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# An Economic Framework for Fertility Analysis

RICHARD A. EASTERLIN

In recent years, economists and noneconomists alike have been asking: How relevant to human fertility behavior is economic theory? Until recently, most theoretical work on the economics of fertility derived from studies by Harvey Leibenstein (1957) and Gary S. Becker (1960) in which the economic theory of consumer behavior was applied, in one form or another, to childbearing decisions (see also Robinson and Horlacher, 1971; Easterlin, 1969). The conventional theory of consumer behavior views the individual as trying to maximize satisfaction, given a range of goods, their prices, and his own tastes and income. In the application of the theory to fertility analysis, children are viewed as a special kind of good, and fertility is seen as a response to the consumer's demand for children relative to other goods. In the last few years, a special variant of this approach has emerged, deriving chiefly from a 1965 article by Becker and distinguished by use of the concept of a "household production function" (T. W. Schultz, 1973 and 1974). In the present paper, the term economic theory of fertility refers to both the older and the newer variants.<sup>1</sup>

Although the economic theory of fertility based on consumer choice has noticeable limitations, I will argue here that a more comprehensive economic framework incorporating this theory remains the best point of departure for systematic fertility analysis. Such a framework, however, must be able to include the principal concepts of demographers, sociologists, and other scholars of human fertility. And it must be relevant to fertility behavior in a wide range of circumstances, past and present—to the trends, fluctuations, and differentials in fertility observed throughout human history. Thus, the empirical concern here is not only with present or recent fertility in the United States, on which most economists' work (including my own) has been focused, but also with the demographic transition and premodern fertility differences and movements. Is it fair to apply such a sweeping standard of empirical relevance? I think so. Aside from the social urgency of solving problems like the demographic transition, I am dealing here with the scope of the subject of fertility as viewed by noneconomists. Thus, economists' claims of a superior theory are customarily assessed by noneconomists in terms of this wide-ranging set of problems.

Before proceeding, let me make clear that I think that the application to fertility problems of the economic theory of household choice has resulted in a number of valuable contributions. First, economics has clarified the appropriate con-

cept of income for analyzing fertility decisions, namely, "full" or "potential" income, and has shown, for example, that for a number of purposes, total family income is a less pertinent measure than husband's income or variant measures of the household's earning potential. Second, economic analysis has reduced the conceptual confusion between cost of children and expenditures per child. As with many economic goods, rising income may promote the acquisition of both greater quantity (more children) and higher quality (greater expenditures per child), and the rise in the latter does not necessarily imply substitution against the former. Third, economics has clarified causal interrelations; for example, few economists would speak of lower fertility "causing" higher female labor force participation, or vice versa, but would view both magnitudes as simultaneously determined by other factors. Fourth—a contribution that is attributable especially to research stemming from Becker's 1965 article—economic theory has led to more explicit recognition both of the competition between children and economic goods for the time of father and mother and of the value of that time to each parent. Finally, I would like to think (perhaps selfishly) that empirical studies of recent American fertility movements and differentials based on an economic framework have contributed to a new understanding of their causes.

Since the stress here is positive, on the value of a more comprehensive economic framework (which incorporates fuller attention to the concepts of noneconomists) rather than on the limits of the economic theory of household choice, I shall start with a brief sketch of the more comprehensive framework, indicating how the more limited version fits in. Then I shall take up various empirical problems to illustrate the value of the broader economic framework as well as shortcomings of the usual approach.

## Theory

The standard formulation of the microeconomic theory of fertility emphasizes the demand for children as the key to understanding fertility behavior. It also treats, but less fully and systematically, the costs of controlling fertility. The principal innovation in the present approach, which builds substantially on prior work by Tabbarah (1971) and Wachter (1972), is more explicit and formal treatment of the production of children, including the possibility of shifts in output independent of demand conditions. Attention to the production side leads to greater recognition of such sociological concepts as natural fertility and of real world conditions to which the usual demand analysis may be inapplicable.

For brevity, I shall use the total number of surviving children of a "representative" married couple as the principal dependent variable, since surviving descendants, rather than

<sup>1</sup> The newer variant has generated some critical discussion by economists, usually in a sympathetic vein; see, for example, Nerlove (1974), T. P. Schultz (1973), and T. W. Schultz (1973). Leibenstein's (1974) review adopts a more skeptical stance. Ben-Porath's (1974b) discussion recognizes the argument developed here but does not consider its empirical implications.

births, are what parents basically want. Both spouses are assumed to live throughout the reproductive span of the wife. Questions relating to the formation of reproductive unions and to child spacing are left aside. Although the present framework falls short of encompassing all of the subjects of fertility analysis, it is considerably broader in empirical scope and more consonant with the views of noneconomists than the usual economic theory of fertility. The exposition here is highly condensed. This paper develops some implications of the results of a larger study in which the theoretical analysis is discussed in detail (Easterlin, forthcoming). The larger study contains an extensive bibliography, and references here are kept to a minimum.

The determinants of fertility are seen as working through one or more of the following:

1. the demand for children,  $C_d$ , the number of surviving children parents would want if fertility regulation were costless;
2. the potential output of children,  $C_n$ , the number of surviving children parents would have if they did not deliberately limit fertility; and
3. the costs of fertility regulation, including both subjective (psychic) costs and objective costs, the time and money required to learn about and use specific techniques.

#### DEMAND FOR CHILDREN, $C_d$

In keeping with the economic theory of household choice, the immediate determinants of the demand for children are income, prices, and tastes. The demand for children is seen as depending on the household's balancing of its subjective tastes for goods and children against externally determined constraints of price and income in a way that maximizes its satisfaction. Variations in the basic taste, price, and income determinants will cause differences in demand among households at a given time or for a given household over time. Other factors being constant, the number of children desired would be expected to vary directly with household income (assuming children are a "normal" good), directly with the price of goods relative to children, and inversely with the strength of tastes for goods relative to children.

