

Population and Economic Development

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Introduction

Assessing the consequences of population on the pace and process of economic growth is one of the oldest themes in the literature on economics. These assessments have varied enormously over time, spanning the highly pessimistic to the outright optimistic. A systematic review of the major studies in this literature represents a useful way to organize a survey of the consequences of demographic change. Such an approach places the population debates in perspective, and it infuses a healthy dose of caution in appraising current debates. Specifically, how have the "bottom-line" appraisals of the consequences of demographic change on development changed over time; why have they changed; and what are the most recent contributions to this literature?

1. The Beginnings: Malthus (1798)

The debate began with two propositions by the Reverend Thomas Malthus in 1798 (*First Essay on Population*) that population would grow at a geometric rate (e.g., 1, 2, 4, . . .) due mainly to a lack of conscious restraints on fertility, and that food would grow at an arithmetic rate (e.g., 1, 2, 3, . . .) due substantially to diminishing returns to increasingly scarce land. The resulting outcome would be food shortages, starvation, and deaths. In the long run, population size would be held in check by food availability and mortality. Population pressures would

constrain income per capita to a low level of subsistence--a "Malthusian trap," as it has been termed. These images caused economics, unfairly, to be dubbed the "dismal science."

Fortunately Malthus' predictions were not sustained by the preponderance of experience over the next two centuries. Couples did not breed without restraint, but rather by consciously managing fertility in response to changing conditions. Food was not unduly constrained by land availability. Instead, technology blossomed and food expanded apace in the very geographic regions where Malthus focused his empirical studies. Ironically, food *surpluses* turned out to be a "problem" confronting many nations, and governments implemented policies designed to curtail farm production.

Clearly the Malthusian ideas regarding population-economic linkages were incomplete, and richer analytical and empirical foundations were needed. The urgency for such a framework was made apparent by demographic events. By the mid 20th century, it was recognized that the simultaneous occurrence of declining mortality and exceptionally high and sustained fertility in scores of developing countries was resulting in high population growth rates. A concern emerged that these rates could not be sustained over long periods of time. While, as in the past, fertility would predictably decline (*a la* the Demographic Transition), still it was unclear whether such a decline would be soon or rapid enough to avoid potentially deleterious effects on

welfare, economic progress, and the environment. Thus, while the "Malthusian Problem" reappeared, approaches to assessing population consequences assumed quite different tacks. It was time for a fresh reassessment.

2. Expanded Elaborations: 1950s, 1960s, 1970s

2.1 The United Nations (1953)

The first major installment that exposed economic-demographic interactions in detail was provided in a seminal study by the United Nations in 1953, *The Determinants and Consequences of Population Trends*. This study was both balanced and comprehensive. Twenty-one economic-demographic linkages were taken up. The impact of population on some factors was judged to be positive (economies due to scale and organization), on some negative (diminishing returns), and on some neutral (technology and social progress). Overall, a net negative impact of undetermined size was considered most likely in much of the developing world, although this conclusion was guarded, and the UN predicted a wide diversity of effects according to country-specific conditions.

2.2 Coale and Hoover (1958)

A second major installment in the evolution of demographic assessments appeared in 1958 in an influential book by Ansley J. Coale and Edgar Hoover (C/H) entitled *Population Growth and Economic Development in Low-Income Countries*. Based on the simulation results of a mathematical model calibrated by Indian

data, C/H concluded that India's development would be substantially enhanced by lower rates of population growth. Their analysis rested on two premises. First, household and economy-wide saving would be diminished by large families; it certainly would not be stimulated enough in response to demographic changes to provide the increased capital required by an enlarged population. Second, economy-wide investments would be skewed away from relatively productive activities since funds would be shifted toward so-called unproductive population-sensitive social expenditures (e.g., health and education). This crowding out of productive investment was linked mainly to the youthful age composition of the high-fertility population, and not population's size, density, or growth, *per se*.

