
Infrastructure Privatization and Regulation: Promises and Perils

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Infrastructure is crucial for generating growth, alleviating poverty, and increasing international competitiveness. For much of the twentieth century and in most countries, the network utilities that delivered infrastructure services—such as electricity, natural gas, telecommunications, railroads, and water supply—were vertically and horizontally integrated state monopolies. But this approach often resulted in extremely weak services, especially in developing and transition economies and especially for poor people. Common problems included low productivity, high costs, bad quality, insufficient revenue, and shortfalls in investment. Over the past two decades many countries have implemented far-reaching institutional reforms—restructuring, privatizing, and establishing new approaches to regulation. This article identifies the challenges involved in this massive policy redirection within the historical, economic, and institutional context of developing and transition economies. It also reviews the outcomes of these policy changes, including their distributional consequences—especially for poor households and other disadvantaged groups. Drawing on a range of international experiences and empirical studies, it recommends directions for future reforms and research to improve infrastructure performance.

For much of the twentieth century and in most countries, network utilities—electricity, natural gas, railroads, water supply, telecommunications—were vertically and horizontally integrated state monopolies under ministerial control.¹ Infrastructure's enormous economic importance, a desire to protect the public interest in industries supplying essential services, and concerns about private monopoly power led governments to conclude that control over these services could not be entrusted to the motivations and penalties of free markets. Governments also believed that given the large investments involved, public resources were required to increase infrastructure coverage. Accordingly, a single public entity usually controlled every

aspect of a utility—facilities, operations, and administration—and determined which services to provide to essentially captive customers.

The past decade has seen a dramatic change in views about how network utilities should be owned, organized, and regulated (Newbery 2000a). The new model calls for increased reliance on private infrastructure to improve efficiency, promote innovation, and enhance services. But after a series of financial crises, corporate scandals, and stock market collapses; the California electricity crisis; and blackouts around the world, clear guidance is needed on what to do about infrastructure—as well as reassurance about (or qualifications of) earlier, more confident messages. What are the promises and perils of the new model? What principles should guide future efforts to restructure, regulate, and expand infrastructure?

State-Owned Monopolies Often Exhibited Poor Performance...

The performance of state-owned infrastructure monopolies varied considerably. In many developing and transition economies, these monopolies suffered from low labor productivity, deteriorating fixed facilities and equipment, poor service quality, chronic revenue shortages and inadequate investment, and serious problems of theft and nonpayment. Public utilities pursued multiple poorly defined and conflicting objectives, and their managers were often appointed on the basis of political loyalty, not competence. Large portions of the population lacked services in developing areas—though not in transition economies, many of which achieved fairly high service coverage. Prices varied considerably across sectors. They were typically high in telecommunications, whereas underpricing was common in electricity and certain segments of transportation and was especially serious in water.

Infrastructure performance was generally much better in advanced industrial countries. Still, in the electricity sector, high construction costs (caused by delays and changing environmental and safety requirements) and expensive, politically driven programs led to problems. In telecommunications, state-owned entities were forced to adopt inefficient pricing structures and were used to generate revenue for the government and support excessive employment—delaying investment and modernization and undermining efficient operations and universal service. In almost all countries railroads failed to earn adequate revenue, had difficulties adjusting to changes in markets, experienced declining market shares for passenger and freight traffic, and exhibited poor productivity relative to technological opportunities.

In developing and transition economies, a main cause of deteriorating infrastructure performance was underinvestment, due largely to the failure of governments to prescribe cost-reflective tariffs, especially during periods of high inflation. Under state ownership prices fell to levels that could not cover the investment needed to meet growing demand. This problem was deferred as long as governments were able

to provide subsidies and international financial institutions were willing to bail them out. But years of underfunding and failure to address systemic problems led to a significant infrastructure deficit, generating substantial welfare losses. In many countries inefficient public utilities were draining state budgets, diverting resources from other social priorities such as health and education, undermining the banking sector, and impeding the development of the private sector.

By the early 1990s developing economies were incurring annual losses of about \$180 billion due to mispricing and technical inefficiency in water, railroads, roads, and electricity—nearly as much as annual investments in these sectors (World Bank 1994). Infrastructure inefficiencies constrained domestic economic growth, impaired international competitiveness, and discouraged foreign investment.

