

**IMPROVING ACCESS TO INFRASTRUCTURE
SERVICES BY THE POOR:
INSTITUTIONAL AND POLICY RESPONSES**

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ANNEX: Data on Household Access

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Governments around the world—rich and poor alike—confront the problem of how to ensure their people have access to efficient, reliable, safe and affordable infrastructure services. This challenge is particularly acute in developing countries, with many low-income households and communities and where density, distance and resource availability often conspire to increase costs. Governments and stakeholders have addressed the problem in different ways, providing a rich body of experience with policy responses to this problem. Technology and economic thinking continue to evolve, opening up new policy options and opportunities for addressing the challenge of improving access.

This paper provides an overview of current evidence on the nature and magnitude of the access challenge in developing countries, of the policy options available to governments seeking to improve service access by the poor, and of the institutional drivers that shape both feasible policy options and policy effectiveness. Part A summarizes available information on access to infrastructure services by low-income households and communities. Part B focuses on the key levers for policymakers to address the access challenge, looking at the roles of reforms to ownership, market structure, pricing policies, and subsidy and regulatory systems. Part C outlines how policy approaches might be adjusted to different institutional environments. Part D offers some concluding observations on implementation strategy.

A. THE ACCESS CHALLENGE

The quality and coverage of infrastructure services such as electricity, water, sanitation, telecommunications and transport have a major impact on living standards and economic growth. Yet it is estimated that two billion of the world's poor lack access to adequate sanitation, two billion lack access to electricity, one billion lack access to clean water, and more than half of the world's population have never used a telephone.¹ In some cases, this lack of access is due to a failure to make such services available in the regions or neighborhoods where the poor live. In other cases, services may be present, but beyond the affordability of poor households. An understanding of why the poor lack access is therefore critical to determining the appropriate policy response.

In practice, much uncertainty lies beyond the broad estimates of access. Policymakers and their advisers have relatively little consistent, reliable data on current consumption of infrastructure services by the poor, of the service options available to them, or their demand for improved services. Of course, this does not imply that, at the household or community level, the poor are necessarily ill-informed about the benefits of improved infrastructure services, or uncertain of their preferences across services or willingness to pay for improvements. But it does mean that those shaping policies at the national (or international) level seldom do so on the basis of rich information about the needs and preferences of the poor they seek to serve.

Commonly used statistics on global access to infrastructure services by the poor are per-capita consumption of electricity, the percentage of the population with access to the telephone network, or the percentage with access to water and sanitation of a minimum

quality. These statistics provide a rough picture of access to infrastructure by the poor, but are too broad for a deep understanding of the infrastructure deficit facing poor households. A similar number for two countries may obscure quite different local conditions, and national data may over- or under-state access by poor households. For example, some countries (such as India) count all households in a village as being electrified if there is a line into the village—supplying as little as a streetlight and an electric water pump.² At the other extreme, one entrepreneurial woman in a village may use her mobile phone to provide telephone access to many families living beyond reach of a fixed line payphone.

Broad aggregate data fail to distinguish between a lack of access and affordability. Likewise, they provide little insight on the range of services consumed by the poorest households within each country. For example, low-income households tend to consume a mix of energy products for domestic and productive uses. While higher-income households use relatively high proportions of commercial, high-value fuels such as electricity, diesel and LPG for both domestic and productive uses, the poor are more reliant on bio-fuels (wood, dung, thatch and straw residues) and candles for domestic purposes, and animal and human power for productive purposes.³ As incomes rise, the switch to modern/commercial fuels occurs incrementally—for example, switching to electricity for lighting and to fossil fuels for cooking.

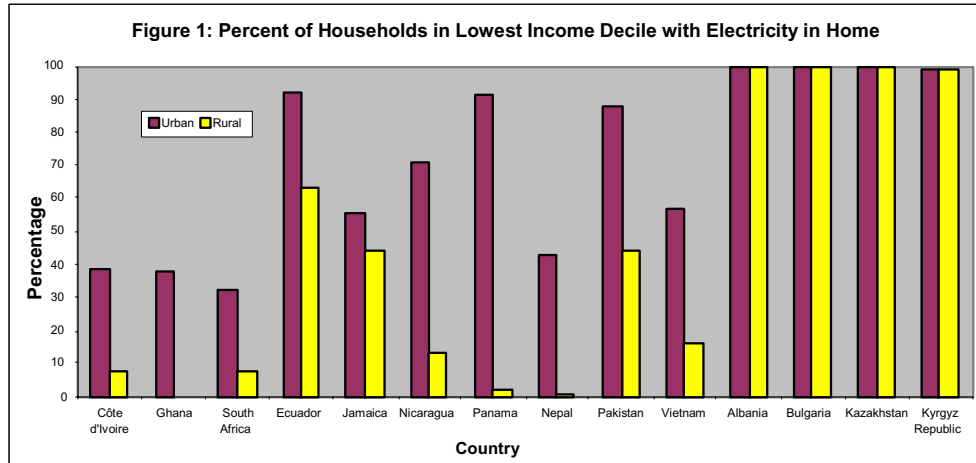
Recent research based on Living Standards Measurement Surveys (LSMS) attempts to provide a more detailed picture of infrastructure access and consumption by the poorest households both across countries and within countries.⁴ This research uses information from surveys conducted in 15 low- and middle-income countries between 1988 and 1997.⁵ Household level data provides information on access by households with different income levels, on access by different subsets of poor households (urban, peri-urban or rural), and on the bundle of services actually consumed by representative households.⁶

Household surveys reinforce the conclusion from aggregate data that access to infrastructure services varies widely across countries. Access to service is often much lower for poor than for rich households, whether the poor are defined in terms of per capita GDP or in terms of relative income within a country.⁷ Infrastructure coverage is much higher in urban than in rural areas. In addition, the LSMS data show that of all infrastructure services, poor households are most likely to have access to electricity and least likely to have access to a telephone. Summary data are presented in an Annex.

Energy. For the pooled sample of 15 countries, LSMS data show that 65 percent of households had electricity in their homes at the time of the survey.⁸ In-house connections were lower for poor households. Of the poorest 5% of the pooled sample, only 32% had electricity in their homes. Within each country, the picture is similar. In Nepal, for example, 75% of the richest quintile had electricity in 1996, whereas only 3.7% of the poorest quintile had electricity.

Electricity connection rates differ significantly across countries and between rural and urban households. Figure 1 shows electricity connection rates for the poorest 10% of urban and rural households in each of the 15 LSMS countries (see Annex for exact numbers).

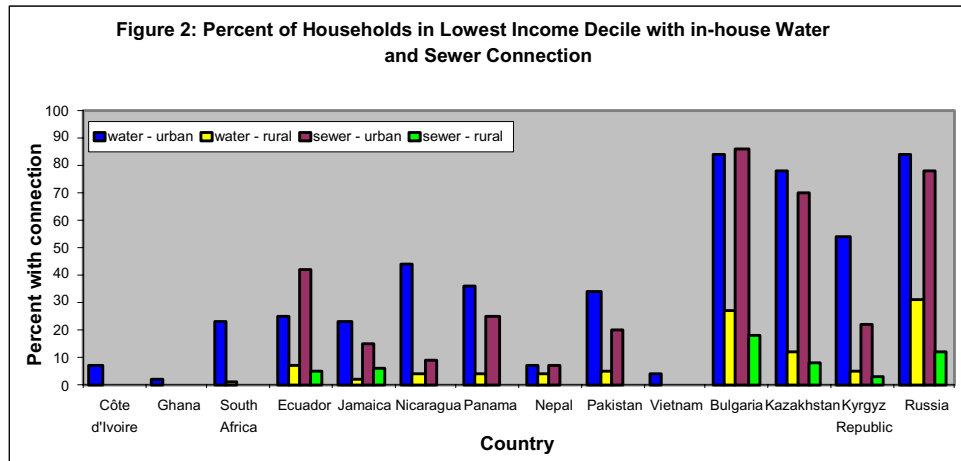
Survey data from 12 Latin American countries reinforces the urban-rural disparity in many countries. In 1996, only 61% of rural households had access to electricity, but almost 97% of urban households had access. The picture is improving, however. In Chile, recent efforts to address the lack of electricity in rural areas increased access for all rural consumers from 53% in 1992 to 76% by the end of 1999.⁹ In Colombia, electricity coverage for the poorest 20% of all households increased from 41% in 1974 to 81% in 1992.¹⁰



Telecommunications. Household survey data show that fewer households have a telephone than have in-house electricity, water or sewerage. Across the pooled LSMS sample, 24 percent of households had access to a telephone. National data on telephone density gives similar coverage rates (see Annex), though these do not capture differences across rural and urban areas or across income groups within the same country.

Telephone coverage is particularly sparse among poor households; fewer than 5% of households in the poorest 25% had a telephone.¹¹ Across 22 Latin American countries only 10% of the population has a telephone. As with electricity, telephone coverage is higher for the urban than the rural poor. In Bulgaria, for example, 51% of the poorest urban decile had a telephone, but only 20% of the poorest rural decile. In many countries, none of the poorest decile has a telephone.

Water and Sanitation. For many countries, national statistics show that less than 50% of the population has access to safe water. In Cambodia, figures are as low as 12% of the rural population and 20% of the urban population.¹² Access to adequate sanitation is even lower. Pooled LSMS data reinforces this low access rate for poorest households across all 15 countries. Focusing on in-house connections, LSMS surveys confirm that the urban poor are more likely to have a water and sewer connection than the rural poor (Figure 2 and Annex).



In-house connections are only one source of water and sanitation services. Households also obtain water from rivers and streams or from a range of informal providers (e.g., public taps, yard taps, wells, water vendors or tankers). Many poor households will rely on some combination of sources (see Box 1). Households without sewerage may have septic tanks for wastewater removal, or a latrine rather than toilet. The rural poor are more likely to rely on on-site sanitation.¹³

Box 1: Where do poor households get their water? Evidence from Nigeria

Recent survey data on household water sources in Lagos show that around 70 percent of households get their water from private water vendors or from a yard well. Most households (61 percent) supplement their water supply by obtaining water from at least one additional source. For example, half the households using yard wells as their primary source purchase additional, higher quality, water from vendors.

Household water consumption differs very little across households obtaining their water from different sources. A more important determinant of water consumption is whether or not the household has a water-based toilet system.

