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Infrastructure and Growth in Developing Countries

Stéphane Straub

A survey of the literature suggests what type of research is most likely to be useful for policy and what data are needed

Drawing practical lessons for infrastructure policy in developing countries requires high-quality empirical research and more and better data. In a new paper Straub surveys the theoretical and empirical research on infrastructure sectors in developing countries—energy, transport, telecommunications, and water and sanitation—to highlight what works and what doesn't when trying to understand the causal pathways between infrastructure investment and development outcomes. Straub draws conclusions on two questions: what type of research is most likely to be useful in the search for practical policy recommendations, and what type of data are needed to carry out that research.

The literature review is organized around two main sets of issues. The first, where most contributions have focused, involves understanding the links between infrastructure and economic growth at the level of the economy, region, and sector. Growth theory provides theoretical foundations, and so does the new economic geography literature, which has the added virtue of allowing the prediction of joint outcomes in growth and spatial inequality.

Direct channels from infrastructure to growth capture the impact of an increase in this form of capital on the productivity of other factors, with results in steady-state growth depending on the assumptions made on aggregate returns to scale. More interesting are the potential indirect channels—maintenance costs, adjustment costs, labor productivity, economies of scale and scope—that reveal the possibility of a growth effect resulting from investments in infrastructure above and beyond the simple factor accumulation effect.

The second set of issues includes composition (new investments or maintenance, operational or capital expenditures, private or public investments), the sequencing of reforms, and the importance of different infrastructure sectors. The theory on these topics is far patchier. It consists mostly of some insights indicating that the balance between new investment and maintenance is likely to depart from what is optimal—and that maintenance spending that is lower than optimal will lead to higher operational costs, both for infrastructure facilities and for private capital goods that rely on them.

On the empirical side Straub surveys 64 recent papers, analyzing some 140 specifications in detail. Two-thirds of these specifications support a positive and significant link between infrastructure investment and growth. But because of the diversity of techniques, indicators, samples, and time frames, the literature provides few clear messages on questions of interest to policymakers—what is the proper timing of

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FOCUS
Finance for All? Policies and Pitfalls in Expanding Access

Recent advances in measuring access to finance help in evaluating its impact on households and firms and devising policies to broaden it

Across the developing world less than half the population has an account with a financial institution, and in most of Africa less than a fifth of households do. Modern development theory emphasizes lack of access to finance as playing a big part in persistent income inequality and slower growth. Without inclusive financial systems that provide broad access, poor people and small enterprises have to rely on their own resources to invest in education or take advantage of promising growth opportunities.

Despite the emphasis in theory, promoting broader access to financial services has received much less attention in development practice, mostly because of serious data gaps in this area. A new World Bank Policy Research Report, prepared by Asli Demirgüç-Kunt, Thorsten Beck, and Patrick Honohan, provides indicators of access for the first time. The report shows that financial exclusion affects not only the poor but also a large share of the nonpoor in many developing countries.

Beyond measuring access to finance, it is important to identify the barriers that prevent poor people and small firms, especially those in rural areas or in the informal sector, from using financial services. The many barriers include prohibitive costs, distance from services, and the inability to produce formal documents when needed. Ethiopia has less than one bank branch per 100,000 people, and in Cameroon it costs $700—more than GDP per capita—to open a checking account. Indeed, in many developing countries banks impose high minimum account balances and annual fees to open and maintain checking and savings accounts, which can exclude large shares of the population.

The report's conclusions confirm some traditional views and challenge others. For example, recent research provides additional evidence to support the widely held belief that financial development promotes growth. The research shows how better access to finance helps by creating an environment conducive to the entry of new firms and to innovation and growth. Research also shows that small firms benefit the most from financial development and greater access—both through easier entry and through the relaxing of constraints to growth. Thus inclusive financial systems also have consequences for the composition of the enterprise sector and the competition in it.