The C/H study had a profound impact on U.S. population policy. It also attracted the attention of academic scholars given its focus on physical capital (as distinct from the Malthusian focus on land), then considered by many to be a (the?) key to economic development.

The C/H study was not without challenge. Over time its impact waned, in part due to the appearance of empirical studies that failed to unearth empirically strong and consistent impacts of population pressures on Third World saving. This is not surprising. At the household level, such saving impacts are fundamentally based on a "life-cycle" conceptualization of behavior. This requires a lengthy "forward looking" planning

horizon. It also requires an institutional structure (e.g., developed capital markets and/or government social security options) to implement lifetime plans. These conditions do not describe the day-to-day survival mode of most residents of the Third World. Indeed, spending on children represents a form of saving (e.g., parents may expect transfers from their children in old age); and moreover, children can be quite productive both in the household and on the farm.

A second challenge to the C/H framework was the appearance of empirical studies that downplayed the role of country-wide age structures as a determinant of spending on education. Even in the face of population pressures, school enrollments and attainments advanced at historically unprecedented rates in many developing countries. This surprisingly occurred without substantial realignments in social budgets. Nations found ways to economize on education resources, and tradeoffs within education budgets were more pervasive than was assumed in the simple C/H model. In short, the empirical underpinnings of the C/H framework were questioned by an increasing body of evidence. Additionally, over time economic theory itself was in flux, highlighting both the *productivity* of human capital (considered economically unproductive in the C/H model), and the importance of technical change (also absent in C/H). While these limitations do not diminish the importance of C/H's pioneering work, they served to shift the population debates in the ensuing decades.

2.3 National Academy of Sciences (1971)

The most pessimistic assessment of population consequences since Malthus appeared in a study organized by the National Academy of Sciences. The findings, *Rapid Population Growth: Consequences and Policy Implications*, appeared in two parts: Volume I, a short Executive Summary, and Volume II, a large set of papers compiled by a panel of distinguished scholars. The study's findings, as summarized by the Executive Summary, are baffling and difficult to interpret. They must be handled with care.

On the one hand, the Executive Summary conveyed a highly negative, indeed an outright alarmist, assessment of the impact of rapid population growth. Twenty-five separate adverse impacts were listed and assessed; no notable positive effects of demographic change were identified. Moreover, there was a substantial disconnect between the Executive Summary and the findings of the key scholars participating in the study, as documented by the papers found in Volume II. The Executive Summary, whose pessimistic conclusions obtained wide publicity in the 1970s, was demonstrably unfaithful to the scholarly studies in Volume II. The Summary was not vetted with the scholars who participated in the study, and indeed its authorship is unknown to this day, in spite of extensive attempts to clarify the historical record (an exhaustive historical assessment of this episode is provided in Kelley 2000). Clearly the assessment of the Executive Summary must be strongly discounted. In spite of this, however, a careful reading of the papers and supporting

components of the Report do reveal an important insight that assists in illuminating the ebb and flow of population assessments over time.

Specifically, the Executive Summary was by admission based mainly on "direct," *shorter-run* impacts of demographic change. ("We have limited ourselves to relative short-term . . . issues . . .", p. vi.) In contrast, the major research papers supporting that study in Volume II, which were much less pessimistic, were based on a *longer-run* focus. More than any other factor, the outcomes of the population debates from the 1970s to the present day would turn on this difference in time perspective. *Direct, shorter-run impacts of demographic change are almost always attenuated (and sometimes even offset) by "feedbacks" that occur only over longer periods of time.*

2.4 United Nations (1973)

In 1973 the United Nations updated its early assessment. This revision arrived at a less eclectic, and a somewhat more pessimistic (but by no means alarmist) evaluation of the various impacts of population growth. This is particularly true of anticipated difficulties of feeding the expanding populations (reverting to traditional Malthusianism), and of pressures on capital formation (reverting to the concerns of Coale and Hoover). In both cases, short-run, direct impacts were highlighted. The report downplays some indirect, longer-run

feedbacks that will likely occur due to price responses, and induced innovation and institutional change.

