

Summaries

Dynamics of tuberculosis and economic growth

DORIANA DELFINO and PETER J. SIMMONS

Tuberculosis (TB) is a major problem affecting the health status and the size of the effective labour force in most of the developing countries. We use data from 120 countries to examine demographic–epidemiological differences between countries and the ways in which these differences vary with economic prosperity. Using an econometric approach we replicate the variations seen in the data.

Next we represent the spread of the disease within a population over time. There is a natural net growth rate of healthy individuals and a death rate of infected/infectious individuals. There is a chance the latter may recover from the disease. The disease spreads through random meetings between healthy and infected/infectious individuals. Applying the parameter values of prosperous and less prosperous countries within this framework shows that, in the former, TB naturally dies out and the healthy population grows to the capacity of the country. However, in the latter, TB is not eradicated and the system exhibits epidemic cycles of decreasing amplitude in the health structure of the population. Broadly this pattern matches the experience of these countries.

There are further interactions between the health structure of the population and prosperity. When TB is widespread, the effective labour force and, consequently, economic output and prosperity are reduced. In turn this worsening of economic conditions leads to increased virulence of the disease. Thus there are elements of a vicious circle. To capture these effects we combine the TB dynamics with a simple economic framework in which labour and capital produce economic output. Capital changes over time due to the joint effects of investing part of output and of depreciation of the existing capital stock. Applying our econometric results on the links between the demographic–epidemiological parameters and economic prosperity within this framework allows us to see the dynamic two-way interaction between TB and economic prosperity. The results again illustrate stark differences between the highest prosperity countries and the remainder. With high prosperity (due to high labour productivity and, from the effects of past investment, high initial capital stock), TB is eliminated over time and the economy steadily grows in both capital and healthy population until the limit set by the carrying capacity of the

country is reached. However, in less prosperous countries the system shows decreasing fluctuations in both the TB prevalence, the total population size, and capital stock, ultimately tending to a state in which there is a positive prevalence of TB and total population is below the carrying capacity.

There is a particular combination of the demographic–epidemiological parameters, defined here as the reproductive rate of disease (function of prosperity), which determines the dynamic patterns of the system. The reproductive rate depends on the force of infection, the carrying capacity of the country, the death and recovery rates of the infected/infectious (all functions of economic prosperity). Hence, to control TB, policy should aim to influence these parameters, either directly, or indirectly through improving economic prosperity. The main direct policy in use is the DOTS programme administered by the World Health Organization (WHO). DOTS aims at raising the recovery rate of infected cases and, therefore, at reducing the mortality rate. However, data indicate that the recovery rate is already high in all countries (around 70 per cent) so there is limited scope for further improvement. There are large variations between countries in the force of infection and the death rate of the infected/infectious individuals. We argue that policy should aim to influence these parameters. Moreover, since these parameters are sensitive to economic prosperity, we argue that a policy of raising labour productivity in the less prosperous countries has the combined benefits of raising the standard of living and of reducing the reproductive rate of the disease.

Protecting China's children: valuing the health impacts of reduced air pollution in Chinese cities

ROBERT W. MEAD and VICTOR BRAJER

As China continues to develop economically, it also continues to generate air pollution, and the goal of this paper is to provide some quantification regarding the extent of various pollution-related morbidity costs upon children in urban China.

First, the collection of air pollution and population data for 38 cities is explained. The authors then derive the estimated child population for each city. Next, they explain how the relevant morbidity data are obtained. Once the data collection is completed, the authors develop projections of population and two different air pollution clean-up campaigns for the period 2002–2011.

Having completed the population and pollution projections, the authors turn to developing and valuing the health benefits from reduced pollution. The health effects section explains how China-specific studies are used to derive the equations that estimate the number of pollution-induced morbidity cases for each of several illnesses. The valuation section then

explains how a China-specific dollar value is attached to each of the different types of morbidity, taking note of the relevant circumstances involving both developing countries and children.

In the results section, the authors estimate the number of cases of childhood morbidity that could be averted in each pollution clean-up scenario. Having estimated the numbers of cases, the authors then apply the dollar values developed in the valuation section to quantify the benefits of pollution clean-up. The results indicate that the morbidity benefits to children of pollution clean-up are substantial. Over the ten-year period from 2002 to 2011, the authors project over 7 million colds, 25 million cases of bronchitis, and nearly 1 million asthma episodes averted. The mid-range dollar value of these child health improvements approaches \$3.5 billion in 2001 dollars.

Some final comments on the valuation of children's health are presented in the conclusion.

