

**DEPARTMENT OF ECONOMICS  
YALE UNIVERSITY**

P.O. Box 208268  
New Haven, CT 06520-8268

<http://www.econ.yale.edu/>



Economics Department Working Paper No. 71  
Economic Growth Center Discussion Paper No. 979

**The Gender and Generational Consequences of the  
Demographic Transition and Population Policy: An Assessment  
of the Micro and Macro Linkages**

**T. Paul Schultz**  
*Yale University*

October 2009

This paper can be downloaded without charge from the  
Social Science Research Network Electronic Paper Collection:  
<http://ssrn.com/abstract=1488330>

# **The Gender and Generational Consequences of the Demographic Transition and Population Policy: An Assessment of the Micro and Macro Linkages**

T. Paul Schultz\*

## **Abstract**

The demographic transition changes the age composition of a population, affecting resource allocations at the household and aggregate level. If age profiles of income, consumption, savings and investments were stable and estimable for the entire population, they might suggest how the demographic transition would affect inputs to growth. However, existing macro and micro simulations are estimated from unrepresentative samples of wage earners that do not distinguish sex, schooling, etc. The “demographic dividend” is better evaluated through case studies of household surveys and long-run social experiments. Matlab, Bangladesh, extended a family planning and maternal and child health program to half the villages in its district in 1977, and recorded fertility in the program villages was 16 percent lower than in control villages for the following two decades until 1996. Households in program villages realized health and productivity gains that were concentrated among women, while child survival and schooling increased, and household physical assets were 25 percent greater per adult than in control villages.

**Keywords:** Fertility decline, demographic transition, intergenerational transfers, gender

**JEL codes:** J13, J21, J68, O15

---

\* The email address of T. Paul Schultz is [paul.schultz@yale.edu](mailto:paul.schultz@yale.edu). The author appreciates comments from Mayra Buvinic, Monica Das Gupta, Andrew Foster, Maureen Lewis, Germano Mwabu and others. The research on Matlab, Bangladesh, summarized in section IV was supported by a grant from the MacArthur Foundation. Draft September 18, 2009.

Several decades into a country's demographic transition, once its crude birth rate starts to decline steadily, the ratio of children (ages 0–14) to adults (ages 15–59) declines, and for several more decades this decline in the youth ratio more than offsets the slow increase in the ratio of elderly (ages 60 and older) to adults. This intermediate stage in the demographic transition is associated with a temporary increase in the share of adults in the population that is referred to as the “demographic dividend.” How does this change in the age composition of a population affect economic growth and the distribution of income by age and gender?

This paper considers links proposed between the demographic transition and economic development that are sometimes assumed to operate through changes in the age composition of national populations. The demographic dividend literature emphasizes a period of high aggregate savings following the decline in fertility, but of potentially equal importance are the consequences for women's productivity and labor supply and the health of women who avoid unwanted childbearing. These life cycle substitutions of family resources from childbearing activities to labor market activities may be facilitated by microcredit and labor market policies that ease the reallocation of women's time and bring family planning and reproductive health programs within reach of relatively immobile women in rural South Asia. Such policies can reduce the gaps between the health and schooling of men and women and boost investment, economic growth, and labor force participation.

The paper is organized as follows. Section I discusses the difficulty of reconciling the large aggregate estimates of life cycle savings effects and the small and insignificant micro estimates of age composition effects on household savings. Sections II and III

review micro and macro simulation studies that concentrate on the expected consequences of changes in the age composition of the population and suggest their limitations due to omitted variable bias and misspecified production relationships at the individual and aggregate levels. Section IV considers the empirical evidence from a long-run social experiment in Matlab Thana, Bangladesh, suggesting how a village-level family planning program helped to reduce fertility and contributes to the reallocation of family resources. The program has spurred the labor productivity of married women, increased child survival, improved the nutritional health of women and daughters, increased the schooling of children, and added to the accumulation of physical capital, all consequences of the demographic transition that should accelerate development.

Although it is only a single study (long-term social experiments with family planning and family health are rare), Matlab suggests that changes in the age composition of the population and the slowing of population growth are not the key mechanisms that translate the demographic transition into economic growth. Section V and VI draw on the record from Matlab to suggest that the policy challenge is to find ways to assist women in using effective family planning and then to design labor and credit market policies for mothers who, with fewer children, will want to reallocate their time and family resources to improve their economic opportunities and to facilitate investments in the health, schooling, and migration of their children. Section VII discusses some directions for research.