The most important new contribution to the population debate deriving from the 1973 study was a finding by Simon Kuznets that, based on simple correlations, a net negative impact of population growth on per capita output was not obvious in the data. While his work was based on *longer-run* assessments, and while they were appropriately qualified, they were important to conditioning the bottom-line UN assessment. Given the strong priors of demographers and policy makers that the negative impacts of population growth on development were large, the inability to easily "confirm" this hypothesis through simple, albeit inconclusive, correlations more than any other factor kept the population debate alive during the ensuing decades. The stage was set for a new round of debate.

3. Revisionism: The 1980s

3.1 Julian L. Simon (1981)

This debate was initiated in 1981 with the publication of Julian L. Simon's *The Ultimate Resource*, which challenged the pessimistic views of economic-demographic interactions. The significant impact of Simon's book is explained by several factors. First, it concluded that population growth was likely to exert a *positive* net impact on economic development in many Third World countries *in the intermediate run*--a startling

assertion that attracted extensive attention. Second, it illustrated that the outcome of population impacts on the economy are likely to hinge both on the *time* dimension of the assessments, and whether *feedbacks* are included in the analysis. Third, it reintroduced to the debates the roles of alternative demographic impacts, specifically those of density and size, to add to the popular focus on population growth and age structure. Fourth, and importantly, the book elevated the role of *technology* as a (the?) driving force of economic growth. Simon asserted that demographic pressures would favorably influence the nature and pace of technological change. Finally, it was written in a highly accessible, confrontational debating style that goaded and infuriated his skeptics and amused and emboldened his supporters.

These various attributes of Simon's framework are best illustrated by his analysis of the likelihood that demographic pressures would ultimately cause natural resource exhaustion. He illustrated with numerous graphs that over longer periods most natural-resource prices actually declined, even in the face of rising demands stimulated in part by expanding populations. Price-induced substitutions in production and consumption of natural resources, and an expansion of supply through discovery and technical advance, are offered to explain this result. Most importantly, these "adjustments" or "feedbacks" were in part *caused by* population pressures, a reality that could be exposed only by extending the analysis over several decades. It is this

longer-run perspective, and the *feedbacks* in markets and other institutions, that account for Simon's findings.

Similarly, Simon hypothesized and attempted to document that the pace of technical change, and its bias, were actually stimulated by population pressures, particularly in agriculture where Ester Boserup's (1965) model, first expounded in *The Conditions of Agricultural Growth*, was advanced. She proposed that increasingly productive agricultural technologies are made economically feasible only at higher land densities, and therefore population pressures against increasingly scarce land could have a powerful positive effect on agricultural output growth. Simon extended this notion to observe that major social overhead projects (roads, communications, irrigation) benefitted from expanded populations and scale.

While Simon's book was highly influential in its own right, arguably its greatest impact was as a catalyst in setting the stage for reassessing the basic propositions of the population debates. The 1980s witnessed a flurry of major "reassessments."

3.2 National Research Council (1986)

The most important and influential reassessment was compiled by a Working Group on Population Growth and Economic Development under the auspices of the National Research Council (NRC). The bottom-line assessment by this group was eclectic, balanced, and non-alarmist:

"On balance, we reach the qualitative conclusion that slower population growth would be beneficial to economic development of most developing countries (p. 90)."

This carefully worded statement illustrates well the central elements of all of the major population assessments in the 1980s: (1) there are both important positive and negative impacts of population growth (thus, "on balance"); (2) the actual size of the net impact--and even whether it is strong or weak--cannot be determined given current evidence (thus "qualitative"); (3) only the direction of the impact from high current growth rates can be discerned (thus "slower," and not "slow"); and (4) the net impact varies from country to country--in most cases it will be negative, in some it will be positive, and in others it will have little impact one way or the other (thus, "most developing countries").

It is interesting to speculate on factors that account for the guarded and qualified assessment of the NRC group. Three factors can be singled out.