Incentives in water management reform: assessing the effect on water use, production, and poverty in the Yellow River Basin

JINXIA WANG, ZHIGANG XU, JIKUN HUANG,
and SCOTT ROZELLE

The overall goal of our paper is to understand better water management reform in China's rural communities, focusing especially on the effect that improving incentives to water managers will have on the nation's water resources and the welfare of the rural population. To pursue this goal, the paper has three objectives. First, we track the evolution of water management reform and seek to identify the incentive mechanisms that encourage water managers to use water more efficiently. Second, we identify the impact on crop water use of the incentives provided to water managers during reform. Third, since we are also interested in the possible negative consequences of an incentive-led water management reform strategy, the paper also explores how changes in incentives affect agricultural production, farmer income, and poverty.

Based on a random sample of 51 villages, 189 farmers, and 378 plots in four large irrigation districts in Ningxia and Henan provinces, both in China's Yellow River Basin, our results show that in our sample areas the two main forms of water management reform, Water User Associations and contracting, have begun to systematically replace traditional forms of collective management. In some regions the reform institutions have become the dominant form of management. Spread mostly by the efforts of water officials, we have shown that implementation has often deviated from theory. Participation by farmers has played only a minor role in most villages. In some villages, reform has been implemented only nominally,

and there are few apparent differences when comparing the 'reform' institutions with traditional management forms. In part because of these implementation problems, our analysis has shown that nominal reform has had little effect on water use.

The absence of a systematic relationship between nominal reform and water use, however, does not mean that the entire reform process has failed. Indeed, one of the main features of China's water management reforms, the provision of incentives to water managers, appears to have succeeded in achieving large water savings, while having only a small or no effect on agricultural production or rural incomes. Our findings demonstrate that in villages that provided water managers with strong incentives, water use fell sharply. The incentives must also have improved the efficiency of the irrigation systems, since the output of major crops, such as rice and maize, did not fall, and rural incomes and poverty remained statistically unchanged. Only wheat production fell. Although our study needs to be undertaken in other areas in the future before the results can be generalized to the rest of China, at least in the sample sites that provided their managers with incentives, water management reform has been nearly a win-win policy. We note that we can find little if any effect of participation by farmers on water use in our sample sites.

Overall, we believe that our findings support the conclusion that the government should continue to support water management reform. Officials that want the reforms to succeed should make an effort to ensure that more emphasis be put on effective implementation. Although negative impacts on production and farmer income were not found, in the longer run, as water management reform reaches into more water scarce areas and seeks to continue to achieve water savings in areas that have already cut back on use, there may be sharper tradeoffs between water use and production and income.

Efficiency and equity in groundwater markets: the case of Madhya Pradesh, India

KEI KAJISA and TAKESHI SAKURAI

The recent proliferation of private well irrigation systems, especially in South Asia, has stimulated groundwater transactions through bilateral bargaining between owners and non-owners over multiple types of contracts, including output sharing contracts. The existence of a bargaining structure implies that the price of groundwater, or equity, varies across pairs of sellers and buyers, depending on the particular characteristics that determine their relative bargaining positions. The existence of output sharing contracts implies, as is widely held in contract theory literature, that a disincentive akin to the effect of *ad valorem* tax can render

production inefficient and also that payments of high rent can render income distribution inequitable. Thus far, however, emerging empirical studies on groundwater markets have either been village-level cost–benefit analyses or case studies. These have paid little attention to the particular characteristics of sellers and buyers, such as their bargaining positions or types of groundwater contracts.

The purpose of this paper is to enrich our understanding of the nature of groundwater markets by examining the impact on efficiency and equity of both bargaining relationships and output sharing contracts using household data from Madhya Pradesh in India. The efficiency is examined using two methods: a conventional method, which compares input intensities under different contractual statuses including output sharing water contracts, and also the stochastic production frontier model. We examine equity by comparing groundwater prices under output sharing contracts with prices under other types of contracts. In order to capture the impact of bargaining positions, we include as the determinants of price the characteristics of both water sellers and buyers.

Regression results find no significant inefficiency in the farms managed by buyers under output sharing contracts, presumably because the possible disincentive effect is circumvented through effective monitoring and contract adherence mechanisms embedded in long-term and intensive personal relationships between sellers and buyers. The results also find that output sharing buyers pay higher water prices, presumably due to the inclusion of a risk premium and an implicit interest premium. However, the rate of premiums (39 per cent) is not excessively higher than the informal interest rate (34 per cent) that the sharing buyers would have had to bear under other types of contracts. The results also show that the buyers who have alternative water sellers pay lower water prices. These findings indicate that taking into account the imperfection of credit and contingent markets in rural areas, informal groundwater markets would work fairly well in agrarian communities if monitoring and contract adherence mechanisms are embedded and if an adequate number of potential sellers exist.