Recent evidence suggests that finance is not only pro-growth but also pro-poor. Beyond benefiting directly from access to financial services, small firms and poor households can also benefit indirectly from the effects of financial development. For example, the poor may benefit from having jobs and higher wages as better developed financial systems improve overall efficiency and promote growth and employment. Similarly, small firms may see their business opportunities expand with financial development, even if the financial sector still mostly serves large firms. Thus pro-poor financial sector policy requires a broader focus of attention than access for the poor: extending access to the excluded nonpoor micro and small entrepreneurs can have a strongly favorable indirect effect on the poor.

Market failures relating to information gaps, the need for coordination on collective action, and concentration of power mean that governments across the world have an important part to play in building inclusive financial systems. But not all government action is equally effective. Thus it is important to have realistic goals. For example, even in the most developed economies not all would-be borrowers are creditworthy and not everyone will or should qualify for credit. There are many examples of overly relaxed credit policies having reduced national welfare.

Government policies to expand access to financial services should focus on reforming institutions, developing infrastructure to take advantage of technological advances, encouraging competition, and providing the right incentives through prudential regulations. In contrast, direct interventions by governments, such as through credit subsidies or government-owned financial institutions, can be counterproductive, reducing incentives for the private sector to deliver services to the poor. Despite the best efforts of microfinance institutions, delivering financial services to the poorest without subsidies remains difficult. But credit is not the only financial service needed by the poorest—and in many cases not even the main one. The report suggests that subsidies may be better spent on overcoming barriers to savings and payment services, essential to participate in a modern market economy.

By reviewing and highlighting a large body of research, the report also identifies many gaps in our knowledge. Much more research is needed to measure and track access to financial services, to evaluate its impact on development outcomes, and to design and evaluate policy interventions. Building data sets on access to finance that benchmark countries annually would help focus policymakers' attention and allow us to track and evaluate reforms aimed at broadening access. Better data at the firm and household level are important for improving our understanding of the impact of access and designing better policies for building more inclusive financial systems.

World Bank. 2007. Finance for All? Policies and Pitfalls in Expanding Access. *World Bank Policy Research Report*. Washington, D.C.: World Bank.

Exports and Productivity: Comparable Evidence for 14 Countries

● *International Study Group on Exports and Productivity*

Exporting firms have strong productivity premiums. Understanding why these differ across countries is key for policy

That exporting firms outperform counterparts selling only in the domestic market is well established through anecdotal evidence and microeconometric research. Two alternative (but not mutually exclusive) hypotheses offer explanations for this difference in performance.

The first hypothesis points to self-selection into export markets by the more productive firms. Selling goods in foreign markets requires firms to incur additional transport and distribution costs, the expenses of skilled personnel to manage foreign networks, and production costs to customize domestic products for foreign markets. These costs constitute an entry barrier that less productive firms cannot overcome. Moreover, firms may be forward-looking, with their desire to export tomorrow leading them to improve their performance today.

The second hypothesis points to the role of "learning by exporting." Flows of knowledge from foreign buyers and competitors help improve the postentry performance of export starters. In addition, firms selling in foreign markets are exposed to more intense competition and must improve their performance faster than firms that sell only domestically.

Cross-sectional differences between exporters and nonexporters may therefore be explained by ex ante differences between firms (the more productive firms become exporters) but also by ex post differences (exporting makes firms more productive).

The big picture emerging from the literature on exports and productivity is this: the more productive firms self-select into export markets, but exporting does not necessarily improve productivity. But this big picture hides substantial heterogeneity. Cross-country comparisons and even cross-study comparisons for a given country are difficult to make because the studies differ in the specifics of the approach followed.

In a recent study the International Study Group on Exports and Productivity uses comparable micro-level panel data for 14 countries and a set of identically specified empirical models to investigate the relationship between exports and productivity. The results are internationally comparable, both qualitatively and quantitatively. The study covers countries in Asia (China), Latin America (Chile, Colombia), and the European Union (Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Slovenia, Spain, Sweden, the United Kingdom), with contributions by economists in all these countries.

The study's main results are in line with the big picture from the literature. The study finds that exporters are significantly more productive than nonexporters when observed and unobserved firm heterogeneity is controlled for, and whether performance is measured by labor productivity or by total factor productivity. It shows that the productivity premiums of exporters increase with the share of exports in total sales but do not differ by firm size.