## **I. LIFE CYCLE SAVINGS EFFECTS ASSOCIATED WITH AGE COMPOSITION**

It is reasonable to imagine that changes in the age composition of a population, other things equal, should affect household demand for physical assets and human capital and thus influence life cycle savings and asset prices. The portfolio of assets held by households might also change if assets complement the endowments of households that vary systematically over their life cycle, such as the labor of children.

Data for the United States and several other high-income countries have shown that the elderly do not dissave at the rate implied by the pure life cycle savings model (Poterba 1994, 2004; Bernheim, Skinner, and Weinberg 2001). To maintain the core of the life cycle savings hypothesis, economists introduce other motivations for savings, such as precautionary savings (wealth as insurance against unpredictable end-of-life expenditures and health crises) and a dynastic family consumption objective (the elderly are assumed to want to make bequests). Modigliani and Brumberg (1954) consider only adult consumption without reference to families or children. A third complication might arise if longer lifespans and longer retirement periods affected savings (Sheshinski 2006). Although these three extensions of the life cycle savings model do not imply identical predictions, they are difficult to distinguish empirically from each other, as the life cycle becomes more multifaceted. Poterba (1994, 2004) reviews this literature and examines the empirical evidence, finding no close relationships between the age composition changes from 1950 to 2000 and financial market outcomes in the United States or convincing evidence from other countries or cross-country comparisons.

Most of the limited number of studies of low-income countries have problems establishing the magnitude of empirical relationships between age and income and

savings at the household level or even across countries. Only in the 1990s do cross-country regressions begin to suggest that more rapid population growth and youthful age compositions are associated with lower physical savings rates and slower economic growth (Kelley and Schmidt 1996). This may be due to the inclusion for the first time of African countries, and many other factors could explain their slow growth, including political institutions, health crises, and civil conflict. Aggregate evidence across Asian countries reveals an association between savings rates and age composition, allowing for country fixed effects, but only if current savings is a function of lagged savings, and this lagged dependent variable is implausibly treated as though it were exogenous (Higgins and Williamson 1997). Whether the trends in declining mortality and fertility are causing the increased savings and economic growth within this sample of countries remains controversial (Deaton and Paxson 2000). When the lagged savings rate is treated as endogenous within countries and estimated using the authors' own list of instruments, the estimated age composition effects on savings collapses and ceases to be significantly different from zero (Higgins and Williamson 1997).

There is no consensus on how to reconcile the larger aggregate estimates of the magnitude of life cycle savings effects (Kelley and Schmidt 1996; Higgins and Williamson 1997) and the smaller and insignificant micro estimates of age composition effects on savings based on household surveys (Poterba 1994, 2004; Deaton and Paxson 1997, 2000).

## **II. MICRO SIMULATION OF THE AGGREGATE EFFECTS OF AGING ON SAVINGS, TRANSFERS, AND GROWTH**

Mason and others (2008) propose simplifying assumptions that permit them to impute production and consumption to individuals by age, based primarily on data from the United States and Taiwan, China. Given their age accounting system, which does not involve economic behavior in the form of human capital investment or labor supply, and ignores entirely gender and schooling, an individual's age profile of savings leads to wealth accumulation and intergenerational private and public transfers by age. Household surveys are used initially to measure average earnings across age groups for all wage earners, and these synthetic age profiles of earnings are then adjusted proportionately to sum to national totals for wage income in the aggregate National Income and Product Accounts (NIPA). This imputation procedure assumes that all adults who are employed in the labor force (wage earners, self employed, and unpaid family workers) work the same amount of time and contribute equally to national income regardless of gender or schooling, subject to the nonwage worker fitted income adjustment to the NIPA total. Consumption is allocated by a variety of rules, many of which are country-specific or imputed by arbitrary age-sex equivalence scales (Browning, 1992).

What are the conceptual problems with this methodology? Demographic outcomes that differ substantially by age in part due to biological factors, such as mortality or fertility, are forecasted as a function of changing age compositions. But when this approach is applied to income and consumption, transfers must occur between age groups that are then required to balance out surpluses in production minus consumption. These transfers may be financed in the private sector, within families or by

charitable or religious welfare institutions, or in the public sector, notably through transfers to youth for schooling and to the elderly for health care and pensions. The problem in using this fixed age-matrix of economic outcomes for projecting income, consumption, savings, and transfers is that there is no behavioral or institutional mechanism hypothesized to equilibrate the consumption surpluses and deficits, balance the aggregate budget in each time period, or shift resources intertemporally, because there is no behavioral model for family formation, fertility, labor supply, human capital investments in children, consumption, savings, asset pricing, and wealth accumulation for retirement and bequests. The specific problems with this demographic simulation approach that relies on age profiles without a behavioral model should be obvious.