Willingness to pay for water and location bias in hedonic price analysis: evidence from the Indonesian housing market

ARIEF ANSHORY YUSUF and PHOEBE KOUNDOURI

Access to safe and improved domestic water is an important attribute of a house and a major policy issue in developing countries, where existence

of such access is not guaranteed. Moreover, the existence or absence of this attribute from a particular house, might affect people's willingness to pay for the house in question. Where this is so, the structure of housing rents and prices will reflect these differentials. Hence, by using data on prices of different properties we can, in principle, identify the contribution which water-related attributes make to the value of a house. This identifies an implicit or shadow price for these attributes, which in turn can be used for calculating total willingness to pay for their provision. The method commonly used to implement this approach is the hedonic technique.

This paper is motivated by the fact that the decision on whether to buy a house in a particular location is endogenous to the price paid. This endogeneity derives from certain socio-economic characteristics of the owner that can influence the location of the house. We demonstrate this argument with a model in which the decision to locate in an urban or rural area is investigated together with the hedonic valuation of the characteristics of the house. We argue that failure to account for alternative locations can give rise to a 'sample selection problem', which results in misleading estimates of the willingness to pay (WTP) for water-related attributes (the focus variables of this paper) and other characteristics of the house in question.

The sample selection problem that we investigate, is analogous to the one considered in travel cost models where the endogeneity of the decision to visit a recreational site is shown to result in estimated demand that exaggerates the consumer surplus associated with the trip. In this paper we use a two-stage Heckman model, which allows us to analyze the independence of information about local environmental disamenities and residential real estate prices. The empirical results of both of these papers suggest that the independence assumption may be inappropriate.

The empirical analysis of this paper uses data from the Indonesian housing market and shows that households value access to safe and improved domestic water. In particular, households in urban areas value piped and pump water access more than well water. However, hedonic valuation of water-related and other household characteristics is influenced by the choice of location (rural/urban) of the house in question, which suggests that ignoring this sample selection characteristic of the market under consideration will bias relevant willingness to pay calculations.

The overall conclusion of this paper is that researchers and policy makers must be careful when employing hedonic techniques to derive willingness to pay for housing attributes; it is possible for these techniques to give rise to misleading conclusions about the effect of an attribute on consumers' welfare if potential biases from inappropriate sample selection criteria are ignored. The arguments raised in the paper have implications for hedonic price analysis applied to other goods whose owner's characteristics can affect sample selection.

Productive efficiency, property rights, and sustainable renewable resource development in the mini-purse seine fishery of the Java Sea

INDAH SUSILOWATI, NORMAN BARTOO, ISHAK HAJI OMAR, YONGIL JEON, K. KUPERAN, DALE SQUIRES, and NIELS VESTERGAARD

The relationship between productive efficiency and sustainable development of fisheries in developing countries has received little attention. When access to common resources in developing countries is relatively open and unimpeded, increases in efficiency place further pressure on the resource stocks and lead to further decline in these resource stocks. Development predicated on increased private efficiency without considering the impact on the resource stocks and the nature of the property rights is not likely to be sustainable.

This paper examines this relationship through a case study of the mini purse seine fishery of the Java Sea. Three key points emerge from the empirical analysis. First, private technical efficiency does not depend on any measurable attributes of the skipper or fishing master. In contrast, measurable attributes of the farmer's human capital, such as education, are often found significant in studies of technical efficiency in developing country agriculture. In agricultural development, these attributes give public policy a handle by which to improve or control efficiency, but no such readily observable handle exists for this fishery. Second, efficiency in this fishery varies substantially between seasons, with a sharp drop during the monsoon season, and in the peak season individual vessel technical efficiency scores are comparatively high. Third, there is little variation in each vessel's technical efficiency scores during the peak season, but increased variation during the off-season.

The relatively large drop-off in technical efficiency during the monsoon season might seem to present a favorable opportunity for a captain's training or extension program to raise technical efficiency. The three salient empirical findings suggest that, in this fishery, however, attempts to manage private technical efficiency through training programs and extension may be largely ineffective because of the paradox between private and social technical efficiency under ill-structured property rights. That is, when access to the common resource is relatively open, increases efficiency of fishing vessels simply lead to further pressures on the resource stocks, a modern version of the 'Tragedy of the Commons'.