It is through tastes or subjective preferences that attitudinal considerations stressed by sociologists operate, such as norms regarding family size and the "quality" of children (standards of child care and rearing). Nothing in the usual presentations of economic theory precludes the analysis of tastes. The overriding emphasis of economists, however, in both theoretical and empirical work has traditionally been on price and income variables rather than on preferences, and in this way they have subordinated consideration of tastes. The household production function variant of fertility theory, moreover, further predisposes its users against the analysis of tastes, since it lends itself to reformulating the influence of preferences partly in terms of household technology.<sup>2</sup> In an earlier article, I developed the argument that the formation of tastes should have high priority in fertility research and that such work would help bridge the economics and sociology of fertility (Easterlin, 1969). Leibenstein's (1974) critique of the household production function approach stresses the importance of studying taste formation, and recently other econo-

mists have started to look anew at the question (for example, Houthakker and Pollak [forthcoming] and, in the fertility area, Ben-Porath [1974a] and Lindert [1974]). I still believe in the need for research on taste formation; however, the emphasis in this paper will be on an additional link between the economics and sociology of fertility.

As noted, the principal dependent variable here is surviving children, since parents are ultimately interested in grown offspring, not number of births. Birth behavior may be linked to demand for children through the rate of infant and child survival. For households to achieve a given number of surviving children, the necessary number of births would be higher, the lower the level of infant and child survival. Even though tastes, prices, and income remained unchanged, birth behavior might vary because of changes in the survival prospects of children. Other things being equal, the higher the survival prospects, the lower the birth rate.

So far it has been assumed implicitly that the family size decision refers to children of a standard "quality," that is, children embodying a given set of inputs of time and goods. Allowance can be made for variations in child quality by viewing child quality as an additional good along with number of children and goods consumed by the parents. An increase in income would then be expected to raise both the number of children and the standard of child quality, whereas a rise in the relative prices of inputs required for children would lead to substitution against both child numbers and child quality. Also, subjective preferences relating to child quality might change, leading, for example, to greater emphasis by parents on the quality of children at the expense of number of children.

#### POTENTIAL OUTPUT OF CHILDREN, $C_n$

On the production side of fertility determination, the key analytical concept is the potential output of children—the number of surviving children a household would have if fertility were not deliberately limited. This depends, in turn, on natural fertility and the probability of a baby surviving to adulthood. Given natural fertility, an increase in infant survival prospects would increase the potential output of children. Similarly, given survival prospects, the potential output of children would vary directly with natural fertility.

The immediate determinants of natural fertility are not the factors shaping the demand for children. Rather, they are a) frequency of intercourse, as affected by sexual desire and involuntary abstinence due to such factors as impotence or ill-

<sup>2</sup> The household production function takes the traditional outputs of economic theory, namely, market goods (including children) as inputs. These are combined in the home with time supplied by household members to produce more basic "commodities" that directly enter the utility functions of the household members (Becker, 1965). In this theory, college education, for example, may be viewed as tending to increase the consumption of operas, not by changing tastes, but by improving consumption technology by increasing the efficiency with which the inputs, consisting for a given household of an opera and the time spent attending it, are consumed. A general critique of the household production function approach has been given by Pollak and Wachter (1973) who argue, among other things, that where there is no operational concept of "commodity," Becker's formulation introduces at best an unnecessary and at worst a misleading additional concept into the traditional chain linking utility directly to market goods and time.

ness, b) fecundity or infecundity as affected by involuntary causes, and c) fetal mortality from involuntary causes. [Sociologists will recognize that the terminology here is that of the well-known Davis and Blake article (1956).] Natural fertility is independent of voluntary controls on coital frequency, fecundity, or fetal mortality, since it relates to the number of births a household would produce in the absence of intentional limitation of fertility.

Natural fertility depends partly on physiological or biological factors and partly on cultural practices. Biological factors would include those that influence natural fertility through such mechanisms as genetic effects on fecundity or the effect of disease and malnutrition on coital frequency and the ability to carry a fetus to term. Cultural factors would include various social customs or events that inadvertently affect coital frequency, fecundity, or fetal mortality, such as the belief that sexual intercourse should be avoided while a mother is nursing (an "intercourse taboo") or physical separation of partners due to such events as civil strife or seasonal migration for employment purposes. Two societies identical in biological and physiological characteristics might differ in natural fertility because, for example, an intercourse taboo led to a higher prevalence of involuntary abstinence in one society than in the other. Natural fertility in a given society and the potential output of children are likely to be below the reproductive potential of the population because of both biological constraints and cultural conditions that inadvertently reduce family size.

A household wishing to reduce family size must necessarily adopt some technique of fertility limitation; hence, a corollary of any demand-based explanation of fertility is that one should be able to observe the use of fertility-limiting practices. The concept of natural fertility stated above, however, makes clear that the existence in a given society of a practice that reduces fertility below the physiological maximum is not in itself evidence that households are deliberately restricting fertility. The critical question is the meaning attached to the practice by its users. If, for example, abstinence is practiced by a couple as a way of limiting family size, then there is deliberate regulation of fertility. But if abstinence is due to observance of a taboo on intercourse while a mother is nursing, then there is no deliberate control, and the practice is simply one of various cultural conditions that keep natural fertility below the physiological maximum.<sup>3</sup>

The emphasis here on the intent behind a fertility-limiting practice is not an analytical quibble, for it bears on such questions as the prospective efficacy of a family planning program. In the abstinence example above, if the practice arises from an intercourse taboo during lactation, the household is not potentially in the market for an improved means of fertility regulation. On the other hand, if the practice is undertaken with the aim of reducing family size, there is an implicit demand for a better method of fertility control. Obviously,

the response to a family planning program would be different in the two circumstances. Nor does it matter whether a particular fertility-limiting practice might have originated from some explicit or implicit societal concern about controlling population growth. Whatever the origins of a practice, the response of its users will depend on their current conception of the reasons for its use.