### **III. LIFE CYCLE SAVINGS AND THEIR EFFECTS ON COUNTRIES**

Models of behavior that are important for answering macroeconomic questions are sometimes hard to estimate with confidence from basic microeconomic data on individuals and households. One such case is the life cycle saving hypothesis, in which consumption behavior in aggregate time series among countries is thought to be affected by age composition (Ando and Modigliani 1963; Modigliani 1970). Efforts to confirm the theory at the micro or household level have led to ambiguous empirical results.

Ideally, income and consumption would be observed for all individuals in a sample survey or census in order to compare savings rates by age and replicate the pattern with lifetime wealth data where savings and transfers can be measured to include capital gains and changes in stocks of consumer durables. Empirical problems arise because consumption is generally pooled and measured at the household level, and

attribution of consumption by age restricts the analysis to single-person households, which constitute a small and unrepresentative subset of the population, especially among the young and old. This is a more serious problem in low-income countries, where a larger proportion of the population resides in intergenerational households headed by working parents or adult children and where self-employment is more common. Adult equivalence scales for consumption “requirements” of household members by age and sex are an unavoidable administrative tool for setting poverty lines and comparing welfare across households that are demographically and economically heterogeneous, but these scales should not be interpreted as derived from a conventional model of individual or household behavior (Browning 1992).

Those who work for pay in the market labor force are a selected sample. The number of hours they decide to work and contribute to household market income is also an endogenous decision that is determined by individual preferences that affect household composition. When savings rates are calculated for the elderly who remain the heads of their households, their savings is often positive and wealth continues to increase on average. An exception is the present discounted value of social security pensions or other annuities, which by definition decline with age unless augmented by other sources (Poterba 2004).

Intergenerational transfers are ignored in the pure life cycle savings model and complicate the interpretation of age-wealth profiles. Modigliani suggests that intergenerational transfers are not important for understanding private wealth holdings. But Kotlikoff and Summers (1988) cite studies of transfers and bequests between living people in the United States and other high-income countries that conclude that transfers

are a substantial factor in age profiles of wealth (Bernheim, Skinner, and Weinberg 2001). Bequest motives within families offer the best available explanation for why so few elderly dissave or rely on annuity insurance to supplement life cycle savings in the face of an uncertain and increasing life span (Kotlikoff and Spivak 1981). The expected magnitude of life cycle savings is reduced when overlapping-generation models allow for intergenerational altruism and bequest motives to affect savings. The magnitude of savings that is then residually attributed to life cycle consumption smoothing is modest, and this may be the most plausible explanation for the failure of microeconomic evidence to show much variation in household savings rates over the life cycle (Poterba 2004).

Household surveys from low-income countries are generally less well designed to document individual income by age and sex than are surveys in high-income countries. Given the fragile empirical basis and limited theoretical implications of more general life cycle models, there is reason to view these frameworks as currently an unreliable forecasting tool.

Because of these shortcomings of cross-country regressions on changes in age composition, and the inadequacy of micro simulations built on rudimentary age profiles of wages or savings for assessing the “demographic dividend,” more microeconomic analyses of household surveys and case studies are needed that define a counterfactual and explain how health and family planning programs affect the timing of the demographic transition and might thereby modify the behavior and development of families.

#### **IV. A SOCIAL EXPERIMENT IN MATLAB, BANGLADESH, AND ITS EFFECTS**

To estimate the causal effects of changes in the age composition of a population, it is necessary to specify factors that change mortality and fertility and thus affect the path of the demographic transition but do not otherwise affect the behavior or outcomes of interest. The approaches outlined in the previous sections do not identify an exogenous source of variation in fertility or mortality driving the demographic transition. They implicitly assume, therefore, that birth and death rates are determined outside the model and that any observed association between birth and death rates and economic change is therefore an indication of a causal relationship operating in a single direction from the demographic transition to development. Those working assumptions are not tenable.

Fertility and to some degree mortality respond to individual preferences and to household economic resources, as well as to other preconditions that affect economic development in many ways, such as institutions that raise the returns to investment and stimulate savings, increase women's education, and reduce fertility. Only when an exogenous shock occurs that reduces fertility can it be confidently inferred that subsequent changes can be attributable to the decline in fertility. To ensure this independence between population policies and fertility change and economic development, the policy intervention should be designed as a social experiment. The goal is to show first that the population receiving the policy intervention has the expected lower fertility and slower population growth. Then, this program-associated voluntary reduction in births can be related to parent reallocation of time and resources from bearing children to other life cycle activities that substitute for child labor and child support and care for their parents. Also, the impact on the quantity and quality of family

labor supply might affect the regional labor market and influence the level of wages, as assumed by Malthus, and could influence the structure of wages between young workers and adults or between men and women.

