

During the second half of the twentieth century the number of countries with liberal induced abortion legislation was increasing steadily. By the end of the twentieth century over 60 percent of the world's population was living in such countries. In contrast, 25 percent resided in countries where induced abortions were generally prohibited. Almost all of the latter are developing countries, where induced abortions are performed frequently by unqualified personnel under unsanitary conditions and thus women's health is often seriously impaired.

3. *The Relative Importance of Proximate Determinants*

The joint effect of all the proximate variables determines fertility levels and trends. For the analysis of fertility differentials and trends only those determinants are meaningful whose effect differs in time and space. If large variations of a determinant have only a small effect on fertility trends and differentials, or if a determinant hardly varies among populations, its analysis will not yield useful scientific or policy relevant insights. Thus the selection of the analytically important factors depends on how sensitive fertility is with respect to a particular determinant and the variability of the determinant among populations. In Table 1 the proximate determinants are rated according to these criteria.

Abundant evidence confirms that fertility is the least sensitive to the risk of spontaneous intrauterine mortality and the most sensitive to time spent in sexual unions and contraception. Variability is the lowest for onset of sterility and the risk of spontaneous intrauterine mortality. Altogether, for the analysis of fertility levels and trends, the four most important proximate determinants are the time spent in stable sexual unions, postpartum infecundability, contraception, and induced abortion.

See also: Adolescent Behavior: Demographic; Family Theory: Economics of Childbearing; Fertility and Culture: Anthropological Insights; Fertility Control: Overview; Fertility Control: Prevalence and Consequences of Breastfeeding; Fertility: Institutional and Political Approaches; Fertility of Single and Cohabiting Women; Fertility: Political and Political-Economic Perspectives; Teenage Fertility

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Fertility Theory: Caldwell's Theory of Intergenerational Wealth Flows

1. *Introduction*

John Caldwell's wealth flows theory proposes a direct link between family structure and fertility (Caldwell 1976b). According to the theory, there are only two major forms of family structure, differing principally in the direction of wealth flows among generations. In 'primitive' and 'traditional' societies, net wealth flows are primarily upward from younger to older generations, and individual interests are subjugated to corporate interests. In developed nations, family structure is organized in terms of downward wealth flows where parents are expected to provide for children's economic well-being.

The theory proposes that fertility decisions in all societies are economically rational responses to familial wealth flows. In societies with net upward wealth flows, the economically rational decision is to have as many surviving children as possible (within the constraints imposed by biology), because each additional child adds positively to a parent's wealth, security in old age, and social and political well-being. In societies with net downward wealth flows, the economically rational decision is to have no children or the minimum number allowed by a psychological disposition that derives pleasure from children and parenting. The worldwide transition from high to low fertility is the result of a change in family structures from upward to downward wealth flows.

This change in family structure was due to the spread of new values that placed a premium on individual satisfaction and achievement (Caldwell 1980). Those values emanated from the educated, middle-class in the west and are now being exported to the developing world through mass formal education. Implicit in the educational materials and expectations of schools is the individualistic value system that

produces downward wealth flows. Labor markets make the adoption of these individualistic values, which are adversative to the family or group production characteristic of pretransition societies, economically feasible. The transition from 'traditional' to 'modern' family structure occurs when a critical mass of individuals adopt the new values, and respond with low fertility. The attainment of mass education in a country should therefore precipitate and predict the fertility transition.

The most serious challenge to the wealth flows theory has come from evolutionary biologists. The argument that prior to modernization, upward wealth flows characterized human family structures is inherently antithetical to theory in evolutionary biology (Turke 1989). Biologists expect net wealth flows to be downward in all organisms, including humans. This research generated by the evolutionary biological critique of wealth flows theory has stimulated the development of a new theoretical framework for understanding human demographic patterns (see *Fertility Theory: Embodied-capital Theory of Life History Evolution*).

2. *Historical Context*

Wealth flows theory is not unique in proposing a link between costs of children and fertility. Notestein (1945, see *Fertility Transition: Economic Explanations*) proposed that the cost of children and their economic value are major determinants of fertility. Becker (1960) also developed formal models of the demand for children based on the household production function, focusing on the tradeoff between quantity and quality of children. Leibenstein (1957), also building on Notestein, argued that two forms of utility derived from children in pretransition (agricultural) societies were the proceeds of child labor and old age security. Evidence regarding the value of children's labor in agricultural societies was offered by Boserup (1965), Clark (1967), and Mamdani (1972). During the 1970s Cain (1978), Caldwell (1976b), Mueller (1976), and Nag et al. (1978) all developed theories concerning the economic contribution of children and the importance of child labor in peasant societies and how these factors impact family size and structure.