#### MOTIVATION FOR FERTILITY REGULATION, $C_n - C_d$

The potential output of and demand for children jointly determine the motivation for fertility regulation. If the potential output falls short of demand  $C_n < C_d$ , there is no desire to limit fertility; on the contrary, an "excess demand" situation of this type would result in a demand for ways to enhance fertility and for the adoption of children (although these possibilities are usually quantitatively unimportant). Households might have knowledge of the means of regulating fertility, but there would be no incentive to use them. In this situation, parents would be expected to have as many children as possible; that is, the number of children parents actually have would correspond to their potential output. Variations in the number of children parents have would arise from variations in the determinants of potential output, namely, natural fertility and the probability of an infant surviving to adulthood.

On the other hand, if the potential output exceeds demand  $C_n > C_d$ —an "excess supply" situation—parents would be faced with the prospect of having unwanted children and would be motivated to regulate their fertility. In an excess supply situation, therefore, there is a demand for ways of limiting fertility. Whether fertility control will actually be used depends on how the costs of fertility regulation compare with the motivation to limit fertility.

#### COSTS OF FERTILITY REGULATION

Although motivation is a necessary condition for fertility regulation, it is not a sufficient condition. Fertility regulation imposes costs on the household of two types. There are psychic costs—the displeasure associated with the idea or practice of fertility control—and market costs—the time and money necessary to learn about and use specific techniques. These costs, in turn, depend upon (a) the attitudes in society toward the general notion of fertility control and specific techniques; and (b) the degree of access to fertility control, in terms of both the availability of information and the range of specific techniques and their prices. Typically, a family planning program lowers market costs by increasing information and providing services free or below cost and also lowers subjective costs by lending legitimacy to the notion of practicing birth control.

Whether fertility control will actually be used in a given excess supply situation depends on how the costs of fertility regulation compare with the motivation to limit fertility. Given the strength of the motivation, the lower the costs of fertility regulation—that is, the more nearly conditions approach those of the "perfect contraceptive society," where psychic and market costs would be zero (Bumpass and Westoff, 1970)—the greater would be the adoption of fertility regulation and the more nearly would the number of children

<sup>3</sup> In sociology the question of the intent behind a given social practice is formalized by distinguishing between the "manifest" and "latent" functions of the practice, corresponding roughly to the intended and unforeseen consequences. Allied notions in anthropology are the concepts of "emic" and "etic," which refer to the meaning attached to a phenomenon, by, respectively, the actors themselves and independent observers (Harris, 1968, pp. 571–575).

parents have correspond to the number they desire. Conversely, the higher the costs of fertility control, the more nearly would actual conditions approach the potential output of children, the lower would be the deliberate control of fertility, and the greater would be the number of unwanted children.

## SUMMARY

In the present analysis the determinants of fertility are seen as working through one or more of the following: the demand for children if fertility regulation were costless; the potential output of children if no conscious effort were made to control fertility; and the costs of fertility regulation. The immediate determinants of the demand for children are income, the price of children relative to goods, and subjective preferences for children compared with goods. The potential output of children depends on natural fertility and the survival prospects of a baby to adulthood. The costs of fertility regulation include subjective costs ("attitudes") as well as the time and money necessary to learn about and use specific techniques ("access").

The role of these factors in determining actual fertility differs depending on the comparative state of the potential output of and the demand for children. If the situation is one of excess demand (or even of excess supply but the motivation for fertility control falls short of the costs of fertility control), then the number of children parents have corresponds to their potential output, and the determinants of potential output govern variations in actual output. If, on the other hand, the situation is an excess supply one in which the motivation to regulate fertility exceeds the costs, then deliberate limitation of fertility occurs and the number of children parents have falls below potential output. As long as fertility regulation is not entirely costless, some parents still have unwanted children. The situation is thus one in which the actual number of children parents have falls short of potential output, the difference reflecting the extent of conscious fertility control, but the actual number exceeds the desired number, the excess consisting of the number of unwanted children.

The usual economic theory of fertility is confined to two of the three basic determinants identified here, namely, the demand for children and costs of fertility control, although the treatment of the latter varies considerably from one writer to another. Moreover, the emphasis with regard to both of these is typically on objective market circumstances—income and prices (including prices of fertility control)—rather than on subjective attitudes. The present approach stresses the desirability of adding a third set of fertility determinants disregarded in the usual economic theory, namely, those shaping the potential output of children, and also advocates a more balanced treatment of subjective (taste) considerations.

## Application

### NONMARITAL FERTILITY

Although the framework as sketched relates to marital fertility, it can be used to analyze nonmarital fertility. In comparing the framework with the more usual demand-based

economic analysis, it is simplest to start with two empirical problems in this area. The examples make the point, on the one hand, that a framework that explicitly includes output considerations is necessary, and, on the other, that demand factors may sometimes be relevant even for nonmarital fertility.

Let me start with the noticeable rise in teenage illegitimacy rates in the United States since 1940. An explanation offered by Cutright (1972) stresses physiological factors. Because of improvements in health and nutrition among young women since 1940, age at menarche has fallen substantially and the likelihood of conception has noticeably increased at ages 15–17. These improvements have also increased the probability of young women carrying a fetus to full term. Together, these factors have resulted in a substantially increased likelihood that a given rate of sexual activity among teenage women will result in a live birth. Cutright's calculations suggest that these factors account fully for the rise in illegitimacy rates among black women aged 14–17 and for about one-third of the rise among whites (1972, p. 27).