It is widely observed that parents with fewer children devote more economic resources to each child, as often measured by their children's health and survival and years of completed schooling. The increase in the wage return to schooling in the 20<sup>th</sup> century has been attributed to the accumulation of complementary physical capital and to a skill bias in technical change that may motivate parents to increase their demands for child quality relative to child quantity. But there are as yet few empirical studies that account for the increase in schooling or health through exogenous increases in returns to human capital or through the decline in fertility.

Estimating the causal effects of exogenous fertility variation on family lifetime behavior and outcomes is a challenge for assessing the policy implications of the demographic dividend. At the individual level, the two instruments used most commonly to induce exogenous variation in fertility are twins and the sex composition of initial births (Schultz 2008). Twins are interpreted as an exogenous shock to fertility before there are drugs to treat subfecundity. But twins are not identical to singleton births, because twins have below average health endowments and birth spacing is altered for twins, an added burden on families, especially those that are credit constrained. The sex composition of initial births is even less useful as an instrument for estimating the consequences of exogenous variation in fertility, because in many low-income countries the estimated response arises because of the preference of some families for male

offspring, which may be associated with other unobserved characteristics of those families, and the differential costs per child incurred by families rearing boys and girls.

A family planning and maternal and child health program implemented in a remote rural district of Bangladesh, Matlab Thana, was designed as a long-term social experiment. It was initiated in half of 141 villages that already had a reliable demographic surveillance system that registered all births, deaths, marriages, and population movements monthly. Under the family planning program outreach effort, begun in October 1977, female health workers contacted all married women of childbearing age every two weeks in their home, offering them various methods of birth control and, after 1982, a variety of additional maternal and child health services (Phillips and others 1982; Fauveau 1994). The program was maintained through 1996, when a household survey was conducted that could be linked to background census data collected in 1974 and 1982 for the 141 villages (Rahman and others 1999).

No claim has been found that the villages were assigned randomly to the program and control areas. Program services were expected to influence behavior in neighboring villages, which they have, and these spillover effects could be reduced by clustering the program and control villages, as was done in Matlab. This regional cluster design also probably reduced the administrative and transportation costs of the program.

To assess whether the program and control areas differed before the program started, ratios of children ages 0–4 to women ages 15–49 from 1974 census data were compared in program and control villages, and this indicator of surviving fertility did not differ significantly between the two types of villages. By the 1982 census, the surviving fertility levels were 16 percent lower in the program villages, according to a double-

differenced population-weighted regression, and this difference remained 15 percent lower in the program than in the control villages after 19 years as shown in the 1996 follow up survey (Joshi and Schultz 2007; Moulton 1986).

Population growth was more rapid in the control than in the program villages, but monthly wage rates did not differ significantly between the two village groups in 1996 for males or females ages 15–24 or for men ages 25–54. But for women ages 25–54, who in the program villages tended to have significantly fewer children by 1996, the monthly wage rates were 40 percent higher than in the control villages, though the participation of adult women in wage employment declined relatively in program villages. Thus, the aggregate effects of population growth on wage rates that Malthus expected, because of diminishing returns to labor, are not evident in Matlab, whereas women who appear to have avoided unwanted and ill-timed births seem to have increased their productivity in the wage labor force (Schultz 2009). The Matlab family planning program can thus be viewed as a female-specific human capital investment program, raising adult women's wages about as much as would three years of additional schooling (Schultz 2009).

Other differences between the program and control villages confirm the tendency of the family planning and maternal and child health program in Matlab to be associated with increased schooling of children, measured by a Z score normalized for age by sex. The nutritional health status of children, summarized by their body mass index Z score, is significantly better for girls ages 1–11 in the program villages and for women ages 25–54 (Joshi and Schultz 2007).

Parents in program areas reported 25 percent more lifetime assets by 1996 per adult residing in the household than did parents in control areas. This pattern is consistent

with parents treating physical assets as a substitute for children. The composition of household assets also differs between program and control villages. Parents in program villages reduced their value of livestock more rapidly than did parents in the control villages, presumably because child labor is a critical input in caring for livestock. On the other hand, households in program villages had 33 percent or more asset values than did control households in financial assets, ponds and orchards, homesteads, agricultural equipment, buildings and shops, jewelry, and consumer durables (Schultz 2009). The program-associated increases in women's wages, physical assets, and human capital are all expected to contribute to the economic development of villages in Matlab.