Interestingly, the exporter premiums differ considerably across countries, with Colombia exhibiting the largest estimated premium and Sweden the smallest. To understand the cross-country heterogeneity in exporter premiums, the study conducts a meta-analysis that econometrically relates the estimated premiums to features of the estimation (for example, whether ordinary least squares is used and how many observations are included) and to country characteristics (for example, size proxied by GDP, level of development proxied by GDP per capita, and indicators of institutional quality). The meta-analysis shows that the level of development cannot explain the observed cross-country differences in exporter premiums. But it also shows that larger or more open countries and countries with a more business-friendly environment and a more effective government exhibit larger estimated exporter premiums.

The findings on exporter premiums suggest a strong correlation between productivity and exports but do not establish causality. To test the self-selection hypothesis, the study examines preentry differences in productivity between export starters and nonexporters. If better firms become exporters, one should find significant differences in productivity between future export starters and future nonstarters even before some of them begin to export. Indeed, the results show preentry productivity premiums for export starters. The preentry premiums are larger in smaller or less open countries and in countries with less business-friendly regulations. Thus, in such environments future export starters must have a strong productivity advantage to cover the extra costs associated with becoming an exporter.

To test the learning-by-exporting hypothesis, the study investigates the postentry differences in productivity growth between export starters and nonexporters. The results provide only weak evidence of learning by exporting. But the authors caution that their methodology does not control for the potential bias caused by self-selection of the most productive firms into exporting and thus that this weak evidence deserves further scrutiny using more sophisticated techniques.

The study's key findings are the cross-country differences in exporter premiums that are shown not to be related to the use of different types of data or to the application of differently specified econometric models. The crucial next step in the research agenda is to develop a solid understanding of the nature and causes of the differences in exporter premiums across countries—a prerequisite for sound policy prescriptions that can help foster export-driven growth.

Ana M. Fernandes and coauthors from the International Study Group on Exports and Productivity. 2007. "Exports and Productivity: Comparable Evidence for 14 Countries." Policy Research Working Paper 4418. World Bank, Washington, D.C.

Local Inequality and Project Choice

Caridad Araujo, Francisco Ferreira, Peter Lanjouw, and Berk Özler

Elites can significantly affect the outcomes of participatory processes, even those that are carefully designed

Decentralization of spending authority and community participation in decisionmaking have become common elements in policy and program design in many developing countries. Since the 1980s a growing number of antipoverty programs have been designed as decentralized, demand-driven initiatives, where the local beneficiaries decide—through a participatory process—what type of expenditures will be made.

Yet the theoretical literature remains ambiguous in its assessment of the rationale for decentralization. This ambiguity arises from the tradeoff between the local government's advantage in access to superior information at lower cost and the risk that capture of decisionmaking by special interest groups may be greater at the local level than at the national. Thus better empirical analysis for specific programs is needed, with particular attention to whether programs might be diverted from their objectives through the influence of local elites.

A new paper by Araujo, Ferreira, Lanjouw, and Özler uses a unique combination of data sets from Ecuador to investigate whether there is elite capture in the pattern of project choice by communities awarded grants from the Social Investment Fund. The data include reliable poverty and inequality estimates at the community level, obtained by combining high-quality household survey data with census data. They also include administrative data on project approvals and expenditures by type and by community for almost three years.

Social investment funds typically offer communities a menu of projects from which to choose, most of which produce public goods and all of which are intended to benefit the poor. The paper exploits the fact that the menu offered by Ecuador's fund included basically two types of projects: local public goods (accessible to all, though their valuation may vary across individuals) and excludable (private) goods. In Ecuador by far the most important private good provided was latrines, built on plots belonging to poor community members with no previous access to toilet facilities.

The paper constructs a theoretical model of project choice between public and private goods, under the assumption that political power is positively correlated with socioeconomic status. The model predicts that, controlling for inequality, poorer communities will select latrine projects more often than richer ones. It also predicts that, controlling for poverty, more unequal communities will choose latrine projects less often, as a result of a concentration of power in the hands of richer people, who do not need latrines.