This hypothesis cannot be expressed within the framework of the usual demand-based economics of fertility, since it has nothing to do with the demand for children or with the costs of fertility control. However, it can readily be handled by the present approach. In terms of the present framework, Cutright's hypothesis is that the rise in teenage nonmarital fertility reflects in good part an increase in the potential output of children caused by physiological changes that have increased natural fertility.

I am not concerned here with the validity of Cutright's interpretation.<sup>4</sup> A popular alternative—also stressing output considerations and thus outside the demand framework—is that higher teenage illegitimacy is due to a breakdown of taboos on premarital intercourse. (In this case the increase in nonmarital fertility occurs in our framework via a shift in natural fertility caused by greater frequency of extramarital intercourse due to changed social mores.) My point in mentioning these interpretations is that an economic theory of fertility that disregards output considerations precludes hypotheses like these. On the other hand, the more general economic framework sketched here lends itself readily to the recognition and formulation of these as well as other hypotheses.

If an economic framework needs to include such output considerations to be relevant to nonmarital fertility, does one need the demand analysis that comes with the framework as well? After all, the desired number of children in extramarital unions is typically zero. My answer is that the full framework, including demand, is needed, and not only because of the possibility of cases where nonmarital pregnancy is sought as a means of fostering a marriage proposal. Let me take, as an example, a recent argument that quite explicitly discounts the relevance of demand considerations to nonmarital fertility. Shorter, Knodel, and van de Walle (1971), in a valuable study of the long-term decline in nonmarital fertility in Europe since the nineteenth century, note the close parallel between the trends in marital and nonmarital fertility. They argue that the type of economic pressures cited by Banks

<sup>4</sup> Tietze, for one, has expressed reservations. (See Tietze [1972] p. 6, and Cutright's reply in the same publication.)

(1954) to account for the decline in marital fertility cannot be used to explain the trend in nonmarital fertility.

J. A. Banks' explanation of the decline in marital fertility as a consequence of rising middle-class standards of living and of simultaneous greater educational aspirations of parents for their children is much less plausible when applied to the decline in nonmarital fertility. It is unlikely that higher incomes moved unwed mothers to curb their illegitimate fertility so as to plan better the educational future of their bastards on hand. Possibly improvements in the standard of living during the last quarter of the nineteenth century restricted illegitimate fertility through some other mechanism. But an ad hoc rummaging about for alternate linkages to an "economic prosperity" model is unlikely to result in any generalizable kind of explanation (1971, p. 393).

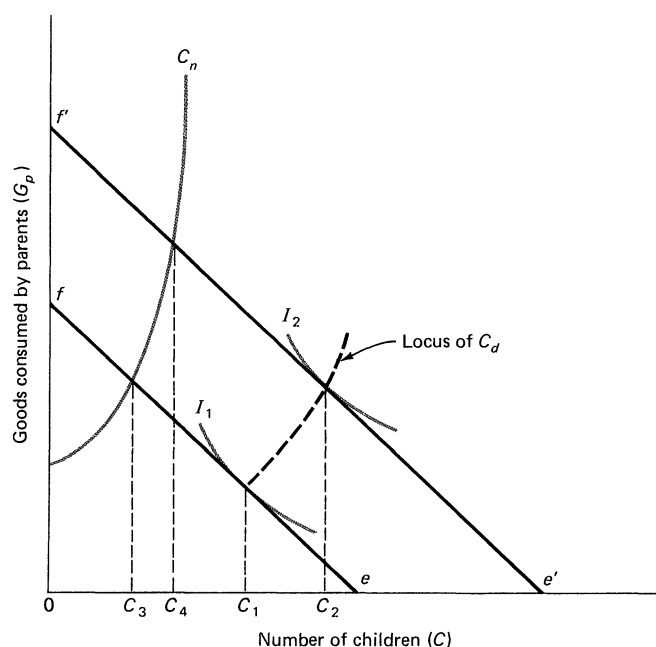
Suppose, however, that a decline in the demand for children among married couples, due to the reasons given by Banks generated a greater demand for fertility limitation. Suppose, further, that in response to this, a substantial expansion occurred in the supply of abortion services, lowering their market costs and increasing their social acceptability. In addition, improved efficiency in the practice of withdrawal might be developed. This reduction in the costs of fertility control would make it easier for unmarried as well as married women to terminate or avoid pregnancy and would thereby reduce nonmarital fertility. Thus, a decline in nonmarital fertility might arise from the same basic circumstances that caused a decline in marital fertility. Although this argument does not contradict the emphasis that the article's authors place on the costs of fertility regulation in explaining the nonmarital fertility decline, it does show that changes in such costs might ultimately stem from the effect of a decreased demand for children within marital unions. Again, let me emphasize that I am not arguing for or against any particular hypothesis. Rather, I am trying to show that the present framework lends itself to consideration of all factors potentially relevant to nonmarital fertility, whether they operate via demand, output, or fertility control costs.

#### PREMODERN FERTILITY DIFFERENTIALS AND FLUCTUATIONS

Let me turn to a different set of empirical problems. Fluctuations in fertility associated with the state of the economy in premodern times have frequently been noted (Lee, forthcoming). Also, a positive association between fertility and socio-economic class at a given time has sometimes been observed in premodern conditions (Stys, 1957, and United Nations, 1961, chap. 10). The natural inclination of economists is to seize on such findings as evidence of demand influences, that is, of variations in the household budget constraint causing corresponding variations in the number of children that households desire.