Caldwell's 'wealth flows' theory differs from the others by expanding the definition of intergenerational transfers across the life course and by directly linking changing value systems regarding intergenerational transfers of wealth to fertility transition. Defining wealth as 'all the money, goods, services, and guarantees that one person provides to another' (Caldwell 1982, p. 333), the theory directly incorporates effects on status and political position as well as on material wealth. Together, those material and nonmaterial transfers across the life course determine the net flow of wealth between generations and also affect societal

norms regarding the emotional value of children. As with economic models, Caldwell's theory recognizes technological impacts on wealth flows, such as the changing economic value of education. While there is unique pleasure derived from having children, pleasure will be derived from fewer children as their economic value decreases or the costs of educating them increase (Caldwell 1982, p. 338). However, unlike the more strictly economic models (Becker 1981), value systems regarding support in old age and the relationship between the individual and the larger family are the primary determinants of intrafamilial wealth flows in Caldwell's view.

3. *The Economic Contribution of Minor Children*

Wealth flows theory has been tested in several ways. Some tests are designed to determine if changes in the economic roles of children are associated with changes in fertility. Several researchers have found evidence of such effects in sub-Saharan Africa. In addition to Caldwell's (1976a) original microlevel study in southwest Nigeria, DeLancey (1990) and Makinwa-Adebusoye (1994) both found through meta-analysis of sub-Saharan African national level survey data that parents perceived upward wealth flows in high fertility contexts.

Similar results have been reported in several Asian countries with national level data. Chang (1990) reports that the adoption of socialist economic principles in China may reduce the economic contribution of children and result in fertility decline, but Moore (1998) suggests recent economic policy initiatives encouraging family economic independence may promote higher fertility. Some studies, using micro-level data, do not find evidence of upward intergenerational wealth transfers in high fertility contexts in India, (Das Gupta 1994 (in Punjab), Vlassoff 1982).

Willis (1982) has criticized Caldwell's hypothesis strongly on theoretical grounds, arguing that members of an altruistic older generation will see offspring success as a substitute for their own, and will therefore be willing to invest in offspring human capital at a higher rate than would be predicted if parents were acting solely in their own self-interests.

In general, the tests discussed above are weak because they do not measure the absolute flow of wealth but rather indicators of changes in the economic contributions of children. Strong tests of the theory require that children provide *net* economic benefits (i.e., amount provided minus amount received) to parents in high fertility societies and net economic costs in low fertility societies. Studies that have actually measured the net flow of wealth in high fertility societies do not support a strict interpretation of the theory. On the basis of data on net production and consumption through the life course, Kaplan (1994) has shown that in three lowland South Amer-

ican indigenous populations engaged in traditional economic pursuits of foraging and swidden horticulture, offspring do not become net producers until their twenties and never compensate their parents in terms of economic investment. Mueller (1976) in a study of 27 peasant agricultural societies found that while children were able to contribute to the household economy at a far higher rate than those in Kaplan's study, they still do not become net producers until their late teens and never repay the initial parental investment. In a review of all published studies, Lee (1996) concludes there are no data showing a net wealth flow from children to parents for any society—ironically, net upward wealth flows between generations are found in *low* fertility societies when public transfers, such as Medicare and social security, are included (Lee 1996).

4. Old Age Security

According to wealth flows theory, a second period in the life course for parents to receive economic benefit from their offspring is during old age. Those benefits motivate high fertility in traditional societies where adult children are expected to support their aging parents. In modern society, the ethic of individualism and public supports for the aged remove this motivation. Empirical evidence bearing on this hypothesis is also mixed. Hugo (1997), using national level data in Indonesia, found high fertility to be associated positively with perceptions regarding the likelihood of receiving old age support. Using historical data from England and Wales, Schellekens (1993) also found that old age security was correlated with high fertility. Cain has argued that children provide risk insurance for the elderly in south Asia (Cain 1981). Using micro-level data from Bangladesh, he also suggests that women desire high fertility to receive support from sons in old age as insurance against the loss of support from husbands in this patriarchal society. In contrast to Caldwell, however, Cain also argues that the breakdown of extended kin networks makes women even more dependent on sons for security. Vlassoff and Vlassoff (1980), using microlevel data from India, found no evidence that old age security motivated high fertility levels. (See Dharmalingam (1994) for a review of the debate between Cain and the Vlassoffs.)

Several studies using national level data have found that there are high expectations or levels of old age support in peasant agricultural societies in sub-Saharan Africa (De Lancey 1990), Mexico (regional level data) (Nugent and Gillaspay 1983), Malaysia (Lillard and Willis 1997), and Taiwan and the Philippines (Lee et al. 1994). Many studies have found extremely low levels of support or expectations of support of the elderly by adult children in the United States and other industrialized countries (Eggebeen 1992). None of these studies in the developing or

developed world were explicitly concerned with the relationship of fertility to old age security.

Critiques of wealth flows theory concerned with the economic contribution to the household of minor children are equally appropriate with regards to a net upward flow of wealth realized as support of the elderly. The evidence in support of wealth flows theory is based upon associations of high fertility with expectations of support. There is no solid evidence about whether high fertility actually increases the likelihood of support at the individual level, nor about the net flow of goods and services between older people and their descendent kin in high fertility societies. In fact, there is some evidence that older men and women make contributions to household economics in peasant agricultural societies through the skills and knowledge they bring to crisis situations. Researchers working with hunter-gatherers and forager-horticulturalists also observe that elderly individuals are often net producers and engage in other forms of work to support members of younger generations (Hawkes and Jones 1997).