Both predictions are borne out empirically, as can be seen in figures 1 and 2. The results presented in these figures are robust to a large number of controls and alternative specifications. Controlling for infrastructure need and a set of geographic and demographic variables, the poverty headcount is associated with a greater probability of the community receiving a latrine project. Inequality (measured by the expenditure share of the top 1 percent, top 3 percent, top 5 percent, and so on) reduces the likelihood of a latrine project being chosen. This effect tends to fade as the elite is defined as a progressively larger group and vanishes when the more commonly used Gini coefficient is used. That the expenditure share of the richest 1 percent in a community is so strongly correlated with the type of project selected may indicate that project choice is heavily influenced by a few dominant actors.

These results are consistent with the paper's model of project choice under political inequality. They suggest that even programs targeted to the poor, and offering only projects designed to reduce poverty, are vulnerable to capture by local elites. Elites can affect the outcomes of participatory processes even when they are reasonably carefully designed.

As evidence of this kind mounts, there may be more general implica-

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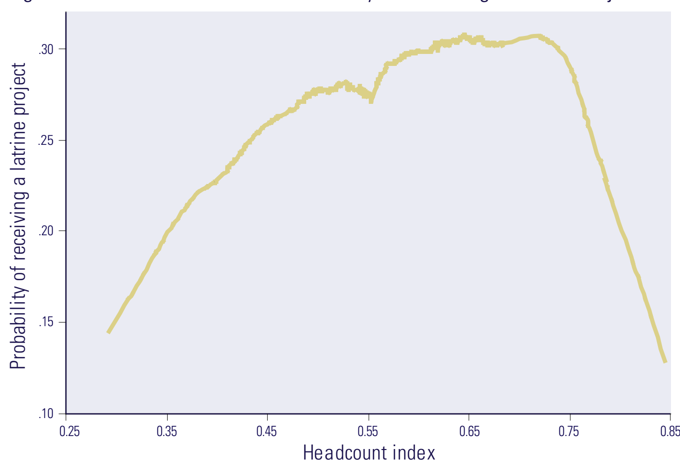
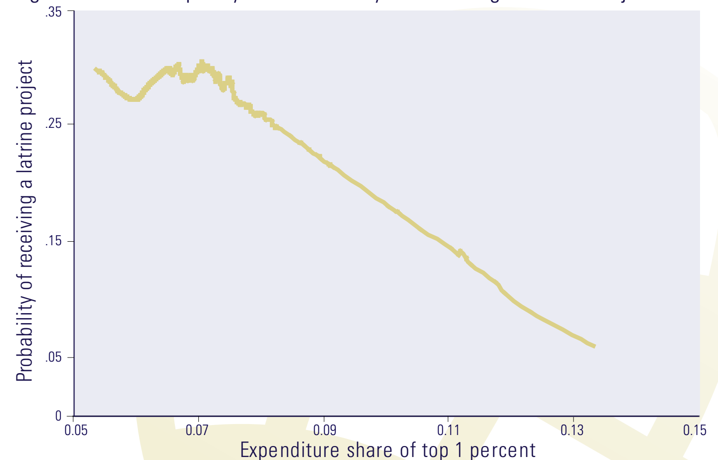
Figure 1. Headcount Index and Probability of Receiving a Latrine Project



Note: Partial linear regressions, linearly controlling for the expenditure share of the top 1 percent.

Figure 2. Local Inequality and Probability of Receiving a Latrine Project



Note: Partial linear regressions, linearly controlling for the headcount index.

What Matters to African Firms?

Alan Gelb, Vijaya Ramachandran, Manju Kedia Shah, and Ginger Turner

African firms discriminate reasonably between constraints. Their perceptions can help prioritize policy reforms

Can perceptions data help us understand investment climate constraints facing the private sector? Or do firms simply complain about everything? In a new paper Gelb, Ramachandran, Shah, and Turner analyze firm perceptions using enterprise survey data from 28 countries in Sub-Saharan Africa. They show that reported constraints reflect country characteristics and vary systematically by income level. Reported constraints are also correlated with objective measures of the investment climate.