Contrary to claims of water vendors charging exorbitant prices, evidence from Nigeria suggests that competition between carriers keeps down the price. Households pay a similar median price (0.15 Naira = US\$0.007) per litre of water from each source, with the only exception being tanker-delivered water for which households pay substantially more (1.29 Naira = US\$0.059 per litre). Surveys suggest that households would be willing to upgrade to a yard tap. This would eliminate the expense of hand carriers while improving water quality and reliability. (Stoveland Consult, 2000.)

Transport. Despite the important role that transportation plays in giving poor households access to employment and education, data on access to transport services is limited. Surveys show, however, that the average poor person makes between 1.5 and 2.5 trips each day, most fairly short.¹⁴ Walking is often the most common form of travel, accounting for two thirds of all journeys in Kinshasa and Dar es Salaam, and 55% of travel by low-income families in medium-sized Indian cities.

Bicycles are the primary form of transport in some cities. In China, for example, bicycles represent 50-90% of the vehicular traffic. Data for India and Malaysia show that bicycle

ownership becomes significant once annual household income reaches 10 times the purchase price. Poor households living in cities with high car density rely on buses and para-transits as an alternative to walking. Fifty-four percent of trips by all income groups in Metro Manila are by bus or jeepney.

To summarize, on the basis of evidence such as the LSMS surveys, access to infrastructure services appears to vary widely across countries, between rich and poor, and between rural and urban households. More poor households have access to electricity than to other infrastructure services, but poor households still rely on a bundle of other sources of energy. At the other extreme, the poorest households in any country are likely to have little or no access to telephone service. Telephone access increases most slowly with income for the poorest 25% of households. National per capita GNP is a relatively good indicator of access to services, but within each country, poor rural households have access to fewer services.

B. POLICY AND INSTITUTIONAL RESPONSES

For much of the last century, most governments believed that the best way to provide infrastructure services to their people was through a state-owned monopoly which was mandated to provide “universal service”, often within the framework of a system of uniform national tariffs. This approach was expected to take advantage of economies of scale and scope in what were thought to be “naturally” monopolistic activities; to ensure access to stable funding for major investments; and to be able to meet the goal of universal access through a system of cross-subsidies between high- and low-income users.

Results have been disappointing. Progress in expanding access has been slow, particularly in the poorest countries. State-owned monopoly provision has become synonymous with high levels waste and inefficiency. According to one estimate, technical inefficiencies in power, roads, railways and water alone caused losses of \$55 billion a year in the early 1990s—equivalent to one percent of all developing countries’ GDP, a quarter of annual infrastructure investment, and twice the annual development finance for infrastructure.¹⁵ Those denied access to formal services have responded by seeking substitutes where the real (per unit) costs are high relative to the costs of services provided through formal networks. In addition, they may face high non-monetary costs, such as the cost of time women or children spend gathering firewood or fetching water, rather than attending school or pursuing income-generating activities.

Today, policymakers interested in expanding access to infrastructure services can draw on a rich body of experience that challenges each of the assumptions behind past approaches. Advances in technology and in economic thinking present policymakers with five main policy levers for improving access to infrastructure services: reforms to ownership, market structure, pricing policies, and subsidy and regulatory systems. Each is discussed in turn, followed by a brief review of measures that transcend the boundaries of individual infrastructure sectors.

1. Ownership Reform: Tapping Private Sector Participation

In what is now the developed world, private companies were historically major players in the development of network infrastructure services—and in the extension of these services not solely to the rich, but also to relatively low-income households.¹⁶ Through much of the twentieth century, by contrast, the provision of formal network infrastructure services was in most countries the sole prerogative of state-owned monopolies. At the same time, many of the poorest citizens of developing countries continued to rely on non-public services—whether self-provision, or purchases from small, often informal, private vendors.

A global trend of liberalizing and privatizing infrastructure activities, beginning in the early 1980s, strengthened in the 1990s. Developing countries have been at the forefront of this movement, motivated by concerns to increase the efficiency of service delivery, accelerate the expansion of improved services, relieve the drain of under-performing services on state and national budgets, and bring a greater and more consistent consumer focus to service delivery.

Between 1990 and 2000, private infrastructure projects in developing countries attracted over \$680 billion of investment.¹⁷ Private sector participation has taken various forms ranging from management contracts aimed at improving operating efficiency, through to concessions, divestitures and greenfield projects that also seek to mobilize private sector investment.

The alleviation of poverty—and, more narrowly, improved access to services by low-income households and communities—was seldom an explicit objective of the early private infrastructure reforms. However, there was a general, if often implicit, expectation that the poor would benefit in three main ways:

- Through efficiency gains, translating into a reduced cost of service for households that have access to existing networks.
- Through mobilization of finance for more rapid expansion of networks, including extension to relatively low-income households and areas.
- Through the release of government funds traditionally required to subsidize loss-making state-owned enterprises. By reducing or eliminating this subsidy, public resources are released for other, potentially more socially valuable, services.

While early results are promising, precise empirical testing remains difficult. Ownership reforms in infrastructure usually take place in the context of broader economic reform programs. Thus, for example, an increase in access in the years following infrastructure privatization may be due to a more general increase in disposable income. In addition, many infrastructure privatization programs are relatively recent, limiting the availability of time series data for systematic testing of propositions about poverty impact. And, even where privatizations have been in place for some time, there is often little systematic collection of data that could throw light on their implications for the poor.¹⁸

Based on the broad experience to date, however, it is clear that the extent to which ownership reforms will substantially and systematically expand access depends critically

on their detailed design.¹⁹ In simple terms, reforms focused on improving the performance of existing systems (for example, management contracts and leases aimed at increasing operational efficiency, or BOTs aimed at making good supply deficits to existing customers) are less likely to make a marked difference to access than concessions, divestitures or greenfield projects aimed at network expansion or non-network service delivery.

Even within this latter category, design issues remain critical. For example, in the United Kingdom the privatization and reorganization of the gas and electricity industries succeeded in reducing costs significantly, but passing those savings on to consumers has proved more challenging.²⁰ In Argentina, recent research has confirmed the central role of regulation in determining the extent to which the benefits from efficiency gains from energy sector reforms are diffused through the economy.²¹ Again in Argentina, a simulation model used to test the likely distributional effects of three draft water concessions found that, while they were likely to encourage efficiency gains of between 24 and 54 percent, customers were unlikely to share greatly in these gains in the absence of significant redesign of the concessions (in particular, approaches to allocating network expansion costs across customers).²²

The balance of this Part looks at the key policy drivers that can influence the extent to which the potential benefits of ownership reform contribute to expanded access by low-income households.

2. Market Structure Reform: Re-Thinking Monopoly

Traditionally, most infrastructure services were assumed to involve “natural” monopolies, in the sense that a single firm could supply the market at lower cost than two or more firms. To sustain this structure—and, often no less important, to allow cross-subsidies between different categories of users—most governments controlled market entry by creating legally-sanctioned monopolies. In many cases, a single enterprise was integrated both vertically and horizontally, with an exclusive right to provide services across an entire jurisdictional unit, whether that be a country or a state in a federal system.

Advances in technology and in economic thinking have challenged the notion of natural monopoly and expanded opportunities for more competitive delivery of infrastructure services. This has led to efforts to relax or eliminate regulatory barriers to entry and to actively facilitate competition by restructuring existing enterprises. Strategies of this kind are now widely adopted in transport, telecommunications, energy, and water services. Expanding the role of competition has been shown to provide large benefits. One study showed that the welfare benefits of *deregulating* airlines, trucking, railroads and telecommunications in the U.S. provided annual welfare gains of nearly \$45 billion in 1990 dollars, or over 7% improvement in the part of GDP affected by regulatory reform. Over 90% of these benefits flowed to consumers.²³

Efforts to reform market structure typically arise in two main contexts: (a) restructuring existing enterprises, and (b) relaxing barriers to new market entry.

(a) Restructuring Existing Enterprises

In markets dominated by an incumbent utility, unleashing substantial competition often requires the incumbent to undergo pro-competitive restructuring before privatization. Horizontal unbundling—such as separating an existing electricity enterprise into several generation companies—may be desirable to create a number of players that may compete head-to-head, or to facilitate “yardstick” competition in the case of segments with monopolistic features. Vertical unbundling—such as separating electricity generation, transmission, and distribution activities—may be necessary to ensure all potential competitors have fair access to a transmission grid or other facility that retains some feature of natural monopoly. Reforms of this kind have the potential to increase the level of competition in the market, and thus to spur both cost reductions and a more aggressive pursuit of new customers, including those who currently lack access to services.

Box 2: Cellular phone operators in rural Bangladesh

New cellular technologies have radically changed the way economists and policy-makers view the telecommunications industry. Around the world, new service providers have taken advantage of drastically reduced economies of scale to enter global and local markets, increasing competition and reducing prices.

Women in Bangladesh have taken the possibilities of cellular technology further than in most countries. Using micro-loans of little more than US\$300, women in rural areas have set themselves up as small-scale operators in a business that can offer a net annual income of over US\$600, or more than twice the 1997 per capita GDP.

These entrepreneurial women have been helped by innovations in financing from Grameen Bank. Grameen Bank supports small-business investment by providing widespread access to microcredit, primarily by women in rural villages. The Bank provides loans that allow local operators to buy pay phones from its subsidiary, Grameen Telecom.

Within three years of its first operation, from March 1997, Grameen Telecom had provided phone access to nearly 2.8 million people in 1,100 villages. Access to phone services has brought many benefits to poor communities beyond the additional income to operators. Phone service has reduced the costs of communication, particularly transportation costs, and by giving local producers information on market prices has increased their bargaining power and therefore their income. (Lawson and Meyenn, 2000.)

The potential for structural reform of an incumbent utility to improve service options and access for the poor varies across sectors and countries. In telecommunications, technological change, particularly the advent of wireless technologies, has markedly increased the potential for structural reforms to enable significant improvements in access (Box 2). Following the launch of GSM technology in Europe in 1992, GSM networks have grown by as much as 80 percent a year, and by 1999 were available in nearly 130 countries—over 70 of which had more than one service provider. In countries with low initial access levels, competition in the cellular market has led to significant expansion of that market. In Romania, for example, the number of subscribers increased thirteen-fold within a year of the introduction of competition in early 1997.²⁴ The number of cellular

subscribers in Africa is expected to grow from about 0.2 million in 1998, to between 1.1 million and 4.5 million in 2005.²⁵ Market restructuring has given wireless companies access to customers using the fixed line network.