An alternative interpretation based on output considerations is possible, however. Figure 1 contrasts the two interpretations. (For simplicity, variations in fertility control costs are disregarded.) If one ignores, for the moment, the curve labeled  $C_n$ , this figure incorporates the usual graphical version

FIGURE 1 "Output" compared with "demand" interpretation of a positive income-fertility relationship



of the economic theory of fertility, though in highly simplified form to bring out the desired contrast. Number of children  $C$  is measured along the horizontal axis and goods consumed by parents  $G_p$  on the vertical axis. Household desires for children are expressed in terms of an indifference map that represents the degree of satisfaction the household attaches to every possible combination of commodities and children. Only two curves on this map,  $I_1$  and  $I_2$ , are shown here, although an entire set filling the quadrant exists at any given time. Any point on a curve expresses the degree of satisfaction attaching to that particular combination of children and commodities, and a curve is drawn so that all combinations on the curve yield the same amount of satisfaction. In other words, an indifference curve is a "constant-satisfaction" curve. Curves further from the origin, for example,  $I_2$  compared with  $I_1$ , are situations involving both more children and more goods, and represent higher levels of satisfaction than curves nearer the origin.

A household's ability to "purchase" combinations of children and goods is represented by a budget constraint, which delimits those combinations within financial reach of the household, based on the household's perceived income prospects and prices of children and goods. Two budget constraints,  $ef$  and  $e'f'$ , are pictured, but at any given time only one is applicable, let us say, initially,  $ef$ . The triangle  $Oef$  represents all combinations of children and goods within financial reach of the household.

In a purely demand-based economic theory of fertility, the household is seen as choosing, from among the set of combinations within financial reach, that which will maximize its satisfaction according to its subjectively determined preferences. In this case, this is the combination shown by the point of tangency of  $ef$  and  $I_1$ , the latter being the highest attainable

indifference curve. Thus, given tastes (as represented in the indifference map) and prices and income (as represented by the budget constraint  $ef$ ), the number of children desired or "demanded" by the household would be  $C_1$ .

What would be the effect on the equilibrium number of children of an increase in income, with tastes and prices remaining unchanged? This is shown by a parallel outward shift in the budget constraint from  $ef$  to  $e'f'$ . With its financial reach now extended, the household moves to a higher indifference curve, the tangency of  $e'f'$  and  $I_2$ , and enjoys a larger number of children,  $C_2$ , as well as more commodities.

The dashed line labeled "locus of  $C_d$ " (desired number of children) is the set of equilibrium values that would be traced as income varied, with prices and tastes held constant. It shows the relationship between income and purchases of a good that economists take to be normal, namely, a positive one—number of children varies directly with income. Confronted with data showing that fertility varies positively, over time or among groups, with changes in a society's income, economists would tend to conceptualize the underlying mechanism as that generating movements along the locus of  $C_d$ . Let me repeat that I am giving a very simplified presentation for purposes of contrast and the typical analytical views of economists are more sophisticated and knowledgeable.

The alternative interpretation of a positive income-fertility relation under premodern conditions is suggested by the  $C_n$  (potential output) function, which has been added to the usual economic diagram. This function shows how number of children might vary positively with the parents' material living conditions even if no conscious effort were made to control fertility. (It is assumed such factors as public health conditions or social customs, which might affect potential output independently of income, are held constant; changes in such factors would, of course, shift the entire  $C_n$  function.) Below some minimum level of parents' consumption, natural fertility would be zero. Starvation conditions, for example, would drastically lower frequency of intercourse and heighten the likelihood of spontaneous abortion if conception did occur. As the parents' living conditions improved from very low levels, natural fertility would progressively increase, although the increments would become gradually less until eventually a point were reached at which further living level changes left natural fertility unaffected. This is the relationship portrayed by the  $C_n$  curve in the figure. Starting with a positive intercept on the  $Y$ -axis, it shows an initial positive relation between  $C_n$  and  $G_p$ ; eventually, however, it reaches a vertical phase in which  $C_n$  is unaffected by further advances in  $G_p$ . No claim is made for the realism of the curve drawn here other than its general shape; my aim is merely to bring out clearly the contrast with the previous demand interpretation.

A movement in the budget constraint from  $ef$  to  $e'f'$  along the  $C_n$  function of Figure 1 would produce a positive income-fertility relationship with the equilibrium number of children varying from  $C_3$  to  $C_4$ . The mechanism underlying this relationship, however, differs from that discussed in the demand interpretation above. In this case the underlying mechanism involves such things as the effect of nutrition on reproductive capacity, as suggested, for example, by Frisch's work (1974), or the operation of the social custom of young wives returning to their parents' homes when times are hard. To cite

another possibility, higher income may be associated with greater reliance on wet nursing. As a result, the typical higher income wife would have a shorter period of temporary sterility after childbirth and higher natural fertility, giving rise to the observed positive association.

In the figure as drawn, it would in fact be the output interpretation of the positive income-fertility relation that is the correct one. Over the range of income levels shown (from  $ef$  to  $e'f'$ ) parents could not produce the desired number of children, as shown by the tangency of the appropriate budget constraint and indifference curve. Since desires exceed potential output, parents would, however, have as many children as possible, the amount given by the intersection of the relevant budget constraint with the  $C_n$  function. (We have here the counterpart in fertility analysis of a rationing situation in the theory of household choice, where a household is unable to attain the consumption pattern that would be optimal under free market conditions because of the restricted availability of one or more goods.) Variations in income (that is, shifts in the budget constraint) would generate variations in number of children as shown by the  $C_n$  (potential output) function, not by the  $C_d$  locus.

The  $C_n$  function could, however, lie to the right of the  $C_d$  locus, if, say, health conditions or social customs were more favorable to high natural fertility. In this case the demand interpretation would be the appropriate one, since—disregarding fertility control costs—households would be unwilling to produce more children than desired. Variations in income would generate variations in number of children as given by the  $C_d$  locus, not by the  $C_n$  function.

Again, I am not concerned here with which interpretation (or perhaps combination thereof) may be more appropriate to premodern situations. My point is simply to show the alternative interpretations that are possible in order to demonstrate the need for a framework sufficiently flexible to encompass both.