Countries are divided into three income groups—low income, with a GDP per capita of less than $400 (Burundi to Burkina Faso in the figures), lower middle income, $400–2,000 (Zambia to Cape Verde), and upper middle income, $2,000 and higher (Swaziland to Mauritius). Figure 1 shows how perceptions vary with income (selected data are reported here). In countries at the low end of the income scale manufacturing firms are most likely to be concerned about the most elemental constraints to doing business: Is there a reliable power supply? Can finance and premises be secured? Can the firm plan ahead?

Moving up the scale to lower middle income, firms must confront problems caused by weak governance and low administrative and bureaucratic capacity. These include corruption, the tax system (rates and administration), and the control of crime and violence. Some aspects of regulation will be less troubling to firms in these settings—even if labor laws are stringent, the state's weak capacity to enforce them means that they are less likely to be perceived as a serious problem.

Labor policies are most problematic for firms in upper-middle-income countries. Unless higher income is due to "exogenous" factors such as large hydrocarbon deposits, the state tends to become more capable. But business will not be the only constituency—labor will also exercise its voice. Shortage of skilled labor is also seen as a more serious constraint at higher income levels, where firms engage in more sophisticated operations.

But are we missing the real story by not considering information from firms that have chosen not to locate in Africa or that simply do not exist? It is worth considering the "camels and hippos" anecdote often mentioned by Ricardo Hausmann. He argues that if you are in a desert and interview camels, you will get a very different idea about the main problems of living and working in the desert than if you could interview hippos, who don't live there. The authors argue that in considering the investment climate, the interesting thing to look at is therefore the underlying industrial structure (that is, the ratio of camels to hippos), from which you can infer what the real problem is (no water).

It is certainly true that the mix of firms surveyed will reflect a degree of self-selection, whether for regulatory and governance issues or other country characteristics. One would not expect to find many high-tech computer firms in Burundi or a vibrant shipbuilding industry in Botswana. But the survey data suggest that sorting effects do not dominate firms' responses:

- Within countries responses are relatively uniform across types of firms, including foreign-owned firms, which presumably are able to compare conditions across countries. Deviations in firms' responses are appreciable only where expected (for example, foreign firms are less constrained by finance).
- Across countries the intensity of complaints correlates with other country-level indicators. For example, complaints about finance are far more prevalent in countries with low financial depth. At the level of the firm, perceptions are well correlated with objective measures of the business environment.

Perhaps the most convincing evidence comes from looking at firms that have adjusted to a constraint. In many countries firms with generators complain slightly more about electricity than those without them (figure 2).

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Figure 1. Firm Perceptions of Constraints across Income Levels

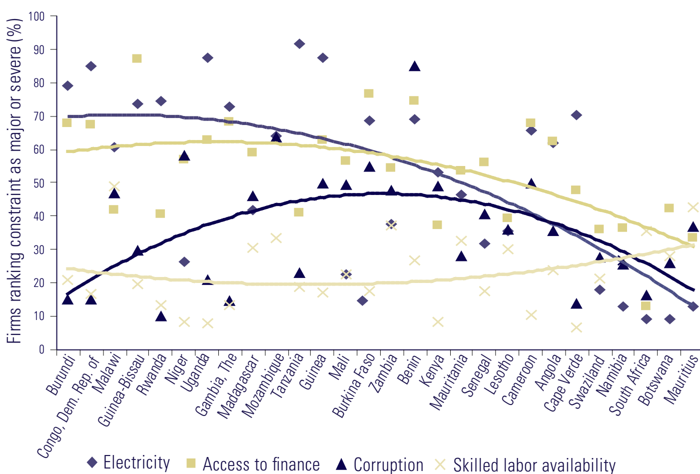
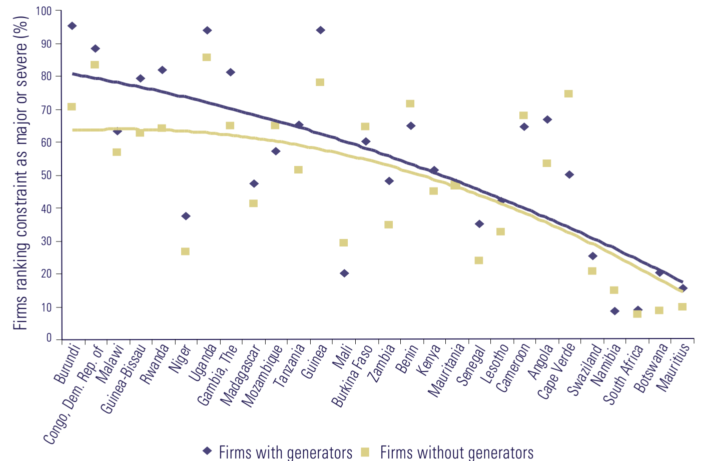