By contrast, in the energy sector, in cases where pre-reform access to utility services is low, focusing reform only on existing networks may have limited benefits for the poor in the short to medium term. While pro-competitive reforms in the energy sector have in many countries been effective in reducing generation costs, they typically has only a limited impact on the costs of constructing and maintaining transmission systems. Some gains may be achieved through competitive tendering of concessions for transmission and distribution networks. Increased competition in equipment markets may reduce the costs of system components. But the level of cost savings is generally insufficient to enable large-scale expansion of transmission and distribution networks to reach the scattered, low-density communities in which many of the poor live.²⁶ Similar considerations apply in the water sector.

(b) Barriers to Market Entry

The success of pro-competitive restructuring in improving services and lowering costs depends critically on their ability to facilitate new entry, and hence competition between service providers. But entry is even more important where the concern is to improve services to consumers currently beyond the reach of formal networks, and in industries where expansion of formal networks under current technologies remains prohibitively expensive. Despite this, infrastructure reform programs are too often silent on the question of how to facilitate entry and service improvements for these groups—and in some cases actively suppress entry, through formal exclusivity provisions and regulatory rules that create barriers against service provision by non-traditional and informal providers.

Outside of formal utility systems in developing countries, a mass of private, small-scale providers typically cater to the infrastructure needs of poor households unserved by formal infrastructure networks—developing innovative approaches both to the practical problems of service delivery, and to catering to the payment capacity of poor households.

In Paraguay, about 300 to 400 private firms and individuals—called *aguateros*—supply piped water to households not served by municipal water companies. These range from very small operations supplying a local neighborhood, to larger companies with as many as 800 connections.²⁷ While in many developing country cities private water vendors have a reputation for very high per unit prices, small-scale providers like the *aguateros* often charge prices broadly in line with utility prices. In Guatemala City, around 20 independent water vendors, many belonging to a formal federation, supply clients with holding tanks, including poor communities that have constructed communal holding tanks. And in Teshie, a suburb of Accra in Ghana, tanker companies have reached a formal arrangement with the local public utility for the purchase of bulk water for distribution to households that currently lack connections.²⁸

In Yemen, where entry into the electricity business is formally allowed, small-scale operators provide services to rural towns and villages beyond the reach of the formal

utility. Again, suppliers range from individual households that generate for their own use, and sell power to a small number of neighbors, to larger operators with diesel generators supplying up to 200 households.²⁹ In Kenya, where fewer than two percent of total households have access to electricity from the national grid, private suppliers are playing a key role in expanding service—selling more than 2.5 megawatts of photovoltaic electric capacity since 1990 (see Box 3).³⁰ In Hargeisa, Somalia, private owners of power generators with excess capacity have emerged as key service providers following the destruction of public power facilities during the civil war – supplying around 10,000 households at a flat daily rate of US35 cents per light bulb.³¹ In Cambodia, which has one of the lowest electrification rates outside sub-Saharan Africa, hundreds of small private providers offer services ranging from battery recharging sites to fully metered electricity provision for entire communities. These providers are estimated to serve more than one-third of all electricity customers nation-wide.³²

Box 3: Opening the Market—Photovoltaic systems in Kenya

Where a formal utility fails to provide network services to many households, simply allowing entry may be sufficient to encourage entrepreneurs to fill the gap. In Kenya, the formal utility fails to provide an electricity connection to more than 98% of the rural population. Rural households have started to fill the gap by turning to alternative systems. Between 1982 and 1999 the market for photovoltaic units grew into a US\$6 million a year industry.

In the 1980s, demand for photovoltaic systems came from NGOs installing demonstration systems in schools and missions, and from off-grid community leaders and middle-income households. Each year, the household market accounted for well over 50% of photovoltaic equipment sales.

Photovoltaic retailers realized that ongoing sales required an expansion of the market. The availability of smaller, lower-cost modules helped on the supply side. Local innovation in extending the marketing from lighting to television raised demand. In 1998, local entrepreneurs were selling over 22,000 modules each year. Competition had brought the retail price down from US\$100 a module in 1990 to US\$65 in 1998. The introduction of hire-purchase options has extended the market further. Since 1990, 60% of the 2.5 megawatts of photovoltaic capacity sold has been in the household market. (Hankins, 2000.)

In Senegal, small private operators rent lines from SONATEL, the national operator privatized in 1998, and run telecenters for local households. Telecenters have grown fast, producing about four times more revenue per line than individual lines.³³ In Mogadishu, Somalia, in the absence of any formal regulation, active entry and competition has driven down the price of international telephone calls from US\$1.50 per minute to around US\$1.00 per minute—a price that remains high, but not out of line for the region as a whole.

And in developing country cities around the world, private operators of small-scale transport services use station wagons, minivans, mopeds, motorcycles, and pedicabs to fill the gaps left in formal transport provision. Providing rides between bus routes, to areas outside official routes, and along streets inaccessible by motor vehicles, para-transit providers often operate illegally to meet consumer needs outside an officially regulated and restricted marketplace.³⁴

While small-scale providers exist in almost all developing countries, and play a key role in serving poor households, they are often marginalized, and sometimes illegal. State

providers were routinely given exclusive rights to provide service, including for communities and households beyond the reach of their networks. Exclusivity provisions remain common where distribution systems are privatized (particularly in the water and energy sectors).³⁵ These provisions were often seen as necessary to prevent entry by suppliers only willing to serve low-cost, high demand customers, and thus undermining existing cross-subsidy systems. While this analysis has some validity for the increasing returns parts of established networks, focusing on incentives highlights the problems of transferring the same reasoning to low-income countries where capacity is scarce and networks underdeveloped. With no threat from potential entry, an incumbent's incentive to invest in network extension remains weak. Exclusivity provisions harm consumers without a connection to the formal monopoly by preventing them turning to alternative formal suppliers.³⁶

For these reasons, exclusivity arrangements traditionally granted to infrastructure providers need to be scrutinized with increasing caution. For example, distribution networks for electricity, gas, water and sewerage might be privatized *without* exclusive service areas (especially service areas that include unconnected households). And non-network solutions (such as contracts for rural electrification through solar, wind-powered or micro-hydro schemes, and on-site sanitation) can be designed to allow entry by providers offering alternative technologies and/or lower prices.

Implementing a deregulatory policy of this kind raises issues over the extent of the market to be liberalized as well as the extent of relaxation of entry barriers.

Extent of Market to be Liberalized: Liberalization of entry might extend to the market as a whole, or only to people not served by the traditional utility. If the former, the potential for “cream skimming” will reduce the ability to use cross-subsidies to meet social and political objectives, as customers paying higher prices will be able to defect to other suppliers. This strategy may also lead to duplicate networks competing with each other, such as several power or telephone firms running separate lines down a street. Neither concern need be insurmountable; indeed such approaches were common during the early stages of infrastructure development in the United States.³⁷ If liberalization is limited to people who are currently unserved by the traditional utility, the challenge becomes one of managing the boundaries between areas served by the utility and other areas. This may not be a major issue, however, as utilities providing services through networks should enjoy significant cost advantages over smaller-scale suppliers, which will allow them to win customers from smaller rivals as the network expands.³⁸

Extent of Relaxation of Entry Controls: Regulatory barriers to entry in the liberalized area might be eliminated, or replaced by some residual, lighter-handed form of entry control. For example, new and typically smaller-scale entrants might still be required to register with or receive some kind of permit or authorization from the regulatory body to provide a basis for controlling essential safety, environmental or public health concerns. Indeed, it is possible to envisage a multi-tiered regulatory structure, with the smallest providers subject to minimal regulatory scrutiny at entry, larger firms subject to closer scrutiny, and the traditional utility subject to a more conventional licensing regime. If such a scheme is to be applied, it will be important to ensure entry restrictions are not

misused to create local monopolies or as a mechanism for graft. Clearly defined entry criteria applied through a transparent process can help to meet these concerns.

Liberalizing entry alone is unlikely to be sufficient in mobilizing innovation to get services to households and communities beyond the reach of formal infrastructure networks. Pricing, subsidy, and regulatory policies will all affect the capacity of non-traditional suppliers to operate, the costs that they face, and their capacity to interact (and interconnect) with formal utilities. These issues are discussed further below.

3. Pricing Reform: Relaxing Past Approaches

Traditionally, prices for infrastructure services have been subject to deep distortions, often to the detriment of the poor. While details vary from sector to sector and between countries, three general patterns are evident:

- *Prices are determined by the state rather than by a market.*
- *Prices tend to be set below cost covering levels.*
- *Cross-subsidies are often built into prices, with some prices above and some below full cost recovery.*

Each of these patterns has been justified as appropriate for helping the poor; they were supported by an implicit assumption that all households had access to the formal network. Moving away from a monopoly market structure means reconsidering the appropriateness of traditional approaches to pricing.

(a) State vs. Market Determination

Traditional regulation of prices by the state reflects concerns over possible abuse of the monopolies created or sanctioned by the state, as well as the desire to use infrastructure prices to meet various social objectives. State regulated prices are assumed to be lower than market prices, at least for low-income households or for consumption that has health and educational benefits. In practice, this may not be the case.

Price regulation is technically demanding, particularly for countries with weak institutional capacity. Regulators need information on utility costs, consumer characteristics, and price responsiveness to set appropriate prices; they need additional institutional capacity to enforce price regulations. More important, infrastructure prices tend to be politically sensitive, and regulation is vulnerable to be influenced by short-term political considerations that are not consistent with the longer-term interests of the sector or its customers. Political influence on prices represents a source of risk to investors, and will be reflected in a higher cost of investment capital and hence reduced investment at higher prices.³⁹

In some cases, the complexity and political vagaries of price regulation leave customers paying higher prices than market prices. Increasing private sector participation and competition promise to increase efficiency and thus to reduce costs and prices. For example, in Argentina the wholesale price of electricity fell by almost 50 percent in the five years following privatization and the creation of competition between generators; the

average retail price fell by almost 40 percent.⁴⁰ The liberalization of the long-distance telecommunications market in Chile in 1994 led to a 50 percent drop in calling prices; a similar drop occurred in 1998 as a result of increasing competition in the provision of cellular services.⁴¹ Whether market liberalization will result in lower prices to consumers in any particular case will depend on the extent to which existing subsidies need to be unraveled and the details of the regulatory system.

(b) The Role of Costs

Traditionally, prices for most infrastructure services provided by state-owned monopolies have been set below full cost covering levels.⁴² While this can be a politically appealing strategy, it leaves utilities with insufficient resources to cover operating and maintenance costs, let alone expand coverage to those who lack access. The fiscal costs associated with mis-pricing services in power, water and railways alone have been estimated at nearly \$123 billion annually, or nearly 10 percent of total government revenue in developing countries.⁴³ Pricing consumption below costs also reduces incentives to conserve scarce resources, creating additional pressure on raw materials as well as on power plants, water treatment facilities, and other major investments.

