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The Effects of Health and Demographic Change on Economic Growth: Integrating Micro and Macro Perspectives — Part II

II. Population Growth, Land Fragmentation, and Groundwater

The Brown University research program aims to increase the understanding of how investments in health and fertility decline contribute to economic growth. The project focuses on the effects of changes in health and demographic structure on the level of economic activity, the role of demographic change in the sustainable use of environmental resources, and the long-term effects of early child health and nutrition on adult productivity. This subproject looks at the ways in which population growth affects economic well-being through changes in the quality and level of environmental resources.

Country where the research will take place

India

How does the research describe the impact of population/reproductive health on poverty reduction and/or economic growth?

It has long been suspected that one of the most important mechanisms by which population growth affects economic well-being is through changes in the quality and level of environmental resources. There are two central features to this argument. First, the production and availability of environmental resources is importantly tied to a relatively rigid set of fixed natural factors or processes and thus is not readily expandable through increases in the size of the workforce. This relative inflexibility is most clearly evident in the case such nonrenewable resources as oil, but also arises in the context of renewable resources such as fresh water or forests. A depleted groundwater aquifer, for example, can be replenished over time, but the rate of replenishment is tied to precipitation and the size of the watershed that flows into this aquifer, two “inputs” into water production that cannot be easily altered. Second, extraction and use of environmental resources is often difficult to monitor and thus may not be efficiently allocatable using normal market mechanisms. The fact that uses of environmental resources are not appropriately priced implies that the incentives that would lead to technological innovation and adoption (such as drip irrigation) to compensate for scarcity in the face of rising population sizes may be substantially weakened. From a longer-term perspective, any constraints on the pricing of environmental resources may lead households to be less sensitive to environmental resource scarcity in terms of their own decisions about childbearing.

Previous work yielded a model that integrated hydrogeological water flow with an economic model of water extraction. This model shows that, because of the nature of waterflow in aquifers, larger farmers more adequately internalize the effects of the groundwater extraction than do small farmers. Thus decreases in farm size arising from population growth are likely to have important adverse effects on the sustainability of agricultural productivity growth.

Foster and Rosenzweig are able to test and confirm some aspects of the model but a key weakness of this work is the lack of access to the locations of wells used by the study farmers. The previous work also has not included an assessment of the productivity costs of changes in availability of groundwater. With the much more detailed data on well location, usage, and costs in combination that will be collected in 2007; it will be possible to address these weaknesses as well as to provide a clear assessment of how the process of population growth and the consequent land fragmentation that has taken place over the last 40 years has impacted farm profitability. This research will extend these previous analyses using the 2006 data, and then use these results to examine how changes in the level and pace of fertility decline in India over the 1980s might have affected the structure of the rural economy today.

How will the research address a policy need, and what kind of policy lesson is expected?

There is a need to assess what types of policy interventions are most effective in terms of increasing the efficiency of the use of natural resources. Among the relevant policies are developing markets for environmental resources, providing

public access to these resources, trying to regulate access to resources, build social and political institutions that can play a role in the allocation of resources, and providing opportunities outside of agriculture to encourage land consolidation. But in order to evaluate these policies one needs a clear sense of how economic behavior and incentives interact with the processes that determine resource availability. This project is focused on developing and testing an appropriate set of theoretical frameworks that can be used to study alternative policy choices.

Methods used

Methods are based on the collection of spatially detailed household survey data along with information on resource

availability at the level of the community. Analytic models of behavior and the interaction of behavior with underlying resources processes are then developed and tested using these data.

Data used

ARIS-REDS surveys, a multipurpose panel data set that constitutes a representative sample of rural India and spans a period of almost 40 years.

Notes

This project has been underway for one year.