

Fertility and the Economy

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1. Introduction

- Malthus's famous essay on population is subtitled "With Remarks on the Speculations of Mr. Godwin, M. Condorcet, and Other Writers."
- It begins with an objection to their claim that the well-being of mankind will continue to improve over time, and develops a theory of population change to rebut their arguments.
- According to Malthus, population grows more slowly when average incomes decline because the typical person then marries later and has fewer children - the preventive check - and because deaths increase when families are poorer - the pessimistic positive check.
- These fertility and mortality responses raise future incomes through diminishing returns to the size of the labor force.

- The modern economic analysis of fertility is a development of Malthus's pioneering work.
- The modern approach is a very delayed reaction to the failure of the Malthusian analysis to explain the behavior of fertility in the nineteenth and twentieth centuries in Europe, the United States, Japan, and other developed countries.
- The crucial problem is that fertility fell rather than rose as per capita incomes advanced in these countries.
- This essay will discuss the analysis of fertility mainly in the context of the Malthusian question: what are the links between family choices - in particular, fertility behavior - and long-term economic growth?
- Due to this emphasis, I pay less attention to some significant advances that are more oriented to understanding microlevel differences in fertility behavior.

2. Income and price effects

- The spirit of the Malthusian approach to fertility can be stated in a very simple way.
- Assume the typical family maximizes its utility with respect to children and other goods:

$$\left. \begin{aligned} U &= v(x) + b(n), v', b' > 0, \\ v'' &< 0, b'' < 0, \end{aligned} \right\} \quad (1)$$

where n is the number of children, x are goods, and utility increases at a decreasing rate in both x and n .

Malthus claimed that the number of children is determined by “the passion between the sexes... that will remain nearly in its present state” (p. 8).

This assumption about “passion” explains why Malthus did not try, until very late editions, to explain changes in fertility over time by shifts in tastes.

- Rather, he relied on changes in income since each family is constrained by a budget equation

$$p_x x + p_n n = I , \quad (2)$$

where I is income, and p_x and p_n are the unit prices of x and n , respectively.

- Clearly, the assumption of a concave utility function implies that

$$\frac{dn}{dI} > 0 , \quad (3)$$

so that fertility rises and falls with increases and decreases in income.

- The basic result of demand theory implies that

$$\frac{dn}{dp_n} < 0 . \quad (4)$$

3. Quality of children

- In Malthus's time, parents in most families had relatively few ways to spend on children since education, training, and medical care were all quite rudimentary.
- But an analysis of the demand for children that ignores various dimensions of their “quality” became less and less relevant with the economic development and other changes that began during the nineteenth century.
- It would be absurd now to omit education, training, and health when considering parental interest in children.
- The utility function in (1) is readily modified to incorporate the quality of children:

$$U = v(x) + b(n, q) , \tag{5}$$

where I assume all children are of the same quality (q), and where the function b is assumed to be weakly concave in both n and q .

- quality, while the full cost of higher quality children depends on their number.
- A simple modification of the constraint in (2) is

$$p_x x + p_n n + p n q = I , \tag{6}$$

where $p_n + p_q = \Pi_n$ is the full marginal cost of an additional child, and $p_n = \Pi_q$ is the full marginal cost of higher quality.

- The term p_n refers to the cost of child-bearing and other fixed expenditures that are independent of quality, while p refers to education, health, and other variable costs.

- I have intentionally left the specification of “quality” vague since no single formulation is best for all purposes.
- But an inclusive and surprisingly flexible approach equates quality simply with the utility of children.
- Their utility obviously depends on how much human capital they have, but utility depends on many other variables as well.
- If quality (q) does equal the utility of each child, and if parents' utility is linear in child's utility, then parental utility can be expressed as

$$U_t = v(x_t) + a(n_t)n_t U_{t+1} , \tag{7}$$

where $n_t U_{t+1}$ is the total utility of children.