Below-cost pricing has often been defended on the basis that it helps the poor, who otherwise could not afford service. In practice, however, below cost pricing typically benefits the more affluent members of society who enjoy access to formal services. As infrastructure deteriorates, low-income households and those without political connections are more likely to suffer inferior service. More importantly, low-income households are less likely to have access to the network⁴⁴ and are therefore unable to benefit from lower prices for formal network service. Below cost tariffs can actually be harmful to the poorest members of society, as utilities have fewer resources to expand networks to include them, and even if they have the resources they have no incentive to do so when the cost of connection and ongoing service exceeds the regulated tariff.

Households without access to formal services often pay high prices for inferior substitutes. For example, urban households in developing countries without access to piped water often pay more than 20 times the piped water price to buy water from informal vendors.⁴⁵ And households without access to electricity must often rely on more expensive forms of energy—for example, paraffin can cost 10 times as much as electricity for lighting, and a dry cell battery to power a radio costs about 1,000 times as much per unit of energy as does networked electricity.⁴⁶

In situations with high coverage and where pre-reform prices were heavily subsidized, some upward pressure in prices may be inevitable to achieve sustainable levels. This has been almost universally the case in the transition economies of Central and Eastern Europe. In these situations, policymakers must decide whether to continue any ongoing subsidy scheme, and if so in what form (see below). It is worth noting, however, that household willingness to pay for services increases with service quality—so price increases are likely to be more supportable where they are accompanied by quality improvements (Box 4).

Box 4: Escaping the Low Price, Low Quality, Low Revenue Trap in Armenia

The experience of the electricity and water industries in Armenia demonstrates starkly the negative incentive cycle created by universal below-cost pricing. Increasing block tariffs allowed all households to pay a subsidized rate for their first units of consumption, and left the utility without sufficient revenue to cover costs. In response the utility cut back on service. By 1993, electricity was supplied to households for only 2 to 4 hours each day. As service quality fell, customers stopped paying their bills. By 1993, the payment rate was only 10% for residential customers.

In 1999, the increasing block tariff structure was replaced with a single price for electricity. Because of the broad reach of the subsidized tariff, moving to a single price raised the average household expenditure on electricity. To assist poor households meet payments a direct cash transfer was made to all 230,000 households eligible for family benefit (30% of the population) and a further 70,000 households believed to face difficulty paying their electricity bills.

Prior to changing the tariff structure, the Armenian government had invested in extending electricity connections and improving service quality. By January 2000, electricity was available 24 hours a day and 98% of households reported having a connection. Payment has been made easier and collection rates have improved. Armenia has largely escaped the low-equilibrium trap. (Lampietti et al, 2000.)

(c) Cross-Subsidies

Regulated prices for some categories of user are often set above cost-covering levels in order to subsidize service to users that are charged below cost-covering prices. Two general forms are common: cross-subsidies between broad categories of consumers (e.g. business to residential, or urban to rural); and cross-subsidies between consumers of different quantities of the service (for example, through rising block tariffs). Systems of the latter kind are usually intended to ensure low-income consumers can afford at least some minimal level of consumption.

Typically, cross-subsidy arrangements are implemented along with uniform tariffs for each category of user within a national or sub-national jurisdiction, with the result that investors have reduced incentives to expand access to users with higher than average connection costs—which typically includes most of the rural poor. Cross-subsidies are often seen as a way to extend the benefits of subsidized service to poor households without placing a fiscal burden on the relevant government entity, but this may be illusory. Cross-subsidy schemes rest on granting the provider a monopoly, thus dulling incentives for efficiency, increasing regulatory demands and imposing indirect fiscal costs.

Importantly, cross-subsidies are only available to households connected to the formal network. Poor households without access to a service are excluded from the benefits of cross-subsidies, and can end up paying far more for service from informal, non-network sources, and even illegal sources. Where the poor do have access, they still may not be the primary beneficiaries of cross-subsidies. Careful targeting of cross-subsidies is difficult and costly, which means that broad proxies for consumption are used that allow households in all income quintiles to share in the subsidy. On net, transfers from rich to poor are often negligible. Analysis of water cross-subsidies in barrios and cities in seven

Central American countries found that poor households received net benefits in only one.⁴⁷ The same study found that in cities with high coverage, the rich gained the most. Welfare losses from cross-subsidizing water in Guayaquil were estimated in 1999 as US\$4.4 million per year.⁴⁸

In addition, increasing block tariffs implicitly assume that each household has their own electricity, phone, water or sewer connection. In practice, families often share connections. In Lagos, Nigeria, most families live in shared apartment blocks with an average of 7 others, usually sharing kitchens, bathrooms and toilets. Where initial tariff blocks are calculated to provide minimum service for one family, shared connections will largely negate the intended benefits of lifeline tariffs. Maintaining increasing block tariffs may actually discourage shared connections if households prefer to wait in hope of an individual connection; constant per unit tariffs may make the division of shared usage fees easier.

Some evidence for low levels of consumption by poor households relies on data from households relying on labor intensive sources. Household consumption is likely to increase as the poor gain access to more capital intensive sources. In Armenia, families with an in-house tap or tanker service consume between two and four times as much as households hand-carrying water.⁴⁹ For households with an in-house connection, the poor in Central America were found to consume as much as the rich.⁵⁰

In many cases, concerns about the affordability of cost covering prices may be misplaced. Current volumetric expenditure by the poor, calculated in terms of opportunity cost, has rarely been used as a guide to willingness-to-pay, despite the use of current consumption figures as an indicator of future consumption. While the methodologies for assessing household willingness-to-pay remain problematic, there is considerable emerging evidence that low-income households are often willing to pay more for safe and reliable infrastructure services than is implied by typical affordability guidelines.⁵¹ Indeed, as noted above poor consumers often pay very high prices for poor quality substitutes.

Given the problems associated with traditional pricing approaches, a strong case can be made for relaxing intensive price regulation and relying more heavily on competitive disciplines imposed by rival suppliers. More intensive price control can be limited to access to networks such as transmission grids and local telephone exchanges that continue to enjoy substantial market power.

Implementation of a price liberalization strategy raises issues relating to the extent of the market to be liberalized as well as the extent to which control are relaxed.

Extent of Market to be Liberalized: Retail prices might be deregulated for the market as a whole, or only for those not served by traditional utilities. The approach chosen should depend on decisions about liberalization of market entry and the effectiveness of competition. If all customers have the option to change supplier, there is no economic rationale for regulating retail prices. If only people unserved by the traditional utility have effective choice, more intensive supervision will be required of the dominant firm and the challenge will remain of how to manage the boundaries between the two market segments.

Extent of Relaxation of Price Controls: Price controls in liberalized market segments might be eliminated, or replaced by some residual, lighter-handed form of price regulation. The main argument for full liberalization is to let markets do their work.⁵² High prices signal profitable opportunities for new entrants, with even the threat of potential entry constraining pricing behavior.⁵³ And even where considerable market power remains, profit-maximizing suppliers will engage in price differentiation among customers that reduces the inefficiency associated with monopoly provision.

A bold price liberalization policy may nevertheless face resistance. New entry may be slow or uneven. Price differentiation, despite its efficiency features in monopolistic markets, often provokes concern about unequal treatment. No less important, governments and regulators often find it difficult to resist populist urges to intervene to “protect” consumers from paying what are perceived to be “excessive” prices. In this environment, several compromises between pure *laissez faire* and the heavy-handed ways of the past might be considered:

- Regulators might facilitate the operation of market forces by monitoring and publishing prices, thus helping to inform consumers of what kinds of prices might be “reasonable”, and also signaling market opportunities to potential rival suppliers.
- Regulators might be given a “reserve power” to impose price regulation on particular suppliers if their prices were found to be excessive. While this kind of “potential regulation” has been adopted in some industrialized countries,⁵⁴ the approach may not be well suited to other contexts. In particular, it is not hard to imagine regulators facing strong pressure to intervene to meet short-term political objectives, which would see a return to the failings of past approaches. Giving regulators broad discretion over when to intervene, and if so on what basis to set maximum prices, would create considerable risks for firms, potentially deterring entry and raising the cost of investment capital. For this reason, adoption of this strategy would require careful attention to the design of appropriate safeguards against the misuse of discretion.
- Regulators might establish a relatively loose ceiling for infrastructure prices, allowing firms the freedom to price up to that level. Regulators would need to pre-determine a ceiling that would still provide high-powered incentives for firms to enter difficult and potentially more risky markets to serve the poorest. Establishing such a limit by reference to the “reasonableness” of particular rates of return would be complex to administer and enforce. An alternative would be to set maximum prices in liberalized areas by reference to some fixed multiple of the regulated prices for the incumbent utility. This would expose investors to less risk than under the more discretionary “reserve power” approach.

Whichever approach is taken to pricing policy, the question may arise as to whether some additional subsidy mechanism should be implemented to address the needs of low-income consumers. This issue is discussed below.

4. Subsidy Systems: Design Matters

Designing a subsidy scheme for infrastructure services involves choices among many design variables. The main issues and options are reviewed below.

(a) Clarifying Objectives

The starting point in designing any subsidy system should be to identify clearly the objective. As we have seen, this question has traditionally received only limited scrutiny, with the result that policies claimed to “protect” the poor often did more harm than good.

In some cases, efficiency considerations may support the provision of a subsidy. This may be the case, for example, where consumption is associated with a positive externality, such as the public health benefits associated with access to basic sanitation services. Subsidizing consumption will be effective only for households who already have access, however. Where the goal is to expand access to services, particularly by those who live in areas where the costs of connection are higher than average, the subsidy might best be directed to supporting connection to services, rather than ongoing consumption.

If the objective is to ensure all citizens are able to afford consumption of at least some minimal level of services that are deemed essential, subsidies can be directed to some minimal (“lifeline”) units of consumption under increasing block tariff structures, rather than to all units of consumption. This may be a relatively efficient mechanism for helping those currently connected to the network, but offers no benefit to those who lack access.

(b) Targeting the Beneficiaries

Once the objective is clearly defined, the next question is to determine the class of intended beneficiaries.

The precise targeting of people to receive subsidies can be an information-intensive and costly exercise. In some cases, existing census or other data may provide reliable information for means-testing individual households. In the absence of such information, some pragmatism may be required, having regard to the costs of generating reliable information and the potential for mis-targeting, including errors of both inclusion (ie, including an unintended recipient) and exclusion (ie, excluding an intended recipient). In some cases, the area of residence may be a reasonable proxy for household income. For instance, in Colombia eligibility for certain subsidies is based on the zone of residence of particular citizens. Similarly, many schemes intended to support rural electrification simply assume that those living in rural areas are relatively poor and usually in need of assistance.