Figure 2. Perceptions of the Electricity Constraint among Firms With and Without Generators



Work-Related Migration and Poverty Reduction

Michael Lokshin, Mikhail Bontch-Osmolovski, and Elena Glinskaya

Migration and remittances are key factors in reducing poverty in Nepal—and are likely to remain so

Work-related migration and remittances are among the key factors in the decline in poverty in Nepal since 1996. Indeed, more than a million prime-age men from Nepal are working outside the country today. Remittances from Nepalese expatriates grew by 30 percent a year in 1995–2004, from less than 3 percent of GDP to about 15 percent, exceeding the combined shares of tourism, foreign aid, and exports. About $1 billion comes into Nepal as remittances each year, and inflows through private and unofficial channels could be even larger.

Remittances sent home are the most tangible benefit of work-related migration for Nepalese households. Remittances enable households to overcome the constraints of credit and risk and help them move into modern and more productive activities. Remittances are typically spent on housing and schooling, and a significant share directly supports households' consumption.

But remittances are only one consequence of migration. When a young, productive male leaves home, multiple adjustments need to be made in the labor supply of those left behind. Migration changes the relative productivity of the remaining household members; it affects households' preferences in risk aversion and in dealing with uncertainty; and it provides access to new, superior technologies (such as entrepreneurship and hygiene). Migration also has implications for investments in the health and education of the migrant's children. The cumulative effects of these changes determine the observed poverty status of a household receiving remittances.

In a recent paper Lokshin, Bontch-Osmolovski, and Glinskaya investigate the effects of work-related migration and remittances on rates of poverty and inequality in Nepal. Relying on data from a 2004 national survey, the authors estimate a model of household migration decisions jointly with consumption equations instrumenting for the endogeneity of the migration decision. They compare the observed rates of poverty and inequality in Nepal with those simulated under counterfactual scenarios.

The results show that almost 20 percent of the decline in the headcount poverty rate in Nepal between 1995 and 2004 can be attributed to the increase in work-related migration and the resulting remittances. Without migration, the aggregate poverty rate in Nepal would have been 33.6 percent rather than the 30.0 percent observed in 2004, and mean per capita spending 14,000 Nepalese rupees rather than 15,000. More than half the increase in poverty would have been due to a higher number of would-be poor among households with a migrant living abroad. Migration and remittances had only a marginal impact on income inequality in Nepal.

Migration and remittances have a strong impact on the living conditions of households with a migrant. Among households with a member who migrates within Nepal, the poverty rate would be twice as high as the present level if the migrant had stayed home. Among households with a member working abroad, the poverty rate would also be substantially higher if that member had not migrated.

One important conclusion emerging from the analysis is that the elasticity of poverty reduction in Nepal over the past decade is higher for domestic migration than it is for international migration. One plausible explanation for the difference is that remittances derived from work in foreign countries are more likely to be invested in productive assets and real estate. This is often attributed to the preferences of the sender and also to the notion that households tend to treat international remittances as transitory income that should be invested. Local remittances are treated as a mix of transitory and permanent income and are more often used for both investment and consumption.