- The degree of altruism per child also determines the intergeneration discount rate in the dynastic utility function.
- This can be seen by using the equivalent of (7) to substitute for U_{t+1} , U_{t+2} , etc. to get an explicit representation of dynastic utility:

$$\left. \begin{aligned}
 U_t &= v(x_t) + a(n_t)n_t v(x_{t+1}) \\
 &\quad + a(n_t)a(n_{t+1})n_t n_{t+1} v(x_{t+2}) \\
 &\quad + \dots + A_{t+i}N_{t+i}v(x_{t+i})
 \end{aligned} \right\} , \tag{8}$$

$$\text{where } N_{t+i} = n_t \cdot n_{t+1} \cdot \dots \cdot n_{t+i-1} , \quad \text{and} \quad A_{t+i} = a(n_t) \cdot \dots \cdot a(n_{t+i-1}) . \tag{9}$$

4. Overlapping generations

- Biological reproduction requires that the analysis of fertility be imbedded in an overlapping generations framework, where prime-age men and women produce children who become the adults of future generations.
- In the Malthusian model, the children produced by this generation become the workers of the next generation.
- Demographic theorems on stable populations and population pyramids rely on the systematic overlap of different generations (see, e.g., Coale and Demeny 1966), but the overlapping framework did not become common in economics until Samuelson's classic paper (1958).

- Economists now use overlapping generation models to study the determinants of old age support and other "transactions" between the old and young, the demand for money, the accumulation of capital over time, and many other issues.
- Family economics brings to these problems recognition of the obvious, although frequently neglected, fact that the old and young are not strangers who engage in market transactions, but that the young are typically the children of the old (one searches in vain for such recognition in many theoretical articles on overlapping generations; see e.g., Geanakopoulus's article on overlapping generations in the *New Palgrave Dictionary* 1987).
- Altruism, loyalty, guilt, and other emotional ties link the young to the old that color and often dominate so-called "transactions" between them (Becker 1991; also see Cigno 1991, chap. 9).

5. Effects of mortality on fertility

- The Malthusian model assumes that mortality as well as fertility is affected by changes in the standard of living.
- Even if mortality is exogenous, fertility and mortality are related, for mortality changes can cause fertility to change.
- In particular, since both fall over time as countries develop, it is worth investigating whether the falls in mortality could have helped produce the declines in fertility.
- The modern analysis of fertility recognized early that changes in child mortality affect birth rates and the demand for children (see, e.g., Becker 1960; O'Hara 1975).
- For, presumably, parents care mainly about the number of children who survive childhood.
- If they want a fixed number of survivors, then obviously increases in the probability of survival cause equal percentage declines in births in order to hold fixed the number who survive.

6. Uncertainty and fertility

- I have so far ignored the enormous uncertainty associated with having children: about whether and when sexual intercourse will produce a conception, about the health and abilities of children, about their loyalty and support when parents are older, about whether they can be reared in a stable and happy marital environment, and so forth. I cannot do justice to all aspects of the uncertainty, but will only briefly discuss a few issues that are important and also convey the flavor of how uncertainty impinges on fertility choices.
- Parents partly adjust to uncertainty about child mortality by adopting a sequential decision-making strategy: the probability of having an additional child in a given interval becomes contingent on the mortality and other experience with prior births.
- Various empirical studies have estimated the magnitude of mortality “replacement ratios” (see, e.g., Ben-Porath 1976; Schultz 1976; Gomez 1981; Olsen and Wolpin 1983; Wolpin 1984).

7. Fertility and economic growth

- have considered how the cost of rearing children, investments in human capital, mortality, and other variables influence the demand for children. At the same time, however, fertility affects an economy's performance through its connection with the number and skills of workers.
- This mutual interaction between the demand for fertility and economic change helps determine demographic and macroeconomic changes over time. Not enough is known yet to tell this story in a single way. To illustrate the processes involved, I will draw on a particular approach taken in my joint work with others.
- Barro and Becker (1989) combine the dynastic utility function in (7) and (8) with a two-sector neoclassical growth model.
- A constant-returns-to-scale sector uses labor and capital to produce consumer goods and new capital, while another sector uses time and goods to produce children.
- This expands the neo-classical framework to include endogenous population growth due to fertility choices.

Figure 1