Recipients may also play a role in signaling their eligibility. For example, if the subsidy is directed to a low-cost service option, more affluent citizens will be less likely to choose the subsidized service. In Peru's rural telecommunications scheme, for instance, subsidies are directed to payphones, in the knowledge that more affluent people will

prefer the convenience of their own household or mobile phones. Similarly, subsidies directed to new household connections to infrastructure services will exclude those who are already connected. Recipients might also be required to take some positive action to qualify for subsidized services, such as registering with local authorities. They may also be required to meet some additional condition, such as paying their share of the bill, as is the case with water subsidies in Chile (see Box 5).

Box 5: Targeting Subsidies—Chile's approach

Chile replaced its cross-subsidy system with a comprehensive subsidy scheme for low-income households, assisting with the purchase of a variety of public services. Subsidies amount to a total of US\$12-13 million, excluding the administrative cost of the scheme. The program is financed by central government but administered through the municipalities. Subsidies are paid to the public-service operator rather than the household.

In the case of water, the subsidy covers 40-85 percent of the charges for the first 20 cubic meters of consumption. The goal of the scheme is to ensure that water and sanitation services do not take up more than five percent of household income. There are multiple criteria for eligibility including: region, average cost of water, household income and wealth, and family size. Eligibility is reassessed every three years. Households failing to pay their share of the bill have their subsidy suspended. Initially, the onus of proving entitlement to the subsidies was laid on households. However, low take-up rates prompted water companies to collaborate in identifying needy customers by examining tariff payment records. It is now believed that all eligible households in urban areas (about 20% of the population) are covered by the scheme. (Serra, 2000; Gomez-Lobo, 2001.)

(c) Funding Source

There are two main options for financing infrastructure subsidies: general taxation revenues, and levies imposed on suppliers or consumers of the same service. The latter include traditional cross-subsidies (where transfers are managed within a single enterprise) as well as more transparent approaches that can be compatible with competitive delivery. In addition to the distributional consequences of these alternatives, which will vary in each sector and country context, there are several efficiency implications to consider.

Allocative Efficiency. Raising revenue from any source involves some allocative inefficiency. In the case of cross-subsidies, the cost comes from reduced consumption of the implicitly taxed service. The higher the elasticity of demand for the taxed service—that is, the more quantity demanded responds to a price change—the greater the efficiency loss. If the demand for access to service is less elastic than the demand for consumption, which will often be the case in infrastructure, subsidies funded by levies imposed on access charges will have lower efficiency costs than those funded by levies on consumption. Traditional telecom cross-subsidies financed by high long-distance charges may be particularly costly in this regard.⁵⁵ It is not difficult, for example, to construct hypothetical cases in which the allocative efficiency costs of raising revenue through cross-subsidies exceed 50% of the funds raised.⁵⁶

Yet, the allocative-efficiency costs of raising revenue through the general tax system may also be significant. While this needs to be considered in the context of each country's taxation system, it has been suggested that the cost in the United States may be as high as

40% of the revenue raised,⁵⁷ which may be higher than the costs of a cross-subsidy funded through a levy on a relatively inelastic service such as interconnection.⁵⁸

Compatibility with Competition. Traditional cross-subsidies require monopolistic market structures; without these, those paying the higher prices would defect to other suppliers and so undermine the basis for the cross-subsidy. The costs of maintaining monopoly provision to finance cross-subsidies will vary between industries. In sectors such as telecommunications, where the welfare benefits of competition are substantial, maintaining monopoly provision will have a high cost. In other sectors, the potential costs of preserving monopoly will depend on the extent and form of competition that is feasible in the sector, and the structure of the subsidy.

It is possible to design cross-subsidy systems that are compatible with competition. For example, a levy on service providers or on more affluent consumers may be used to finance subsidized services to targeted beneficiaries irrespective of which firm provides the service. Schemes of this kind are increasingly common in telecommunications.

Transparency. The magnitude and direction of transfers under traditional cross-subsidies are opaque, limiting scrutiny by stakeholders. This may partly explain the prolongation of approaches that manifestly failed to achieve their stated objective.

Funding subsidies through general taxation increases the transparency of transfers, as they will be considered as part of the annual budget process alongside other claims on public expenditure. However, it is also possible to increase the transparency of cross-subsidies by making the earmarked levy an explicit part of the monthly bill and the subsidy an explicit part of beneficiaries' bills, and to mandate regular reporting of the level and direction of aggregate transfers.

(d) Delivery Mechanism

Traditional cross-subsidies are delivered via a single service provider which is directed to set prices according to a regulated tariff schedule, and to manage the necessary financial transfers internally. Several alternatives exist.

First, the amount of the subsidy may be transferred directly to the targeted beneficiary, whether as a cash payment, a tax deduction, or a voucher tied to expenditure on the specified service. Cash payments and tax deductions may be efficient means of meeting distributional objectives, but may raise concerns over the subsidy being expended on matters other than intended. Voucher schemes address this concern but can involve relatively large administrative costs.

Another variation is for the subsidy to be channeled through the service provider, but with the consumer bearing the onus of demonstrating their eligibility, which may also be conditional on paying the unsubsidized portion of the bill. This is the approach adopted in Chile to subsidize the first units of water consumed by low-income households.⁵⁹

If the objective is building out a network to increase access, the most appropriate delivery mechanism will depend on the distribution of unconnected households, market structure

and available technologies. Where customers have choice of provider and unconnected households live in close proximity to those with service, one of the consumer-driven mechanisms discussed above might be the most effective. For some services, whole communities lack service. Awarding subsidy payments directly to a service provider for reaching coverage and service goals can keep down the costs of administering the subsidy. Such output-based subsidies have been used in Peru to extend pay phones and internet access to targeted rural communities.⁶⁰ Potential providers bid for the contract on the basis of minimum subsidy required to meet set goals, pushing the subsidy 41% lower than expected.

(e) Controlling Subsidy Costs

Clear definition of objectives and careful targeting of intended beneficiaries can help to reduce the costs of the subsidy. These approaches can be complemented by additional measures.

One approach of particular relevance to the goal of expanding access by the poorest is to permit the use of technologies and solutions other than the traditional, high-quality networked utility. For example, subsidies might be permitted for the installation of public phones rather than a whole local network,⁶¹ or for off-grid electrification.⁶²

Competition can also be used to reduce the costs of the subsidy. For example, rights (and obligations) to provide subsidized services may be allocated through competitive auctions to the bidder demanding the lowest subsidy, as in rural electrification and rural telephony in Chile.⁶³

Sustainability considerations may also influence subsidy design. Consumption subsidies will typically require a long-term commitment, unless they form part of a transition strategy for moving to full cost covering user fees, as was the case in Guinea's water sector.⁶⁴ In some cases, it might be more feasible to direct subsidies to household or community connections to services like electricity and water, and leave consumption to be financed from user fees.

(f) Administrative Costs

In evaluating design options, it is important to consider the administrative costs and demands involved. The administrative costs include any costs the government or utility incurs in collecting revenue for the scheme, in determining eligibility, and in managing the delivery of the subsidy.

Traditional cross-subsidies will usually have relatively low administrative costs. Cross-subsidies funded through more explicit levies and transfers may have slightly higher costs. Direct subsidies funded from the budget may impose no additional administrative costs of fund-raising, since the apparatus for collecting taxes is already in place. But the extra administrative costs of providing explicitly targeted direct subsidies, however they are funded, may be high. These high costs are more of a burden for targeted consumption subsidies than for targeted connection subsidies, since the latter is a one-off rather than ongoing payment. A simulation of administrative costs for different types and illustrative

levels of subsidy in Panama is revealing: it showed that for a water consumption subsidy of \$1.50 per month, the administrative costs absorbed 40% of the total value of the subsidy, whereas for a one-off sewerage connection subsidy of \$750 the costs fell to 7 percent.⁶⁵ In some cases, it may be possible to reduce administrative costs by drawing on selection procedures developed for other purposes, or by jointly administering a scheme across several services, rather than on a sector-specific basis. This is the case, for example, for a broad range of consumption subsidies in Chile.⁶⁶

5. Regulatory Systems: A New Focus

The fifth lever for policymakers—and one that incorporates most of the specific elements discussed above—is the design and implementation of the overall regulatory system governing the infrastructure sector. In this context, the regulatory system is defined to include three distinct but closely related elements:

- a set of *regulatory rules* defining permissible conduct that will be embodied in laws, licenses, contracts or similar instruments;
- one or more *regulatory bodies* responsible for administering and enforcing those rules; and
- a set of *regulatory processes* undertaken or managed by regulatory bodies to discharge their responsibilities.

Until the early 1980s, most of the literature on regulation focused on experience in the United States, which had more than a century of experience in regulating private providers of infrastructure services. This experience, and that of other OECD countries, provides a rich set of insights into the challenges of regulatory system design. However, many of the key elements of those systems are not easily transferable to developing countries with very different policy priorities and institutional conditions, and indeed attempts to do so uncritically may result in outcomes that harm rather than help the poorest.⁶⁷ How might a regulatory system be designed if expanding access to the poor was a major objective?

(a) Regulatory Rules

Regulatory rules in infrastructure typically have three main focuses: controlling market entry, controlling prices, and controlling service quality. Over the last two decades, experience in OECD countries has highlighted the many costs associated with regulation, leading to a growing consensus that governments should intervene sparingly, and with care. This applies with even greater force in the context of pro-poor regulatory strategy. At the general level, constraints in administrative and regulatory capacity and other adverse features of the regulatory environment will reduce the likelihood that regulation will achieve its intended results, and increase the likelihood of unintended costs. This affects the basic calculus of whether the expected benefits of intervention will exceed the likely costs, and should thus lead to much more modest regulatory ambitions. There are also implications for each of the main forms of regulatory intervention.

Controlling Market Entry. As discussed above, a deliberate focus on expanding access requires careful scrutiny of exclusivity provisions and other regulatory barriers to entry.

Amongst other benefits, more liberalized approaches reduce demands on more intensive price and quality regulation. Formally recognizing informal providers that currently operate in the “black” or “gray” economy also facilitates scrutiny against other regulatory objectives, such as basic environmental, public health and safety concerns. Some of the key implementation issues affecting the implementation of an entry liberalization strategy were discussed earlier.