First, the Summary Report highlights *individual and institutional responses* to initial impacts of population change--conservation in response to scarcity, substitution of abundant for scarce factors of production, innovation and adoption of technologies to exploit profitable opportunities, and the like.

Second, the study was compiled almost exclusively by economists, whose faith in the potential for market-induced responses to modify initial direct impacts of population change is greater than that possessed by other social and biological scientists.

Third, research which had been accumulating over the past ten to fifteen years downplayed many of the previous concerns voiced on the impacts of rapid population growth. For example, as noted by Simon and others, the concern that population growth results in the exhaustion of non-renewable natural resources is misplaced. The relationship between population growth and global resource use is not as strong as had been assumed.

Similarly, the concern about a substantial reduction of saving due to rapid population growth is not confirmed by the data. While some capital shallowing occurs, the impact of this on economic growth is not particularly strong. Finally, the concern that population growth will significantly shift resources from productive physical capital formation into alleged "less-productive" areas was not sustained by the data. The financing of educational enrollments, which expanded significantly even in the face of population pressures, came from some combination of increases in public (sometimes deficit) spending, reduction in per pupil expenditures, and efficiency gains.

Interestingly, a new concern was elevated in importance by the 1986 Report in the area of renewable resource degradation.

Unlike non-renewable resources, property rights are difficult to assign or maintain for renewable resources like fishing areas and rain forests. Overuse can result. The problem is not population growth *per se*, but rather institutional failure. Cutting population growth in half would not solve the problem; it would only postpone the deleterious outcome of resource degradation. The solution requires policies to focus on the *causes* of failure (the need for more effective property rights, market responses, and government policies to correct externalities) rather than a focus on population pressures, which mainly exacerbate the environmental responses.

3.3 Other Studies in the 1980s

The bottom-line assessments of five other studies in the 1980s merit citing. All reflect the balanced, longer-run methodological perspective of the 1986 National Research Council report. Specifically, all highlight direct and indirect responses to population pressures. The resulting bottom-lines, while assigning a negative net impact of rapid population growth are, on average, both qualified and guarded.

The World Bank's *World Development Report 1984* is concerned most about countries that exhibit exceptionally rapid growth rates: ". . . population growth--at rates above 2 percent . . .--acts as a brake on development" (p. 79), although, "Up to a point, population growth can be accommodated . . ." (p. 79).

An overall appraisal of both the *World Development Report 1984*, and the National Research Council report two years later, is offered by Dr. Nancy Birdsall, who headed the World Bank study and was also a member of the NRC Working Group. She concluded that "Rapid population growth can slow development, but only under specific circumstances and generally with limited or weak effects" [Birdsall (1988), p. 529].

Allen C. Kelley's 1988 survey for the *Journal of Economic Literature* concludes that ". . . economic growth . . . would have been more rapid in an environment of slower population growth, although in a number of countries the impact was probably negligible and in some it may have been positive" (p. 1715). Adverse impacts are most likely to occur where 1) water and arable land are scarce, 2) property rights are poorly defined, and 3) government policies are ineffective and biased against labor.

T. N. Srinivasan's 1988 survey parallels the conclusion of the NRC Report. He emphasizes caution in the formulation of population policies, noting that "many of the alleged deleterious consequences [of population growth] result more from inappropriate policies and institutions than from rapid population growth. Thus policy reform and institutional change are called for, rather than policy interventions in private fertility decisions to counter these effects" (p. 7).

It appears that in the 1980s a broad consensus was struck on the net assessments of demographic change. Most analysts held that while slower population growth would indeed advance the economic progress of most developing countries, the size of the net impacts would not likely be especially remarkable by comparison with numerous other determinants of economic growth. The shift of the research emphasis during the decade to highlight the importance of 1) *time* in the analysis (modifying shorter-run direct impacts of demography with feedbacks occurring over the longer run), and 2) the need to account for the separate components of demographic change (births, deaths, age, size, density), combined to put the research programs on solid footing. While these "revisionist" renderings and methodologies were widely embraced, uncertainties still remained, most importantly the need to obtain more precise *quantitative* assessments, especially those that accounted both for the components of demographic change and the timing of their impacts.