## **V. HOUSEHOLD CREDIT, HUMAN CAPITAL FORMATION, AND FINANCIAL INSTITUTIONS**

What can governments do to ensure that households are equipped to turn the decline in fertility into an economic dividend? In Matlab, the resulting household benefits do not appear to be due to the aggregate effects on the general wage labor market of the program's slowing of population growth. The program benefits of improved control of reproduction are associated with households reallocating their time and financial resources as they reduce family size, realize health and productivity gains that are concentrated among women and children, and accumulate nonhuman capital to drive economic development.

If the returns to human capital rise, due perhaps to technical change in the world that complements the skills of more educated workers in production, parents with physical assets that are accepted as collateral, such as land, are in a more favorable position to respond to these new opportunities and borrow to invest more in the schooling

of their children. Underinvestment in human capital by poor people may then occur, and public policies are needed to facilitate the schooling of children in poor households to prevent a widening gap in schooling between landed and landless classes. A variety of policy responses are discussed in the development literature: expanding local access to schooling, monitoring the quality of schools and making teachers more accountable to local parents in poor areas, providing fellowships for able students whose parents are relatively poorly educated and lack collateral to finance their children's schooling, and targeting cash transfers to poor mothers conditional on their children's enrollment and advancement in school.

Encouraging financial institutions to make loans to poorer parents may require subsidies and close monitoring to document that the loans reach the intended group and have the anticipated consequences on family resource allocation. An institutional alternative is joint lending to neighborhood groups or social networks, such as the prototypical Grameen Bank in Bangladesh, which is said to rely on social network pressures within a group of borrowers to substitute for the incentive effects provided by normal collateral to enforce loan repayment. Women often lack collateral because of their culturally weak property rights in the family, and women are consequently a prime beneficiary of some microcredit institutional innovations. These institutions could arguably solve the problem of market failure for poor women who do not currently have access to the formal financial sector (Aghion and Morduch 2005).

But microcredit programs oriented toward poor women may still embody biases among types of investment activities and occupational careers that might discourage women from some favorable long-run choices. Physical capital investments may be

avored over human capital investments. Self-employment of women may be favored over investments to enter the wage sector. Outputs from traditional home production activities may be less profitable in the long run than other types of off-farm production and employment. Self-employment activities might increase the marginal productivity of child labor and thus deter parents from investing more in the schooling and migration of their children. And most self-employed women work in productive activities at their home, which increases the likelihood that they can combine their work with their traditional responsibilities for child care, thereby lowering the opportunity cost of additional children and favoring larger family sizes, other things equal. Fertility may thus be increased by microcredit schemes targeted to poor women. If women reallocate their productive efforts outside their home and enter into wage employment, their lifetime productivity may increase as well as the human capital of their children.

Reorienting microcredit programs to facilitate women's transition to wage work should reduce a built-in bias of many programs that are oriented toward supporting self-employment for women in the home. Microcredit might be designed to help parents support the temporary or permanent migration of their daughters and sons to improve their adult employment opportunities, with remittances from the children to their parents helping to repay the loans, motivating parents and daughters to delay marriage and increasing daughters' influence in the choice of a mate as they become more economically empowered. Outmigration of children from poor rural areas might also encourage parents to first send their children to school for a longer period when urban jobs reward better educated workers more than do most manual rural jobs.

Finally, the products produced by participants in these microcredit programs for women might not represent the most promising lifetime opportunities. Traditional handicrafts (baskets, textiles, ceramics, and wood working) might not be commodities for which domestic demand is especially price and income elastic. Livestock, which are often acquired by women with the aid of microcredit programs, might increase the household's demand for child labor and thus discourage children's school attendance or outmigration. As noted earlier, these developments would reduce a woman's opportunity cost of having more children and could thereby sustain higher fertility. One evaluation of the consequences of microcredit in Bangladesh finds that after controlling for the heterogeneity of women who take loans from the village microcredit system, the program increased women's self-employment earnings, but the women were also more likely to then have additional births (Pitt and Khandkar 1998).

## **VI. LABOR MARKET REFORMS, REGULATIONS, AND THEIR CONSEQUENCES FOR WOMEN**

Labor market regulations often restrict employment opportunities for low-wage groups, including women. How are these regulations modified so as to help rural women enter the wage labor force as their fertility declines? Evidence is accumulating, particularly from Latin America, that formal labor market regulations intended to raise wages, increase fringe benefits, fund social welfare programs, and increase job security for workers through employment regulations have one thing in common (Heckman and Pages 2004; Schultz 2000): they reduce employment opportunities for members of disadvantaged groups, who typically receive below average wages, presumably because they are less productive than the average formal sector worker. This includes

inexperienced female entrants to the wage labor force, but also disadvantaged minority racial groups, such as indigenous groups in Latin America, lower castes in India, and remote ethnic and tribal groups in many regions. Mandatory regulations such as minimum wages and employee benefits may improve conditions for those who retain their jobs, if employers cannot shift their cost to workers, but labor market regulations tend also to exclude the less productive workers from entry-level jobs that might enable them to qualify over time for better jobs through on-the-job training (Mincer 1976).