Controlling Prices. As discussed above, traditional approaches to price regulation are rarely consistent with addressing the needs of the poorest. Although often claimed to benefit the poor, in practice such regulation benefits only those who receive services from regulated firms, which in developing countries typically excludes the poorest. Regulated prices are also often set at levels below the cost of supplying low volume users or people in remote or high-cost locations, which destroys incentives for firms to expand access to those people. And any form of price regulation introduces the potential for misuse to meet short-term political objectives, thus increasing the risks faced by private firms and so deterring investment.

The arguments for relaxing intensive price regulation and relying more heavily on competitive disciplines imposed by rival suppliers were discussed above, as were alternative implementation strategies. Under a more competitive market structure with targeted subsidies, more intensive price control can be limited to access to networks such as transmission grids and local telephone exchanges that continue to enjoy substantial market power.

Controlling Quality. Regulation of service quality may be justified by concerns over environmental, safety, health or other consumer protection concerns, as well as to avoid price regulation from being undermined. Expanding the role of competition changes the role of quality regulation, requiring a more dynamic, output focused approach.

Where regulation of quality is justified, setting standards at the appropriate level is essential, as higher standards will be reflected in higher costs and hence higher prices. Moreover, high technical, health, safety or environmental standards will not meet their objectives if large parts of the population cannot afford service from formal utilities as a result, and rely instead on informal suppliers that evade regulatory oversight.

The form of intervention can also matter a great deal; for example, regulating inputs or processes rather than outputs or outcomes will reduce firms’ incentives to search for and apply lower cost ways for achieving the required result (see Box 6).⁶⁸

Policymakers concerned about the poorest may need to apply different quality standards to different categories of suppliers and customers. Minimal standards tied to essential health and safety concerns may be appropriate in areas not served by traditional utilities, with progressively higher standards applied to more affluent customers with access to network services. A multi-tiered entry regime along the lines discussed above may provide a simple structure for implementing such an approach, although care needs to be taken to avoid creating disincentives for firms to grow and so “graduate” into a more intensive regulatory environment. In each case, the costs of intervention need to be

weighed against the expected benefits, having regard to the likelihood of the regulation achieving its intended objective.

Box 6: Reducing Regulatory Barriers to Extend Service in Bolivia

In the Bolivian cities of La Paz and El Alto, customers have received their water and sewerage services from a private concessionaire – Aguas del Illimani – since August 1997. The consortium operates under a concession contract with many typical features, including exclusivity combined with service obligations of a specified quality. One innovation in the concession came at the bidding stage; bidders had to say how many connections they would make in return for a specified tariff. Aguas del Illimani committed to achieve 100% water coverage by December 2001.

Quality standards set in the contract require the concessionaire to provide in-house connections for water and sewerage service to all customers. Specifying outputs (type of service, service quality) rather than inputs (material standards, construction techniques) in the contract allows the concessionaire to select the most efficient way to provide the service. Even output standards can restrict the concessionaire's options, however. Providing contract-quality service may be so expensive as to undermine the expansion goals.

The willingness of the regulator to contemplate alternative delivery modes has allowed the concessionaire to experiment with lower-cost options. In a pilot project, households in some El Alto neighborhoods are being connected to condominium water and sewerage systems. These systems use smaller pipes, often running under yards rather than under roads to keep down installation costs. Relaxing regulatory requirements has expanded service options and accelerated network expansion. (Komives, 1999.)

(b) Regulatory Bodies

Most regulatory systems for infrastructure include some body or bodies charged with administering the rules. The optimal characteristics of such bodies will depend on the tasks to be performed and the environment in which they operate. In this regard, the capacity constraints and risk characteristics associated with regulatory environments where the poorest tend to reside, and the more liberal approaches to regulatory intervention suggested above, require some variations on the standard prescriptions based on experience in industrialized countries. These may be considered in three main areas: the expertise required of regulators, notions of “independence”, and the optimal location of regulatory bodies among tiers of government.

Expertise. The expertise required of regulators will depend on their specific responsibilities. In most systems, these will need to include the ability to administer price regulation, even if this is limited to regulation of interconnection to networks. There will also be a need to monitor and perhaps enforce compliance with at least minimal quality standards.

More liberal approaches to market entry and price and quality control will lighten the burden of this work. But the regulator will need to shift its focus from supervising a single utility and its existing customers to overseeing a larger number of more diverse suppliers adopting different technologies and business strategies to serve customers with more diverse service packages. Depending on the regulator's roles in this broader market, different strategies for monitoring performance may be required. Regulators may also need skills in community outreach and public education, both to understand

customer needs and preferences and to respond to possible pressures to reintroduce more intensive regulation that may have adverse consequences for the poor. Regulators will also benefit from skills in building partnerships with other actors who might assist in performing these broader functions, including local governments, communities and NGOs.

“Independence”. Notions of regulatory “independence” comprise two main ideas. First, that the regulator operates at arm’s length from regulated firms—to reduce concerns over ‘capture’ or other forms of undue influence. Second, that the regulator operate at arm’s length from political authorities—to reduce the regulatory risks faced by investors, and hence the cost of investment capital.⁶⁹

The objective of ensuring regulators operate at arm’s length from regulated firms can be particularly important under a pro-poor regulatory strategy. Failure to meet this requirement can undermine the effectiveness and the legitimacy of the regulatory system, and thus increase the risk of political backlash against more liberal approaches. Moreover, in liberalized markets it will be important for the regulator to maintain a “level playing field”, which will be impossible if the regulator has an interest in the success of some of the rival firms.

The importance of ensuring regulators operate at arm’s length from political authorities will depend on the responsibilities entrusted to the regulator. Insofar as the regulator controls prices or other politically sensitive issues, insulation from short-term political pressures will be important to reduce the risks faced by investors. Pragmatically, however, establishing a fully “independent” regulator is difficult in any country, let alone in countries with limited tradition of independent public institutions and where political systems are still evolving. This argues for carefully circumscribing discretion and establishing additional safeguards. For example, in Mexico responsibility for deciding whether or not to impose price regulation and responsibility for administering such regulation are entrusted to separate bodies: price regulation can only be imposed if the Federal Competition Commission—an independent body with an economy-wide focus—determines that the conditions of effective competition are absent.

Tier of Government. Regulatory bodies might be located at the supra-national, national, or at various sub-national tiers of government. There is general consensus about the main factors that should be considered in deciding on the optimal location, although there can be difficult tradeoffs involved.⁷⁰

Factors supporting decentralization to lower tiers of government include: greater proximity to users, which enables approaches to be adapted to local preferences and conditions; greater proximity to service providers, which facilitates effective monitoring; and enhanced opportunities to innovate. Factors supporting more centralized approaches include economies of scale in administration; improved ability to deal with spillovers that cut across jurisdictional boundaries; and reduced vulnerability to “capture” by regulated firms and by local political authorities. Weighing these factors in the context of local constitutional and political realities may lead to different results in different societies.

The trade-offs can be even more vexing in framing a pro-poor regulatory strategy. On the one hand, a scarcity of skilled resources argues for greater centralization of decision-making authority. On the other hand, a more diverse market with more small-scale firms supplying more distinctive and localized sub-markets argues for greater decentralization of at least monitoring activities.

Pragmatically, this may require a division of regulatory responsibilities. A central body may be responsible for overseeing the market as a whole and dealing with inter-connection and pricing issues for the dominant utility. More decentralized actors—such as municipal governments or NGOs—may be responsible for monitoring performance of individual service providers, dealing with customer complaints that cannot be resolved directly between the supplier and its customers, and helping to manage relations with local communities. This implies a major change in the roles played by these entities, with implications for capacity-building efforts. Publication of performance results by a central regulatory body can also help decentralized oversight by providing a benchmark against which to compare local providers.

(c) Regulatory Processes

Regulatory bodies—no matter where located, or how expert and independent—need access to reliable information to make sound decisions. This includes information about the needs and priorities of consumers, firms and other stakeholders, as well as about the performance of regulated firms. Regulators that enjoy safeguards of their independence also need measures to ensure they are accountable, and transparent processes for engaging those affected by their decisions can play an important role. Processes for engaging stakeholders can thus have an important impact on the quality of regulatory decisions as well as on the legitimacy of the regulatory body itself.

Designing processes to engaging stakeholders needs to take account of a range of factors. These include: the effectiveness in reflecting a full range of relevant views and perspectives; accessibility to parties in remote locations or with limited sophistication; safeguards associated with being seen to be “too close” to any particular interest; and the impact on the costs and delays associated with regulatory decision-making. Diverse approaches have been developed. These include formal regulatory hearings of the kind common in the United States, specialist consultative or advisory committees, such as those established in the water sector in the United Kingdom, as well as a range of less formal approaches. A key feature of all modern approaches is transparency—to ensure accountability, to provide assurance to stakeholders, and to increase the predictability and perceived fairness of decisions.

Engaging stakeholders becomes even more important, and more challenging, when pursuing a pro-poor regulatory strategy of the kind outlined above. The regulator will need to:

- Understand the needs and priorities of the poorest, including those who are not customers of traditional utilities. They may be located in urban slums and remote rural localities, and have limited access to reliable transport and communication links.

- Understand the needs and perspectives of a larger and more diverse group of actual and prospective service providers, ranging from small-scale entrepreneurs to more traditional utilities. In some cases, these firms may operate in the informal sector, and even have been operating illegally.
- Engage municipalities, NGOs and other groups with an interest in representing or advancing the needs of the poorest.

Moreover, the regulator will need to engage this larger and more diverse group of stakeholders in a way that helps to curb populist pressures to reintroduce more intensive regulation that may adversely affect the poorest. Public education thus becomes an important part of the new regulatory agenda.

In this setting, exclusive reliance on formal hearings of the kind adopted in some industrialized countries will not be enough. Greater effort will be required to reach out to and engage stakeholders, both to ensure decisions are well informed and to underpin the legitimacy of the regulatory system. There is no single model for how this might be done. But there are some promising experiments being undertaken in many developing countries. These include:

- Visiting communities and engaging them in a dialogue on needs and priorities. For example, the regulator in Jamaica reaches out to communities through local churches, and regulators in Bolivia hold town hall meetings across the country.
- Establishing specialist consultative or advisory bodies to provide the regulator with convenient access to a range of views. For example, in Brazil concessions in the energy sector each include a special committee that comprises representatives of local government as well as different categories of users, including slum dwellers, farmers, businesses, and the like. The challenge with such approaches is to ensure the bodies are in fact representative.
- Developing information strategies aimed at educating citizens about the regulatory system. For example, regulators in Peru make extensive use of radio commercials, and regulators in Jamaica make extensive use of “talk-back” radio shows.
- Delegating to municipal governments or NGOs particular roles in monitoring service provision and managing more intensive consultations with their constituencies. For example, in Brazil there is a national system of consumer protection that delegates to sub-national governments certain responsibilities for dealing with consumer issues within their jurisdiction.