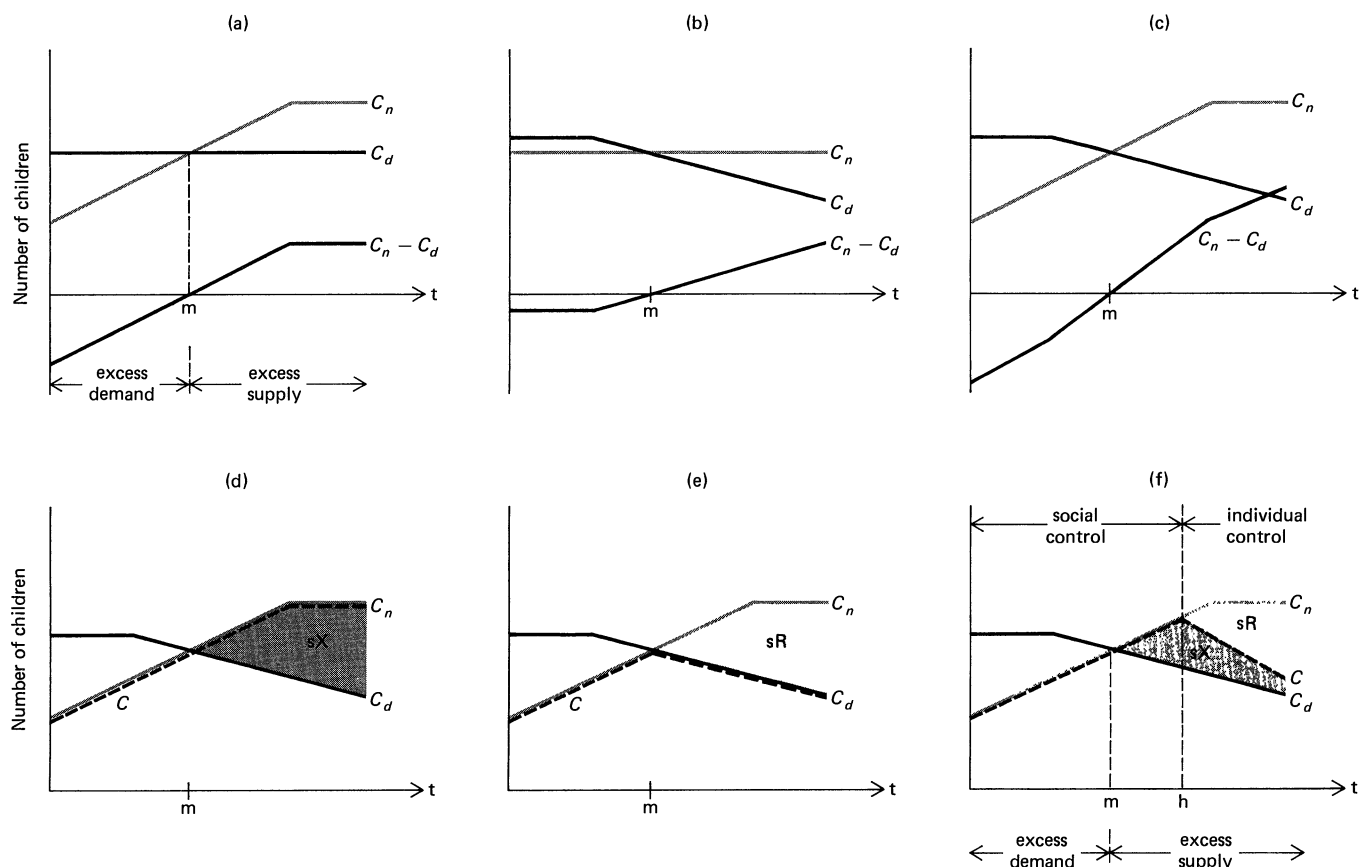
#### THE SECULAR DECLINE IN FERTILITY

This subject provides another opportunity for illustrating the influence of both demand and output factors on fertility behavior. The leading interpretation of the shift from high to low fertility in modernizing societies is the theory of the demographic transition. In this scheme, a shift to low fertility follows with a lag a decline to low mortality levels and is associated, in a general way, with the process of urbanization and industrialization.

The present framework suggests a more comprehensive view, in which the demographic transition model is one of a number of possible real world patterns. The emphasis is on identifying different ways in which the process of social and economic development may engender within the household a new type of concern with regard to reproduction, that of unwanted children, and lead to a growing motivation to regulate fertility.

Figure 2 shows some hypothetical trends during modernization in the equilibrium values of  $C_n$ ,  $C_d$ , and other variables. In all of the diagrams, the progress of economic and social modernization is assumed to be correlated with time and corresponds to a movement to the right along the  $X$ -axis. The

**FIGURE 2 Hypothetical trends in fertility variables associated with economic and social modernization**



**Legend**

The following definitions all refer to the total number over the reproductive career of the "representative" household:

- $C_n$  is the number of surviving children parents would have in an unregulated fertility regime.
- $C_d$  is the desired number of surviving children in a perfect contraceptive society.
- - -  $C$  is the actual number of surviving children.
- $sX$  is unwanted children, the excess of the actual number of children over the desired number.
- $sR$  is the degree of voluntary fertility regulation, measured in terms of children averted.

diagrams represent only the general nature of the possible relationships during modernization; no implication is intended regarding specific magnitudes.