The findings on the role of work-related migration and remittances in Nepal have important implications for public policy. They suggest that strategies for promoting economic growth should take into account both domestic and international migration. While no panacea for the development challenges in Nepal, such policies could have an important effect on poverty reduction. Since Nepal has a plentiful supply of labor, migration for work could provide employment and higher earnings for a significant segment of the labor force.

Indeed, unless local labor markets and the global economic environment change dramatically, growing numbers of Nepalese men and women will seek job opportunities outside Nepal. Migration and remittances are therefore likely to remain important contributors to poverty reduction in the country.

Michael Lokshin, Mikhail Bontch-Osmolovski, and Elena Glinskaya. Forthcoming. "Work-Related Migration and Poverty Reduction in Nepal." Journal of Development Economics.

(continued from page 5)

The reason may be that these firms tend to be more dependent on electricity and that generator power costs some three times as much as grid power. If the self-selection process for firms is incomplete, the constraints identified by those present will likely be seen as even more serious by those that have chosen not to enter. Thus in Uganda, for example, easing the power constraint could bring in many new firms as well as improve conditions for established ones.

Overall, firms appear to discriminate reasonably between constraints. Their views are a useful first step in the consultative process between business and government and can help prioritize more specific behavioral analysis and policy reforms.

Alan Gelb, Vijaya Ramachandran, Manju Kedia Shah, and Ginger Turner. 2007. *"What Matters to African Firms? The Relevance of Perceptions Data."* Policy Research Working Paper 4446. World Bank, Washington, D.C.

Economic Effects during Outbreaks of Infectious Disease

Milan Brahmbhatt and Arindam Dutta

Outbreaks of infectious disease can lead to severe economic disruptions even when little illness or death ultimately occurs

Recent years have seen a growing interest in the economics of infectious diseases. This interest has come with the emergence of many new infectious diseases—more than 30 in the past 25 years, including HIV/AIDS and severe acute respiratory syndrome (SARS)—as well as the return of old threats such as pandemic human influenza.

Interest has also increased with fresh experience of the enormous human and economic costs that can arise from illness and death, as with HIV/AIDS in developing countries. But as with SARS in East Asia in 2003 and the plague in Surat, India, in 1994, outbreaks of infectious disease can create severe economic disruptions even when relatively little illness or death ultimately occurs. In a new paper Brahmbhatt and Dutta seek to improve the understanding of these "SARS type" effects and look at public information strategies that could help mitigate the costs they entail.

Brahmbhatt and Dutta begin with a narrative account of the Surat and SARS events. In Surat official estimates ultimately counted only 52 suspected plague-related deaths. But economic losses were estimated at up to $2 billion, a result of a massive and sudden flight of population from Surat, panic in other cities, a fall in tourism, and trade embargoes on Indian exports. In the four East Asian economies most affected by SARS—China, Hong Kong (China), Singapore, and Taiwan (China)—economic losses amounted to an estimated 0.5–1 percent of GDP in 2003, despite these economies' experiencing only about 700 SARS-related deaths.

The economic essence of such events thus appears to reside in costs of prevention in one form or another rather than in the standard costs due to illness and death. The main economic effects arise from the uncoordinated and sometimes panicky efforts by large numbers of individuals to avoid infection. These efforts, such as fleeing from the area of an outbreak or reducing contact with other people, lead to sharply reduced demand for many service sector activities, as occurred during the SARS outbreak.

Brahmbhatt and Dutta observe that recent work in economic epidemiology may provide a natural framework for analyzing SARS-type events. The key intuition of this approach is that self-interested, forward-looking individuals adapt their behavior to take account of the prevalence of a disease and the threat it poses to them. These changes in behavior will differ according to the disease. But they will generally have both economic and epidemiological consequences, leading, for example, to both negative demand shocks in the economy and lower rates of new infections and disease prevalence.

A critical question then is how people form their subjective probability judgments about the risk of disease. While the assumption of rational expectations provides a useful benchmark, research in psychology and behavioral economics in recent decades reveals substantial biases in probability judgments in many contexts. Recent theoretical work on information cascades and herding behavior suggests the possibility that in situations of imperfect information people may rationally look to the behavior of others as a source of information and yet arrive at erroneous conclusions. Under conditions of high uncertainty, poor information, and emotional stress during an outbreak of infectious disease, individuals could well arrive at significantly biased subjective assessments, at least for a time. That would lead to less than optimal decisions, resulting in the aggregate in an excessively high cost of private preventive actions.