Some combination of all of these strategies may be necessary and desirable. Much will depend on the size and diversity of the regulator’s jurisdiction and the effectiveness of alternative channels of communication.

6. Beyond Traditional Sector Boundaries

The five policy levers described above rest on common principles but tend to be applied on a sector-by-sector basis. Indeed, policymakers in infrastructure tend not to stray outside their bailiwicks, and rarely venture into other sectors or into broader policy issues that affect access to services. More aggressive pursuit of the interests of the poorest will require policymakers to take a more holistic view. For example:

- In some cases, there will be direct linkages between access to different infrastructure services. For example, upgrading rural road surfaces in Morocco to allow all-weather access delivered indirect energy benefits. As lower transport costs reduced the price of butane gas, households could switch to butane and away from fuel wood, which had cost women about two hours daily to collect.⁷¹ Similarly, improving access to one infrastructure service may be dependent on improving access to others, such as where expanding access to modern telecommunications services depends on reliable access to electricity.
- Low-income households often have problems accessing credit to finance new connections, and equipment for making use of these connections. Recent decades have seen the emergence of promising private solutions to this problem, including term payment arrangements extended by service providers, the extension of finance through local micro-credit agencies, and community savings schemes. While there is debate on the scope and nature of government action appropriate to support such schemes, one clear objective should be to ensure that finance and banking regulations do not erect unnecessary barriers to the development of financing arrangements targeted at the poor.⁷²
- Many regulations make it more difficult for suppliers to offer a service, for households to sign up for it, or otherwise increase the costs of services. These can include building codes defining construction-standard prerequisites for connections; land use and physical planning regulations restricting the extension of services into informal neighborhoods; rules and processes for clarifying land tenure and ensuring land security; and prerequisites for legal recognition of community-based organizations that could act as intermediaries between service providers and local households. Taxes, import restrictions and a range of other interventions may also have the effect of increasing the costs of equipment used in serving low-income households and communities. Just as sound sector policies contribute broadly to the success of most other productive activities in the economy, soundness of broader micro-economic policy is ultimately vital to assuring sustainable improvements in infrastructure services.

These policy approaches focus on opening up the potential for technological and commercial innovations that may bring better services within the reach of the poor—and removing or reducing barriers that may stand between low-income households and communities and access to these services. Some require new interventions—for example in the form of revised regulatory and subsidy arrangements. Others require the reform of existing interventions that may inadvertently impede the improvement of services for the

poor. Most focus on reshaping the institutions that in turn shape the nature and cost of the services delivered—rather than on the actual delivery of these services.

The new policy approaches do not mean that the government has no role to play in financing infrastructure sector investments. However, it does mean that public investments need to be much more carefully designed than in the past, and done in a way that facilitates rather than crowds out or restricts private competitive responses. In many cases, public resources may be best channeled through transparent subsidy mechanisms rather than supporting existing monopolies.

C. CALIBRATING APPROACHES TO INSTITUTIONAL CONDITIONS

The success of any policy measure depends on how well it is adapted to the particular implementation environment. This is certainly true of measures intended to expand access to infrastructure services by the poorest.

A theme throughout this paper has been that traditional approaches—which often reflect experience in industrialized countries—will often be poorly adapted to meet the needs of the poorest in developing countries. This broad assertion rests on four main points of difference between the two types of country environment.

The Access Priority. In industrialized countries, the overwhelming majority of citizens have access to modern infrastructure services, and policy and regulatory strategy focuses on overseeing established industries and customer relationships. In contrast, large proportions of the populations of developing countries lack access to any formal infrastructure services. The effectiveness of any pro-poor strategy must thus be tested against the goal of expanding access to services, rather than just improving the convenience of those who already have service.

Affordability Constraints. Infrastructure prices are sensitive in every country, rich and poor alike. But the world’s poorest people face real constraints on their ability to pay, which affect both access and the consumption possibilities of those with access. At the same time, the costs of providing service to the poor living in rural or peri-urban areas may be higher than average. Any strategy to improve services for the world’s poorest must place particular emphasis on affordability concerns, and thus strive to minimize costs, including the costs imposed by the policy intervention itself.

Administrative and Regulatory Capacity. Most industrialized countries have well-established administrative and regulatory capacity, including a pool of qualified professionals and the administrative and physical infrastructure to interact effectively with the overwhelming majority of their citizens. Countries that are home to the world’s poorest people are rarely so well endowed. Administrative and regulatory capacity are typically under-developed, particularly outside the principal cities. Poor transport and communication networks exacerbate the difficulties faced by regulators in monitoring the behavior of firms and interacting effectively with consumers and other stakeholders. While not unique to developing countries, weak administrative and regulatory capacity often co-exists with corruption concerns. In such environments, regulation can often be

used to create corruption opportunities for officials rather than to pursue legitimate public purposes. Capacity constraints of these kinds affect the basic calculus of whether interventions are likely to provide net social benefits, as well as the design of particular interventions.

Political and Regulatory Risk Environment. Most industrialized countries have relatively stable political systems and reasonably independent and trusted judiciaries. They have also established long track records in treating private investors fairly, and so are perceived by investors to involve relatively little political and regulatory risk. In contrast, many developing countries are still transforming their political and judicial institutions, and have not yet established a long track record in protecting private property rights. Indeed, some have nationalized assets within living memory. As a result, investors often perceive high political risks associated with infrastructure investments in developing countries, which in the regulatory sphere usually translates into particular sensitivity about regulatory discretion. Absence of sufficient safeguards against the misuse of such discretion will increase firms' cost of investment capital, which will be reflected in reduced investment, higher prices, or both.⁷³

Of course, these broad generalizations do not apply equally to all infrastructure sectors in all developing countries. Indeed, even within a single sector in a single country, differences may exist between regions. Nevertheless, they do provide a starting point in thinking about question of institutional fit. Broadly speaking, the case for adopting bolder deregulatory measures of the kind outlined in this paper will be greatest in countries or regions with low coverage levels, low per capita incomes, weak regulatory and administrative capacity, and are perceived to be high political and regulatory risk environments. Those countries or regions also tend to be where most of the world's poorest live.

D. MOVING FROM THEORY TO PRACTICE

Changing old ways of doing things is never easy—whether on the relatively modest scale of making poor communities more active players in decisions about how to improve their infrastructure services, or on the grander political scale of reformulating policies to enable competition and entry. Very often, those who stand to gain from such changes—and this applies above all to the poor—have less political voice, or a less concentrated political voice, than those who risk losses.

The policy approaches outlined above are no exception. In particular, they threaten the loss or erosion of various kinds of monopoly power (and accompanying opportunities for corruption)—through the removal or reduction of exclusive service prerogatives; through the trimming back of regulatory prerogatives; through the reform of systems of standards to increase the range of acceptable technologies.

To weather the inevitable resistance, governments need a strong commitment to improving outcomes for the poor. In this context, experience shows that the quality of the reform process is likely to be critical to the reform dividends. Processes with a strong focus on stakeholder consultation and consensus building are essential—with particular

attention to mobilizing stakeholder groups who stand to gain from reform. These include, most notably, the poor themselves, but also small businesses who could take a more active role in serving them, and non-governmental organizations that could take a more active role in facilitating and monitoring service delivery in rural towns and peri-urban slums.

Beyond politics, the policy directions described above suggest critical changes in the design of infrastructure projects (particularly reform projects), and the process by which these projects are developed. For example, they suggest more, and early, emphasis on distribution level issues—in particular, restructuring and regulatory reform to facilitate entry prior to engaging in large-scale privatization. They imply more attention to data-gathering on such matters as the nature of current infrastructure use and demand for services by low-income communities, and more attention to identifying potential new players in infrastructure markets (for example, small businesses with the potential to become service providers). And, in the context of designing regulatory regimes, they suggest more attention needs to be given to identifying non-governmental and community organizations that could play a role in monitoring service provision.

As in any area of policy innovation, much can be gained from a concerted effort to monitor and draw lessons from reform experiences in other countries. However, the success of any policy will depend ultimately on careful adaptation to local conditions and priorities.

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END NOTES

- ¹ World Bank staff estimates.
- ² See Townsend, 2000.
- ³ See World Bank, 1996.
- ⁴ See Komives, Whittington and Wu, 2001.
- ⁵ The countries are Albania, Bulgaria, Côte d'Ivoire, Ecuador, Ghana, Jamaica, Kazakhstan, Kyrgyz Republic, Nepal, Nicaragua, Pakistan, Panama, Russia, South Africa, and Vietnam. These countries were chosen because data and supporting documentation were available and because the surveys included questions on all or most infrastructure services. The pooled sample includes data from more than 55,500 households.
- ⁶ The definition of poor households is used in three ways in the paper: GNP per capita, lowest income decile within a country, and the bottom 5% income quintile across 15 countries. The third measure combines national and relative income. For example, if most consumers in Nepal have a lower income than the bottom 10% in South Africa, Nepalese households will be represented more heavily in the bottom income quintile in the pooled sample.
- ⁷ The relationship between GNP per capita and infrastructure access is weakest for electricity. (Komives, Whittington and Wu, 2001.)
- ⁸ Komives, Whittington and Wu, 2001. See Annex for survey dates for each country.
- ⁹ See Jadresic, 2000, p.3.
- ¹⁰ See Foster, 2000, p.40.
- ¹¹ Komives, Whittington and Wu, 2001.
- ¹² See World Bank, 2000b.
- ¹³ See Komives, Whittington and Wu, 2001.
- ¹⁴ The data for this section is taken from Allport, 2000.
- ¹⁵ See World Bank, 1994.
- ¹⁶ Tynan, 2000b, discusses the role of private water companies in expanding water networks and supply in London from the late 16th century through to the end of the 19th century.
- ¹⁷ These data are drawn from the Private Participation in Infrastructure Database, managed by the Private Provision of Public Services Group at the World Bank. The database tracks projects, newly owned or managed by private companies in water and sanitation, telecommunications, energy (electricity, gas transmission, and gas distribution) and transport (ports, airports, railways and roads). Financial closure is a prerequisite for inclusion in the database.
- ¹⁸ Galal et al., 1994, provide a general methodology for assessing the welfare impact of privatization programs, but do not focus specifically on the welfare impact on poor households. Foster, 2000, discusses alternative methodologies for measuring the impact of energy sector reform on the poor.
- ¹⁹ See, for example, Estache, Gomez-Lobo and Leipziger, 2000.
- ²⁰ See Newbery and Pollitt, 1997.
- ²¹ See Chisari, Estache and Romero, 1997.
- ²² See Van den Berg, 2000.
- ²³ See Winston, 1993.
- ²⁴ See Rossotto, Kerf and Rohlf, 1999.