Raising minimum wages reduces employment proportionately and lowers labor force participation rates among low-wage groups (Maloney and Nuñez 2002). In some provinces of Canada, for example, extending fringe benefits to women in the form of maternity leave reduced women's wage rates relative to men's and reduced the share of female employment in the provinces that added maternity leave (Gruber 1994). Where minimum wages are binding and coverage is enforced, it is anticipated that formal sector employment will be reduced among the less productive groups whose current output does not exceed what employers must pay for labor. Especially in South Asia and Africa, where schooling is substantially less for adult women than men, minimum wage regulations reduce women's employment opportunities in entry-level jobs (Bell 1997; Revenge 1997; Gruber 1997; Heckman and Pages 2004; Schultz 1988).

Labor market reform appears to be difficult to achieve directly, because of the political strength of vested interests, including unions, in maintaining the status quo. These restrictions in the labor market that restrain women's entry into the formal sector have, however, been indirectly eroded in some countries through lowering the barriers to international trade and encouraging foreign direct investment (Schultz 2000). Country

studies have also found that women's employment is concentrated in export-oriented industries and that women's share of jobs in these industries increases as barriers to trade fall (see, for example, Ravenga 1997; Hanson 2003; and Ozler 2000).

Nonetheless, even when employment growth is rapid, as in the Middle East and North Africa since 2000, and barriers to trade and capital mobility are reduced, unemployment rates for women have risen relative to those for men, and this unutilized supply of women's labor is larger in many countries in the region for better educated women (Nabli, Fauregui, and de Silva 2007). The decline in public sector employment may encourage more efficient labor allocation, but in some economies, such as Egypt before 1990, the public sector is a major employer of educated women. Reducing wages in this protected public sector could lower women's wages but thereby expand women's employment opportunities going forward and increase the benefit-cost ratio in the public sector provision of schooling and health services, delivered mainly by female employees.

## **VII. CONCLUSIONS AND RESEARCH DIRECTIONS**

Following the demographic transition, the growth in the labor force and the increase in per capita productivity tend to be associated with the increase in women's labor force participation rates. With a microeconomic model of family labor supply that accounts for women's time allocation and their productivity in the wage sector, it should be possible to answer more generally the question that motivated this article. How do policies that affect the decline in fertility contribute to development through the increase in household income and to the accumulation of household human and physical capital? Changes in women's labor supply and household savings, in both human and physical

capital, are major sources of per capita economic growth that may plausibly be linked to the demographic transition. With the growing availability of household panel survey data, microeconomic models of family labor supply, fertility, and consumption behavior could be estimated. The fertility transition could then be accounted for within a simultaneous equation behavioral model rather than by analyzing household consumption while treating fertility and family composition as though they were exogenous “control” variables.

Because the productive opportunities of people not in wage employment are not observed, inferring the average productivity of all men and women requires a model that accounts for who participates in the wage sector, as well as the productive characteristics of individuals, such as their human capital and other resources (Heckman 1974a,b; Schultz 2009). Identifying such a sample selection model requires a variable that affects the individual’s productivity of time in nonwage work or leisure but that is uncorrelated with the unobservable determinants of the market wage. The rural family’s ownership of agricultural land is a possible exclusion restriction that is expected to raise labor productivity in home production and self-employment and increase the value of leisure, thereby reducing the likelihood that a wife, her husband, or their children will work outside the household for a wage (Schultz 2009). But land could also be correlated with unobserved factors such as ability, motivation, and family connections that might affect market wages.

This empirical approach underlies the findings on the Matlab district of Bangladesh, summarized above, that gains in productivity due to a program-induced decrease in fertility and slowing of population growth appear to have promoted

development. No relative gain in wages of male or female workers ages 15–24 is detected in the villages where a family planning social experiment has reduced fertility and population growth for two decades, challenging a premise of the Malthusian framework. However, older women in the program villages, ages 25–54, who have reduced their childbearing, are observed to receive much higher wages than women in the control villages, holding constant for schooling and age. This empirical finding in Matlab confirms the hypothesis that an effective family planning and reproductive health program can enhance women’s human capital and productivity. But the program effects on the time allocation of women benefiting from their avoidance of unwanted childbearing is difficult to predict a priori. In the Matlab case, women ages 25–54 work less in wage employment in the villages served by the program than in the comparison villages (Schultz 2009).