4. New Paradigms: The 1990s and Beyond

While most of the 1990s was preoccupied with digesting the revisionist results of the 1980s, population research did advance in several areas.

First, the findings from "simple correlations" between the rate of population and per capita economic growth appeared to have changed. While a general *lack* of correlation was the widely-obtained statistical result for the 1960s and 1970s, in the 1980s

the correlation turned negative (see Kelley and Schmidt 1994). On the one hand, most analysts agreed that such simple correlations are difficult to interpret, plagued as they are by failure to adequately account for reverse causation, excessive reliance on cross-section data, sensitivity to the selection of countries, the complexity of demographic linkages that are poorly modeled, spurious correlation, econometric pitfalls, and data of dubious quality. On the other hand, the previous finding of no correlation for the 1960s and 1970s in the face of strongly held priors of a negative correlation literally kept the population debate alive. Now, a *change* in this relationship from one of no-correlation to one of a negative correlation for the 1980s required an explanation. New questions appeared: what accounts for the changed correlations; are the new results robust; are they quantitatively important?

The ability to address these issues coincided with the emergence in the 1990s of empirical "convergence" models of economic growth. Pioneered by Robert Barro, these empirical paradigms distinguish between factors (economic, political, social, institutional, geographic) that determine each country's *long-run* level of per capita output, and the shorter-to-intermediate-run *transition* of countries to this longer-run state. These models lent themselves to investigating the impacts of demography since they exposed both short- and long-run impacts.

Efforts to model demography using the new convergence models have varied notably. Barro (1997), for example, looked primarily on the longer-run impacts of demography, and found that reductions in the total fertility rate increased the potential for economic growth.

In yet an earlier study, Kelley and Schmidt (1995), building on the Barro core variables, distinguished between several alternative demographic influences on the economy's potential output in the long-run, (e.g., the impacts of population size and density), and timing of demographic impacts (e.g., the timing of reductions in birth and death rates) which influence both the short and long run. These timing specifications highlighted the reality that birth-rate reductions have an immediate positive impact on growth by economizing on child-rearing expenses while, in fifteen or so years, the impacts will be reversed, since there will be fewer persons entering their productive work force years. Death rate reductions, especially infant/child mortality, can have similar timing impacts. Kelley and Schmidt found that these timing/transitional features were empirically important, and the long-run impacts of both density and size added modestly to growth as well.

Bloom and Williamson (1998), also building on Barro's empirical framework (although with different core variables highlighting policy and geography), modified the demographic modeling to break out an accounting reckoning of age-compositional impacts. While

explicit modeling of longer-run demographic impacts is absent in their framework, their clean accounting framework clearly exposes the impacts of changing age structures, driven by changes in fertility and mortality. These are quantitatively important impacts on the *transition* to long-run output per capita. Their results focused on East Asia where declines in fertility were rapid and shorter-run transition effects are predictably large.

Finally, Kelley and Schmidt (2000) compared the above (and other) modeling efforts in a single empirical investigation, and came up with a somewhat surprising result: demography accounts for around 20% of changes in output per capita growth from 1960-1995 across a wide collection of countries. While for several reasons they consider their findings qualified, it is interesting that these findings are broadly consistent with those of the 1980s. Population *does* matter: its impact is likely adverse over the period 1960-1995; this impact varies from decade to decade; components of demographic change exert both positive and negative impacts; these impacts vary notably from place to place; and, as a determining variable of long-run economic prosperity, population's impact is notable, but not remarkable. In the shorter-to-intermediate run, during periods of "transition" (both demographic, and economic), population's impact can be elevated or diminished, depending on the pace of demographic change and especially on the country's specific institutions (government policy, efficacy of markets, definition of property rights).

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