As we have seen, the motivation for fertility regulation varies with the prospective number of unwanted children, the excess of  $C_n$  over  $C_d$ . In the upper panel of Figure 2, this is shown by the solid line at the bottom of each diagram; in the lower panel this line has been omitted to simplify the presentation—the applicable  $C_d - C_d$  line for Figures 2d–2f is that shown in Figure 2c. In all of the diagrams in Figure 2, the initial situation, that on the Y-axis, is one in which there is no motivation for fertility regulation, because parents are unable to produce as many children as they would like to have. More generally, all positions to the left of point  $m$  are excess demand situations. In these circumstances there would be a demand, not for ways of reducing fertility, but of raising

it, and also for children to adopt. This representation is, of course, vastly oversimplified. A more realistic diagram might show  $C_n$  fluctuating widely in premodern conditions and the early stages of modernization, with an average level in the neighborhood of  $C_d$ , and then trending upward as the fluctuations dampen.

Figures 2a–2c illustrate alternative ways in which the motivation to regulate fertility might emerge and grow in the course of modernization, causing the  $C_n - C_d$  curve to cross the X-axis and move upward to the right. Figure 2a shows a situation in which the moving force is on the output side—a rise in natural fertility (due to improved health of mothers, for example), while desired family size remains constant. Figure 2b illustrates the contrasting demand situation in which  $C_n$  is constant but desired family size shifts from above to below  $C_n$  (as a result of an increase in the relative cost of



children, for example), leading to the appearance of unwanted children. Figure 2c shows a shift from excess demand to excess supply conditions due to changes in both  $C_n$  and  $C_d$ .

As noted previously, although motivation is a necessary condition for fertility regulation, it is not a sufficient condition. Whether in a given excess supply situation fertility control will actually be used depends on the strength of the motivation compared with the subjective and market costs of fertility regulation. Figures 2d and 2e illustrate the two extremes with regard to costs of fertility control. In both diagrams, to the left of point  $m$  parents are not able to have as many children as they would like to have. As a result, in this range the actual number of children they have, shown by the dotted  $C$  line, is equal to the maximum amount they can produce, as indicated by the  $C_n$  curve, and rises as potential output increases. As one moves to the right of point  $m$  in both diagrams, a problem of unwanted children emerges, creating the motivation to regulate fertility. In Figure 2d, it is assumed that the costs of fertility regulation are prohibitive. As a result, the actual number of children continues to follow the potential output curve  $C_n$  and unwanted children increase. The number of unwanted children is shown by the vertical distance between  $C$  and  $C_d$  marked  $sX$ . Figure 2e, on the other hand, represents the perfect contraceptive society—subjective and market costs of fertility regulation are zero. As soon as the motivation to regulate fertility occurs, parents immediately do so. The actual number of children falls short of the maximum possible and follows the  $C_d$  curve, turning downward in the case shown. The extent of fertility regulation, measured in children averted, is shown by the vertical  $sR$  distance between  $C_n$  and  $C$ .

In any real world situation, fertility control costs would be neither zero nor prohibitive. The likely course of the actual number of children for a given level of fertility costs is shown in Figure 2f. Initially as the potential output curve  $C_n$  edges above the desired number of children  $C_d$  to the right of point  $m$ , the motivation to regulate fertility is not great enough to offset the costs, and the actual number of children continues to be governed by the  $C_n$  curve, with unwanted children increasing as shown by  $sX$ . As the movement to the right continues, however, a point is reached at which the loss in welfare due to unwanted children begins to exceed that associated with the costs of fertility regulation. In effect, a threshold of fertility regulation, labeled  $h$  in the diagram, is reached (Kirk, 1971). Fertility control is introduced and the  $C$  curve turns downward in the direction of the  $C_d$  curve, with fertility regulation practiced to the extent shown by the vertical distance  $sR$ . As long as costs of fertility control are positive, however, there will continue to be some unwanted children, indicated by  $sX$ . Given the  $C_n$  and  $C_d$  curves, the effect of a reduction in the costs of fertility regulation would be to shift point  $h$  to the left, and, for any given excess of  $C_n$  over  $C_d$ , to reduce unwanted children  $sX$  and increase the amount of fertility regulation  $sR$ .

This sketch attempts to bring together systematically the factors that may operate to induce a motivation for fertility limitation during modernization. The advantage of the present approach is that it directs equal attention to the possible roles of demand, output, and fertility control factors. By making different assumptions regarding changes in the basic fer-

tility determinants, it is possible to bring out within the present framework alternative sources of change from high to low fertility. The typical demographic transition pattern—a shift from high to low mortality preceding a corresponding movement in fertility—may be most simply generated, if, with other fertility determinants given, one assumes mortality is sharply reduced in a situation of initially high mortality and fertility. The accompanying increase in child survival prospects, and perhaps also in natural fertility of mothers due to better health, would raise potential output and would shift the typical household into an excess supply situation of the type shown to the right of point  $m$  in Figure 2a. As the prospect of unwanted children continued to grow, the typical household would, in time, reach and cross the fertility control threshold  $h$ , and fertility rates would start to move downward, thus following with a lag the decline in mortality.

By contrast, there are situations of the type noted by Coale (1969) in which the fertility decline accompanied or preceded the mortality decline. Such a pattern might arise from changes in the economic and social structure that give rise to unwanted children by shifting demand below potential output, in the manner shown to the right of point  $m$  in Figure 2b.

To judge from the data on the fertility decline in Taiwan presented, for example, by Freedman and Takeshita (1969), a variant of the Figure 2a pattern may be applicable there. The decline through 1970 appears to be due to the factors underlying the potential output of children and costs of fertility regulation, rather than to changes in desired family size. Perhaps this pattern will prove to be representative of the early phases of the fertility decline in today's developing nations because of the special timing of social modernization relative to economic development. On the other hand, in the United States, where mortality conditions appear to have been relatively favorable from an early date, it may be that a decline in demand of the type represented in Figure 2b was predominant in motivating fertility decline. Arguments emphasizing the role of changing land scarcity in inducing rural fertility decline would apply here (Easterlin, 1971). The present framework brings out such different possibilities by making clear how a given society may be pushed across the threshold of fertility regulation in different ways—by changes in demand, potential output, the costs of fertility regulation, or combinations thereof.