Microcredit institutions in many parts of the world have provided financial assistance for poor women seeking to enter the labor force as self-employed workers. Conditional cash transfers have also been widely adopted in Bangladesh and countries in Latin America as a public institutional mechanism to encourage poor mothers to invest in the schooling of their children, while also minimizing the leakages common in traditional transfer programs as a result of political corruption. It may be productive to reorient these microcredit institutions to also encourage poor families to invest in the human capital of their children as well as to provide loans to cover the costs of mothers entering the formal wage labor market. Changing the orientation of microcredit institutions from a focus on the self-employment of women in home-based cottage industries to one that also facilitates family human capital investments, migration, and wage work by women could

extend and strengthen the benefits of microcredit for poor women and their children, especially following the demographic transition.

Reducing labor market regulations, such as minimum wages and mandatory benefits for workers in covered sectors, is one way to diminish the barriers to women's access to low-wage entry jobs that can enable them to improve their productivity through on-the-job experience and learning. Middle-age women are often denied employment because of a lack of experience. Unions understandably defend the employment benefits and prerogatives of the segment of the middle class they represent in low-income countries. In the public sector, unions can reduce the accountability and efficiency of the workforce assigned to produce essential public services in education and health care. In such cases, lowering wages for women entering the labor force or allowing more competitive entry of "uncertified" teaching assistants and auxiliary health workers in the public sector could reduce insider rents. But all stake holders in the public sector might not support such reforms. (Banerjee and others 2007).

Few governments directly intervene to reduce the influence of labor unions over conditions of employment. However, dismantling barriers to international trade and capital mobility is sometimes associated with favorable labor market trends and with conditions that increase schooling and longevity, especially for women (Schultz 2000, 2006). The balancing of politically organized pressure groups has recently achieved more traction in liberalizing controls on international trade than has any similar effort to reduce regulations in the labor market. Successful labor market reforms are uncommon perhaps because the groups that benefit from deregulation tend to be less concentrated, such as

women, and thus less likely to be organized or empowered within the political system to promote the reforms.

## REFERENCES

- Aghion, B.A., and J. Morduch. 2005. *Economics of Microfinance*. Cambridge, Mass.: MIT Press.
- Ando, A., and F. Modigliani. 1963. "The Life Cycle Hypothesis of Saving: Aggregate Implications and Tests." *American Economic Review* 53(1): 55–84.
- Banerjee, A.V., S. Cole, E. Duflo, and L. Linden. 2007. "Remedying Education: Evidence from Two Randomized Experiments in India." *Quarterly Journal of Economics* 122(3): 1235–64.
- Bell, L.A. 1997. "The Impact of Minimum Wages in Mexico and Colombia." *Journal of Labor Economics* 15(3): S102–35.
- Bernheim, B.D., J. Skinner, and S. Weinberg. 2001. "What Accounts for the Variation in Retirement Wealth among U.S. Households?" *American Economic Review* 91(4): 832–57.
- Browning, M. 1992. "Children and Household Economic Behavior." *Journal of Economic Literature* 30(3): 1434–75.
- Deaton, A., and C. Paxson. 1997. "The Effects of Economic and Population Growth on National Savings and Inequality." *Demography* 34(1): 97–114.
- . 2000. "Growth, Demographic Structure, and National Savings in Taiwan." *Population and Development Review* 26(Supp.):141–73.
- Fauveau, Vincent, ed. 1994. *Women, Children, and Health*. Special publication 35. Dhaka: International Centre for Diarrhoeal Disease Research.
- Gruber, J. 1994. "The Incidence of Mandated Maternity Benefits." *American Economic Review* 84(3): 622–41.
- . 1997. "The Incidence of Payroll Taxation: Evidence from Chile." *Journal of Labor Economics* 15(3): S72–101.
- Hanson, G. 2003. *What Has Happened to Wages in Mexico since NAFTA?* NBER Working Paper 9563. Cambridge, Mass.: National Bureau of Economic Research.
- Heckman, J.J. 1974a. "Sample Bias as a Specification Error." *Econometrica* 42(1): 153–62.
- . 1974b. "Shadow Prices, Market Wages, and Labor Supply." *Econometrica* 42(4): 679–94.
- Heckman, J.J., and C. Pages, eds. 2004. *Law and Employment: Lessons from Latin America and the Caribbean*. Chicago: University of Chicago Press.
- Higgins, M., and J.G. Williamson. 1997. "Age Structure Dynamics in Asia and Dependence on Foreign Capital." *Population and Development Review* 23(2): 261–94.