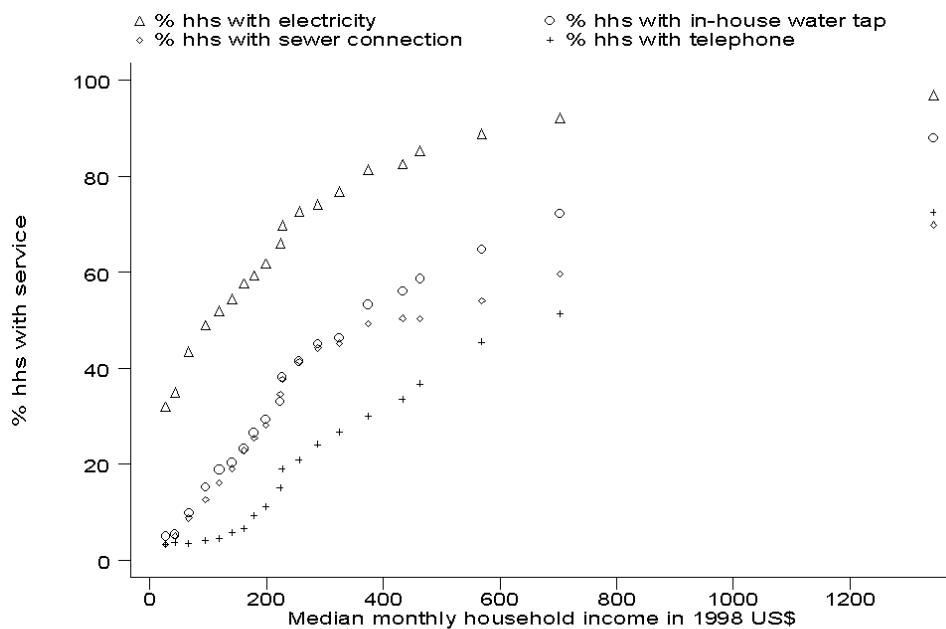
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- ²⁵ See Melo, 2000. Achieving the higher number is conditional on tariffs falling in line with costs.
- ²⁶ See Powell and Starks, 2000.
- ²⁷ See Solo and Snell, 1998.
- ²⁸ See Kariuki and Acolor, 2000.
- ²⁹ See Ehrhardt and Burdon, 1999.
- ³⁰ See Hankins, 2000.
- ³¹ See Marchal et al, 2000.
- ³² PPIAF (2001).
- ³³ Baker and Trémolet, 2000.
- ³⁴ Allport, 2000, and Ehrhardt, 2000.
- ³⁵ For a small sample survey, see Houskamp and Tynan, 2000.
- ³⁶ Recent cross-country evidence on entry regulation for start-up firms by Djankov et al. (2000) supports the incentive-based view that regulatory barriers do not benevolently increase consumer welfare, but generally benefit politicians and bureaucrats. The authors find that regulatory barriers to entry are higher in countries with higher levels of corruption and larger unofficial economies.
- ³⁷ For example, in 1880 Denver granted a general electric utility franchise to “all comers”, and in 1887 New York City gave franchises to six electric utility companies at the same time. See Phillips (1993). For interesting discussions of how political factors led to the introduction of regulation in the U.S., see Keller (1990) and Goldin and Libecap (1994).
- ³⁸ The same reasoning is relevant when assessing objections that firms will not invest in a privatized utility without guarantees of market exclusivity. The privatized utility should have substantial cost advantages over smaller providers. In any event, investors in privatized utilities are usually more interested in secure access to affluent and commercial customers, and so are unlikely to be greatly concerned about competition to serve rural communities or urban slums.
- ³⁹ For a discussion, see Smith, 1997c.
- ⁴⁰ Estache and Rodriguez-Pardina, 2000.
- ⁴¹ Serra, 2000.
- ⁴² Telecommunications is a notable exception, where many governments have used monopolies over long-distance and international services to be a net source of government revenue.
- ⁴³ World Bank, 1994.
- ⁴⁴ Komives, Whittington and Wu, 2000.
- ⁴⁵ As the example from Nigeria shows, however, this is not always the case.
- ⁴⁶ Townsend, 2000; when comparing prices between network and non-network services, it should be remembered that, in some countries, network tariffs are set below full cost recovery.
- ⁴⁷ Walker, et al., 2000.
- ⁴⁸ Yepes, 1999.
- ⁴⁹ Lampietti, 2000.
- ⁵⁰ Walker et al. 2000.
- ⁵¹ See, for example, Walker et al. 2000.

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- ⁵² For a discussion of how this approach might apply to water utilities, see Brook Cowen and Cowen (1998).
- ⁵³ For a discussion of the effectiveness of “potential competition”, see Gilbert (1989).
- ⁵⁴ In New Zealand, the Commerce Act gives the Minister the discretion to impose price controls if she is satisfied that the conditions of effective competition do not exist and control is necessary to protect users or consumers.
- ⁵⁵ See Hausmann et al, 1999.
- ⁵⁶ Consider a traditional telecom cross-subsidy financed, in the presence of monopoly, by raising the per-minute price of off-peak long-distance calls. Suppose the marginal cost of an extra minute’s calling is, essentially, zero, but that in the absence of cross-subsidy the company would set the off-peak per-minute price at 25 cents, thus using the variable charge to cover some of the company’s fixed costs. Now consider an increase in the price to price to 50 cents to provide revenue for subsidies. If the price elasticity of demand for off-peak calls is 1, the allocative-efficiency cost will be 75% of the revenue raised.
- ⁵⁷ See Vedder and Gallaway 1999. Diewert et al 1998 review empirical studies of the allocative-efficiency costs of taxation.
- ⁵⁸ Cremer et al 1998 discuss how to evaluate the relative costliness of cross-subsidies and tax-funded subsidies and cite a study that finds that in the case of the French postal service cross-subsidies appear cheaper than tax-financed subsidies (taking as desired the targeting of the postal subsidies).
- ⁵⁹ See Gómez-Lobo, 2001, and Box 5.
- ⁶⁰ See Cannock, 2001.
- ⁶¹ See Wellenius, 1997.
- ⁶² See Villagran, 2000.
- ⁶³ See Jadresic 2000, Serra 2000 and Wellenius 1997.
- ⁶⁴ See Brook and Locussol, 2001.
- ⁶⁵ See Foster, Gomez-Lobo and Halpern, 2000.
- ⁶⁶ See Gomez-Lobo, 2001.
- ⁶⁷ See Smith, 2000a.
- ⁶⁸ See Baker & Tremolet, 2000.
- ⁶⁹ See Smith, 1997c.
- ⁷⁰ See Smith, 2000b.
- ⁷¹ See Gannon & Liu, 2000.
- ⁷² See Morduch, 1999.
- ⁷³ See Smith, 1997c.

DATA FROM LIVING STANDARDS MEASUREMENT SURVEYS ON HOUSEHOLD ACCESS¹

Figure A Pooled LSMS data showing access to difference services by quantile

Global infrastructure coverage⁽¹⁾ vs. monthly household income proxy,⁽²⁾
by quantile of 5 percent⁽³⁾



Source: 55,546 sample households in a pooled data set of Living Standards Measurement Surveys.

Notes:

- (1) The in-house water curve reports coverage levels among sample households from all 15 countries used in this study. The other three curves report coverage in a subset of countries because some LSMS surveys are missing information on these services. Information on electricity is available in 14 countries, telephone data in 12, and sewer information in 10.
- (2) Median monthly household aggregate consumption is used as a household income proxy. The consumption aggregates prepared by the LSMS survey research teams were adopted for this analysis.
- (3) Households are divided into quantiles of 5 percent according to the per capita consumption of the households. The quantiles of five percent are groups that each consist of 5 percent of the 55,546 households. The per capita consumption cut-offs for the quantiles are the same for the electricity, water, sewer, and telephone curves. When data on a particular country are missing (see note 1), households from that country are simply left out of the quantile coverage calculations.

¹ Source: Komives, Whittington and Wu, 2001.

Country (LSMS survey year)	GNP per capita (1999) ⁽¹⁾	Urban pop. as % of total ⁽²⁾	Percent with electricity connection in home		Percent with in-house water		Percent with sewer connection		Percent with telephone at home		Telephone coverage ⁽³⁾ Main lines per 100 inhabitants
			Poorest decile - urban	Poorest decile - rural	Poorest decile - urban	Poorest decile - rural	Poorest decile - urban	Poorest decile - rural	Poorest decile - urban	Poorest decile - rural	
			8	7	0	-	-	-	-	-	
Côte d'Ivoire (1988)	710	45	39	8	7	0	-	-	-	-	1.18
Ghana (1988-89)	390	37	38	0	2	0	-	-	-	-	0.75
South Africa (1993)	3,160	53	32	8	23	1	-	-	6	0	11.45
Ecuador (1995)	1,310	63	92	63	25	7	42	5	5	0	7.82
Jamaica (1997)	2,330	55	55	44	23	2	15	6	10	6	16.56 ⁽⁴⁾
Nicaragua (1993)	430	55	71	13	44	4	9	0	0	0	3.13
Panama (1997)	3,070	56	91	2	36	4	25	0	20	0	15.13
Nepal (1996)	220	11	43	1	7	4	7	0	0	0	0.84
Pakistan (1991)	470	36	88	44	34	5	20	0	1	0	1.93
Vietnam (1992-93)	370	20	57	16	4	0	-	-	-	-	2.57
Albania (1997)	870	40	100	100	0	-	-	0	0	0	3.05
Bulgaria (1995)	1,380	69	100	100	84	27	86	18	51	20	32.89
Kazakhstan (1996)	1,230	56	100	100	78	12	70	8	38	20	10.35
Kyrgyz Rep. (1993)	300	34	99	99	54	5	22	3	20	5	7.63
Russia (1994-95)	2,270	77	-	-	84	31	78	12	39	13	19.65

Source: LSMS surveys. (Komives, Whittington and Wu, 2001).

Notes: (1) World Bank, in US\$. (2) World Bank, figures for 1998. (3) ITU. (4) 1997 data.

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