital, are severely limited in the extent to which they can alleviate the scarcity of human time for consumption.

For the purpose at hand, the bearing and rearing of children is a very labor-intensive activity; the satisfactions that parents derive from their children is a large part of their "standard of living," and the process of enjoying these satisfactions requires much time, the economic value of which, in this context, is very high.

II

Turning to fertility behavior in the low-income countries, the household model as it now stands has not been developed to treat the particular classes of circumstances that constrain the household in these countries. These are countries in which illiteracy abounds, human time is cheap, and the income opportunities that women have outside the home are mainly not jobs in the labor market. Furthermore, infant mortality is high, life expectancy at birth is low, debilitation during the adult years is

[9] As a consequence of the dynamics of the economy, the premium for allocative ability, distinguished from the ability of people to do useful work, is substantial (see Welch 1970; Fane 1972; Huffman 1972; Khaldi 1972).

[10] Nerlove's subtle and incisive treatment of the interactions between the high value of time and fertility lays the groundwork for new thinking with respect to this important implication.

substantial for reasons of inadequate nutrition and endemic diseases, and the availability of modern contraceptive techniques, including information about them, is, in general, wanting. These classes of circumstances are not as yet at home in the household model.

The difficulty here is not that economic theory is pointless in explaining fertility behavior in the low-income countries. On the contrary, in principle basic economic thinking is fully as applicable to the poor as it is to the rich countries. As a case in point, I have long argued (T. W. Schultz 1964) that the theory of the firm is analytically as powerful in the allocation of resources of poor, small, illiterate farmers in the less-developed countries as it is in determining the allocative efficiency of farmers, say, in Iowa. The usefulness of this theory is now widely recognized because of many recent successful applications. The same argument holds for a fully developed theory of the household. As yet, however, the part of this theory that has been applied to the United States, Israel, and Japan is a special and narrow part of what I envisage as a general theory of the household. Once the additional parts of this theory have been formulated, its usefulness in analyzing household activities in low-income countries will not be in doubt, assuming that it is also extended to treat the effects of economy-wide dynamic development.

Households in low-income countries perform, in fact, a substantially larger economic role than they do in high-income countries. The value of home production is not only large relative to the total family income, it is also produced predominantly by family labor and only in small part by purchased inputs, because in low-income countries the purchased material goods that households can acquire are very high in price relative to the economic value of the time of members of the household. With regard to the costs of children, children are labor-intensive during their infancy regardless of the country's level of income. In low-income countries, however, the mother's time is cheap in a context where health services, nutrition, and education for the children are dear. The satisfactions and producer services that parents derive from their children are in large measure from an assured number of children to provide help for household work and for family endeavors consisting mostly of farm work and to provide food and shelter for the parents during their old age and only in small measure from human capital that enhances the acquired quality of children. These particular economic constraints on the household are not treated in the part of the theory that has been applied in these fertility studies restricted to rich countries.

As an overview, the interactions between the changes in the economy and the economic role of the household including fertility are probably more important in most of these developing countries than in the advanced countries. With respect to which of the two concepts of a population equilibrium is the more relevant in guiding our economic thinking in

explaining the fertility behavior in the low-income countries, my view is that it is the second concept. My reason for opting for this concept is that the now-popular doomsday literature is not a valid characterization of the direction toward which the economy of such countries is moving. The crude Malthusian view of fertility does not apply; these countries are not headed toward a population equilibrium that is being imposed on them by diminishing returns from natural resources. Per capita income is in general not falling in these countries. Measured in terms of living conditions, there are appreciable gains, as is evident from improvements in health and from longer life expectancy. Moreover, birth rates are falling and substantially so in an increasing number of low-income countries. Although they are far from arriving at the second type of population equilibrium, they are moving toward it, and it is therefore analytically the relevant concept.

Earlier (1973*c*), I expressed my concern that our estimates of the price and income effects on fertility may be subject to considerable error for reasons of changes in the economy over time, changes that are not taken into account in these studies. The changes that are taking place in the low-income countries appear to me to be even more important than those in the developed countries, and if this is true, it will be imperative to extend our economic approaches in ways that will make these changes an integral part of the theory and its application. The most pervasive change is in the improvement of health. Estimates of life expectancy from time of birth are rising at a high rate relative to the further rise in the rich countries. The decline in infant mortality must have important fertility implications. Along with somewhat better nutrition, the marked decline in debilitating diseases during adulthood must have some price and income effects on household activities, including fertility. The fact that in some parts of poor countries, in the Punjab of India, for example, many girls are now enrolled in schools is an important change in this context. Then, too, there is some progress in increasing the supply of information about modern contraceptive techniques and in subsidizing the supply of contraceptives. While all of these changes are occurring, the quality of the labor force is slowly rising as is the value of human time.

One measure of the fruitfulness of the 1972 and 1973 conferences on the economics of fertility is in the agenda of unfinished research that the papers, comments, and discussions produced. There is a couplet by Robert Frost bearing on research. Let me paraphrase it:

> We sit around the circle and suppose
> The Secret sits in the middle and knows.