5. Mass Education

Education plays a prominent role in many theories of fertility transition. In the wealth flows theory, education affects fertility through three routes, all affecting the net costs of rearing children. First, education subverts traditional communally-oriented value systems and trains children to pursue individual goals at the expense of supporting their parents (see also Cochrane 1979); second, it reduces children's ability to contribute to the household economy through diversion of time and loss of traditional skills and knowledge (Bock 2001, Caldwell 1980); and third, it increases the direct and indirect costs of children by increasing their demand for consumer goods and by establishing childhood as a period for receiving investment rather than contributing to the household economy (Caldwell 1980).

While there is a great deal of empirical evidence regarding the relationship between education and fertility, less is known about the relative contributions of these alternative causal routes, and particularly about education's impact on fertility through changing values regarding familial wealth flows. The empirical evidence regarding the impact of education on values is mixed. A meta-analysis of national level data from 37 sub-Saharan African countries found that primary school enrollment for both males and females in 1960 and 1980 had no significant effects on total fertility rate 15 and 30 years later. Secondary school enrollment for males and females in 1960 had a weak negative effect on total fertility rate, while only male secondary school enrollment in 1980 had a strong negative effect on actual and estimated total fertility rates 10 to 25 years in the future (Adamchak and Ntseane 1992).

Several studies show that children's school attendance affects parental fertility, (see, for example, Axinn (1993)). However, the causal process underlying this association is unclear, especially since parents who actively seek formal education for their children may differ from parents who do not with respect to characteristics that are themselves determinants of lower fertility. Lloyd et al. (2000) also found that children's school attendance predicts the timing of fertility transitions in a cross-national sample of African countries. Many studies report a negative impact of women's education and fertility, but again several alternative causal hypotheses are consistent with the data. At present, there is no strong evidence for or against the strict interpretation of fertility transition as a cultural watershed generated by mass education.

6. Summary of Wealth Flows Theory

Consistent with the logic of wealth flows theory, there is a great deal of suggestive evidence that changes in the costs of rearing children and in parental perceptions of those costs are associated with fertility transition. People in many high fertility societies also report higher expectations regarding economic support during old age than do people in low fertility societies. Also consistent with the theory is that education and fertility are negatively related in virtually every study measuring their association.

There are two major deficiencies in the theory, however. The first is that the data do not support a strict interpretation of the wealth flows hypothesis. There is no direct quantitative evidence of net-upward wealth flows in any traditional high-fertility society. Virtually all studies supporting the theory have used national-level, cross-sectional data, and have relied on proxy measures and informant reports. Actual measures of wealth flows in micro-level, longitudinal, ethnographic studies, using behavioral observation and measurement of intrahousehold productivity and exchange, all show *downward* wealth flows in traditional high fertility societies. Caldwell recognized that adequate tests of theory would require longitudinal, microlevel, ethnographically oriented research due to the subtleties and complexity of intra-familial wealth flows (Caldwell 1982).

The second deficiency is that the theoretical foundations for the determination of familial wealth flows are not well specified. This is evident in the treatment of education. In the theory, education is at once a vehicle of values transmission, a response to micro- and macroeconomic forces, and a direct cost to parents. The theory does not specify why certain value systems governing wealth flows arise, nor the relationships between exogenous economic factors, human psychology, and cultural evolution.

7. Conclusion

According to wealth flows theory, cultural transmission of new family values is the principal driving force in fertility transition. However, without a theory which can link ecological conditions to cultural features and their distribution, the concept of culture risks being vague, both cause and effect, the unexplained explanator. Culture is many things: a body of accumulated information, a set of customs and rituals, group beliefs, and a mindset about the organization of the social and physical environments. Each of these components may be related to fertility; but a generalized culture concept cannot be successfully used to explain patterning and variation in fertility without risking causal circularity (Bock 1999).

The wealth flows theory of fertility transition is a major contribution to demography. The theory is general in that it explains both high and low fertility regimes. A second strength is that it addresses both exogenous variables and the psychological and social processes that translated those exogenous variables into individual behavior, emphasizing both economic and social factors in understanding fertility transitions. The theory helped to lay the groundwork for theories of the family to become a major perspective within the field of demography, and broadened the scope of demography by directing attention to culture. It also inspired and influenced a large number of empirical studies. However, in the strict sense of predicting two fertility regimes to be associated with upward and downward wealth flows, empirical evidence does not support the theory. In the weak sense of predicting a negative relationship between net wealth flows to children and fertility, there is a good deal of empirical support.

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Fertility Theory: Embodied-capital Theory of Life History Evolution

The goal of this article is to provide an introduction to the embodied-capital theory of life history evolution and the empirical research upon which it is based. The embodied-capital theory generalizes existing life-history theory in biology by treating the processes of growth, development, and maintenance as investments in stocks of somatic or embodied-capital (see Kaplan (1996, 1997) and Kaplan et al. (2000) for more complete treatments). In a physical sense, embodied capital is organized somatic tissue—muscles, digestive organs, brains, etc. In a functional sense, embodied capital includes strength, immune function, coordination, skill, knowledge, and other abilities. Since such stocks tend to depreciate in response to metabolic

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