- Joshi, S., and T.P. Schultz. 2007. "Family Planning as an Investment in Development: Evaluation of a Program's Consequences in Matlab, Bangladesh." Economic Growth Center Discussion Paper 951. Yale University, New Haven, Conn.
- Kelley, A.C., and R.M. Schmidt. 1996. "Savings, Dependency, and Development." *Journal of Population Economics* 9(2): 365–86.
- Kotlikoff, L.J., and A. Spivak. 1981. "The Family as an Incomplete Annuities Market." *Journal of Political Economy* 89(2): 372–91.
- Kotlikoff, L.J., and L. H. Summers. 1988. "The Contribution of Intergenerational Transfers to Total Wealth: A Reply." In *Modelling the Accumulation and Distribution of Wealth*, ed. D. Kessler and A. Masson. Oxford, U.K.: Clarendon Press.
- Lee, R. 2003. "Demographic Change, Welfare, and Intergenerational Transfers: A Global Overview." *Genus* 59(3/4): 43–70.
- Maloney, W., and J. Nuñez. 2004. "Minimum Wages in Latin America." In *Law and Employment: Lessons from Latin America and the Caribbean*, ed. J. Heckman and C. Pages. Chicago: University of Chicago Press.
- Mason, A., R. Lee, A.C. Tung, M.-S. Lai, and T. Miller. 2008. "Population Aging and Intergenerational Transfers: Introducing Age into National Accounts." In *Developments in the Economics of Aging*, ed. D. Wise. Chicago: University of Chicago Press.
- Mincer, J. 1974. *Schooling, Experience, and Earnings*. New York: Columbia University Press.
- Modigliani, F. 1970. "The Life Cycle Hypothesis of Savings and Intercountry Differences in Savings Ratio." In *Induction, Growth, and Trade*, ed. W. A. Eltis, M.F.G. Scott, and J.N. Wolfe. Oxford, U.K.: Oxford University Press.
- Modigliani, F., and R. Brumberg. 1954. "Utility Analysis and the Consumption Function." In *Post Keynesian Economics*, ed. K.K. Kurihara. New Brunswick, NJ: Rutgers University Press.
- Moulton, Brent R. 1986. "Random Group Effects and the Precision of Regression Estimates." *Journal of Econometrics* 32(3): 385–97.
- Nabli, M.K., C. Silva Fauregui, and S. . de Silva. 2007. *Job Creation in a High Growth Environment: The MENA Region*. Middle East and North Africa Working Paper 49. World Bank, Washington, DC.
- Ozler, S. 2000. "Export Orientation and Female Share of Employment: Evidence from Turkey." *World Development* 28(7): 1239–48.
- Phillips, James F., W. Stinson, S. Bhatia, and J. Chakraborty. 1982, "The Demographic Impact of Family Planning–Health Services Project in Matlab, Bangladesh." *Studies in Family Planning* 13(5): 131–40.

- Pitt, M., and S. Khandkar. 1998. "The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter?" *Journal of Political Economy* 106(5): 958–96.
- Poterba, J., ed. 1994. *International Comparisons of Household Savings*. Chicago: University of Chicago Press.
- . 2004. *The Impact of Population Aging on Financial Markets*. NBER Working Paper 10851. Cambridge, Mass.: National Bureau of Economic Research.
- Rahman, O., J. Menken, A. Foster, and P. Gertler, 1999, *Matlab [Bangladesh] Health and Socioeconomic Survey (MHSS), 1996*. Inter-university Consortium for Political and Social Research, Ann Arbor, Michigan. (ICPSR 2705).
- Ravenga, A. 1997. "Employment and Wage Effects of Trade Liberalization: The Case of Mexican Manufacturing." *Journal of Labor Economics* 15(3): S20–43.
- Schultz, T.P. 1988. "Firm and Family Employment, Development, and Minimum Wages." *Estudios de Economia* 15(1): 85–125.
- . 2000. "Labor Market Reforms: Issues, Evidence, and Prospects." In *Economic Policy Reform*, ed. A.O. Krueger. Chicago: University of Chicago Press.
- . 2006. "Does Liberalization of Trade Advance Gender Equality in Schooling and Health?" In *The Future of Globalization*, ed. E. Zedillo. London: Taylor and Francis Books, Ltd.
- . 2008. "Population Policies, Fertility, Women's Human Capital, and Child Quality." *Handbook of Development Economics*, Vol. 4, ed. T. P. Schultz and J. Strauss. Amsterdam: Elsevier, B.V.
- . 2009. "How Does Family Planning Promote Development? Evidence from a Social Experiment in Matlab, Bangladesh—1977–1996." Yale University, Economic Growth Center, New Haven, Conn.
- Sheshinski, E. 2006. "Longevity and Aggregate Savings." CESifo Working Paper 1828. Munich Society for the Promotion of Economic Research, Munich, Germany.