The possibility of an upsurge in fertility in the early phases of modernization is also brought out by the framework. This is shown to the left of point  $h$  in Figure 2f, where  $C$  moves upward with the rise in  $C_n$ . As illustrated, the upsurge is due to changes on the output side. A demand explanation is also possible, however, based on the reasoning stated in developing the dashed line locus of  $C_d$  in Figure 1. Thus the present framework also brings out the possibility of alternative "demand" and "output" interpretations with regard to a pre-modern fertility upswing, of the type noted in parts of Africa (Olusanya, 1969) and the Caribbean (Roberts, 1969).

#### THE CHANGING NATURE OF FERTILITY DETERMINATION

A number of scholars have argued that modernization results in a fundamental change in the mechanisms determining fertility. According to Bourgeois-Pichat:

Fertility in preindustrialized societies seems to be strongly determined if not controlled in the sense we give to this word today. It is determined by a network of sociological and biological factors and when the network is known, the result can be predicted. Freedom of choice by couples is almost absent. The couples have the number of children that biology and society decide to give them.

One of the main features of the so-called demographic revolution has been precisely to change not only the level of fertility but also change its nature. Having a child has been becoming more and more the result of free decision of the couple. And this change in the nature of fertility may be more important than the change in its magnitude. Fertility has left the biological and social field to become part of behavioral science . . .

For fertility we had for a long while a lot of customs carefully molded in the course of time which almost completely determined the size of families. These customs are still there but they are for the most part useless, as fertility is now under the will of people (1967, p. 163).

A similar distinction is that made by Wrigley (1969, p. 192) between "social sanctions" that operate to restrict fertility in a preindustrial situation and "family sanctions" that operate in a modernized society. Srinivasan's (1972) classification of fertility regulation into phases of biological and social controls, on the one hand, and "deliberate individual control," on the other, provides another illustration.

The present framework helps clarify these distinctions. The threshold point  $h$  in Figure 2f may be thought of as the dividing line between premodern and modern fertility determination. To the left of point  $h$ , fertility is "regulated" by a variety of social and biological mechanisms working through natural fertility. Fertility is not yet viewed by the household as involving a potential problem of unwanted children and is, in effect, outside the standard household decision-making calculus. This is not to say that behavior is irrational in the premodern situation. On the contrary, it is rational in the sense that the means are appropriate to the end. Given a conception of the problem as one of having enough surviving children, maximization of output within the existing set of biological constraints and established social practices makes sense. The process of modernization alters not the rationality of the individual but the nature of the problem, from one of having too few children to one of having too many.

The modernization process, which shifts the typical household to a position to the right of point  $h$ , creates a fundamental change in the circumstances of family reproduction, moving the household from a situation where childbearing is a matter "taken for granted" to one posing difficult problems of individual choice regarding the limitation of family size. To the left of point  $h$ , although there is a demand for children, the usual demand mechanisms emphasized in the economic theory of fertility are typically not operative, although fertility may be affected by economic variables operating through output conditions. The explanation of fertility in such a situation calls for inquiry along the lines followed by sociologists and other students of natural fertility. To the right of point  $h$ , the household decision-making approach comes more into its own. Even here, of course, sociology still has an important part to play, particularly in the investigation of taste formation. To dramatize this contrast, the section to the left

of point  $h$  in Figure 2f has been labeled "social control" and that to the right "individual control," following Bourgeois-Pichat's terminology.

Such sweeping distinctions are never fully satisfactory. Social sanctions operate in both premodern and modern circumstances, and the idea that there is no individual choice whatsoever in a premodern society is too strong. Moreover, no society shifts en masse at a single point of time from social to individual control situations. The real world process would inevitably be characterized by timing differences between various groups in the population. One of the needed extensions of the present analysis is to take explicit account of this diffusion process. Nevertheless, the present framework is helpful in formalizing the distinction between social and individual control and clarifying its substantive meaning. Moreover, the difference between social and individual control of fertility is a fundamental one, not merely terminological, for it bears, as we have seen, on such questions as the prospective efficacy of a family planning program.

## Conclusion

I have chosen several problems in the explanation of human fertility—nonmarital fertility, premodern fluctuations and differentials, and the secular fertility decline—to illustrate the need for a framework that directs attention equally to considerations stressed by economists and sociologists—to output along with demand considerations and fertility control costs.

It seems clear that there are many situations in which the usual demand-oriented economic theory of fertility behavior based on the theory of consumer choice may be of dubious relevance. Indeed, considering the history of human fertility as a whole, an extremist might argue that a demand-oriented model has very limited relevance. The basis for this is the impression conveyed by a number of studies of premodern and early modern societies, including contemporary KAP surveys, that there is little or no deliberate fertility control in such societies, although households may engage in practices that have the unintentional effect of reducing fertility. Intentional control of fertility is, as we have seen, a necessary element in a demand explanation of fertility. It should be recognized, however, that the same reasoning implies that in modern societies, where deliberate fertility control is extensive, a demand-based model (including fertility control costs) may be adequate for analyzing many fertility problems.

A broader economic framework, like that advocated here, is capable of handling real world conditions to which the usual demand analysis may be inapplicable. This framework, through more explicit and formal treatment of the production of children, including the possibility of shifts in output independent of demand conditions, lends itself to greater recognition of such demographic concepts as natural fertility, and to the formulation of alternative hypotheses of the type frequently voiced by sociologists, anthropologists, and other noneconomists.

In the long run, the relevance of this framework can be established only by more empirical study. Whether one can get adequate data to test alternative hypotheses of the demand versus output types discussed here remains to be seen. But the effort needs to be made. Unless we can get the necessary data, we will often be unable to choose between competing views of the causes of human fertility.

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