Brahmbhatt and Dutta look at public opinion surveys taken during the SARS outbreak that provide suggestive (though not conclusive) evidence that people did indeed at times hold excessively high perceptions of the risk of becoming infected with SARS or, if infected, of dying from the disease. But some of the survey evidence also suggests that perceptions of the risk of disease are sensitive to new information and that people are constantly trying to update and improve their subjective probability assessments.

Finally, the authors consider whether public information strategies can help reduce unwarranted panic. A preliminary question is why governments often seem to have strong incentives to conceal information about outbreaks of infectious disease. The authors review recent game theory analysis that clarifies government incentives in the context of infectious disease. In the early stages of an outbreak, when there is much uncertainty about whether it will turn into an epidemic or fizzle out, the government has an incentive to simply "wait and see," especially if an announcement might itself start a panic or provoke severe trade and travel restrictions.

An important finding is that the more numerous are nonofficial sources of information about a possible outbreak of disease, the weaker are the government's incentives to conceal its own information. Thus honesty may indeed be the best public policy under modern conditions, where such technological innovations as cell phones and the Internet allow easy global mass communications.

Milan Brahmbhatt and Arindam Dutta. 2008. *"On SARS-Type Economic Effects during Infectious Disease Outbreaks." Policy Research Working Paper* 4466. World Bank, Washington, D.C.

(continued from page 4)

tions for the design of social funds and other community-driven development programs. There may be a need to develop clearer rules on how decisions must be made in each community with a view to making it harder for the more powerful to exercise undue influence.

Caridad Araujo, Francisco Ferreira, Peter Lanjouw, and Berk Özler. Forthcoming. "Local Inequality and Project Choice: Theory and Evidence from Ecuador." Journal of Public Economics.

(continued from page 1)

reforms, how much spending should be allocated to infrastructure at different stages of development, and what impact infrastructure investment has on gaps in development between countries or regions or between rural and urban areas.

On the sequencing of reforms to support infrastructure investments, for example, studies suggest that restructuring should be undertaken before privatization and that a regulatory framework should be put into place and supported by institutional arrangements such as transparency and autonomy. Studies also suggest when feasible competition should be introduced. But the knowledge in this area needs to be refined, for example, to account for finer aspects of regulation. Moreover, it is relevant only when the private sector is involved, and private investment still accounts for a rather small share of the total and is likely to do so for some time to come.

From these gaps in knowledge a research agenda emerges. The main limitation of the macroeconomic approach is that most interesting questions cannot be addressed with very aggregate data. Straub therefore urges moving away from trying to estimate the link between output and aggregate indicators of infrastructure. Efforts involving macroeconomic data should be geared toward understanding how the political, institutional, and regulatory environment has affected the delivery and efficiency of services in different infrastructure sectors. This is an area where the World Bank has a comparative advantage in developing cross-country databases.

The main efforts to develop data should concentrate on microeconomic household- and firm-level survey data, taking into account ownership of surveys and limitations in their current design. This work should be undertaken with a view toward upward aggregation to generate village- or district-level statistics on average access and additional data on quality, costs, and institutional aspects. It should then address econometric issues linked to the use of this type of data, such as the endogeneity of firms' technological choices.

The economic geography approach is very promising, with its ability to insert micro-level data in a global framework that accounts for the spatial, sectoral, and macroeconomic links of investments in infrastructure. But such infrastructure-related work, both theoretical and empirical, is still in its infancy. Efforts should be stepped up to develop the relevant theory, to include infrastructure sectors other than transport, and to develop suitable empirical strategies to test the models.

Stéphane Straub. 2008. "Infrastructure and Growth in Developing Countries: Recent Advances and Research Challenges." Policy Research Working Paper 4460. World Bank, Washington, D.C.

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