The external debt burden forced many countries to undertake fiscal adjustments, which hit public infrastructure investment particularly hard. In Latin America, for example, between 1980–84 and 1995–98 public infrastructure investment as a share of gross domestic product declined from 3.1 to 0.2 percent in Argentina, from 5.0 to 2.0 percent in Bolivia, from 3.7 to 0.6 percent in Brazil, from 3.1 to 1.7 percent in Chile, from 2.5 to 0.4 percent in Mexico, and from 2.0 to 0.6 percent in Peru (Calderon and others 2003). With growing budget deficits and the resulting inability of governments to maintain and expand infrastructure services, most developing and transition economies simply could not sustain state-owned utilities. Debt and fiscal crises, combined with extraordinarily weak performance, stimulated strong pressures for infrastructure reform (Estache 2000).

...Leading to a New Model for Financing and Providing Infrastructure

Recognizing the performance problems of state-owned, monolithic network utilities—and driven by technological progress, advances in economic thinking, and mounting evidence on the high costs of government intervention—nearly all industrial and many developing and transition economies have implemented far-reaching infrastructure reforms. These institutional reforms have entailed combinations of competitive restructuring, privatization, and establishment of regulatory mechanisms (Joskow 2003).

Private entities, with their financial, technical, and managerial resources, are seen as having a comparative advantage in the rapidly changing markets and technologies of network utilities. Thus rebalancing the roles of the private and public sectors has been an integral part of every infrastructure reform program. A key attraction of privatization is that it places the realignment of prices with underlying costs at the center of the reform agenda. Investors demand cost-reflective tariffs before they will commit their capital and expand networks.

The public utility paradigm was premised on the assumption that each infrastructure network industry constitutes a natural monopoly in which a single firm could achieve lower costs and better service than a number of competing suppliers. This view was enshrined in the monolithic organization structure, in which a single entity controlled all facilities and operating and administrative functions and was obligated to serve on demand within its territory in accordance with its public utility responsibilities.

In recent years, however, there has been increasing recognition that network utilities are not monolithic natural monopolies but rather encompass several distinct activities with entirely different economic characteristics—in fact, entailing a mixture of competition and monopoly elements in supply. Technological progress, which has proven to be a potent enemy of natural monopolies (Klein 1996), coupled with mounting evidence of the high costs of regulatory intervention, has undermined the public utility concept. It is now widely accepted that the monopoly utility model no longer applies—and never should have been applied—to all network industries. Moreover, if these industries are properly reorganized and restructured, substantial competition can emerge for many activities.

Thus most analysts now believe that network utilities should be unbundled, horizontally and vertically, with potentially competitive segments under separate ownership from natural monopoly components (Guasch and Blitzer 1993):

- In electricity, transmission and distribution should be unbundled from generation.
- In telecommunications, the local loop should be split from long-distance, mobile, and value-added services.
- In natural gas, high-pressure transmission and local distribution should be separated from production, supply, and storage.
- In railroads, tracks, signals, and other fixed facilities should be separated from train operations and maintenance.

In this view, any interference with market mechanisms in competitive or contestable segments should be minimized, and privatization and competitive entry should be fully exploited. Only segments where natural monopoly conditions persist and are unavoidable (generally because they involve substantial sunk capital) should be regulated and perhaps operated by the public sector.

Some analysts have even questioned the need for regulating, at least extensively, the natural monopoly segments of infrastructure by drawing the distinction between competition in the market and competition for the market. Proponents of this view have resurrected an old, yet powerful idea: Where a large number of firms enter noncollusive bids to become the supplier of a natural monopoly activity, the resulting price need not reflect exploitative market power (Demsetz 1968). Thus, even when competition in the market is not feasible, some of its benefits could be achieved by introducing competition for the market. Under this approach, time-bound monopoly

franchises are awarded by competitive bidding and periodically rebid. This provides incentives for firms to perform well to retain the franchise (Klein and Roger 1994).

The New Model Poses Risks, But Also Holds Considerable Promise

The global wave of infrastructure privatization and liberalization in the 1990s was a significant departure from the previous economic consensus. Not only was the need for state ownership of network utilities questioned. So, too, were longstanding notions about natural monopolies, vertical integration, and related regulatory interventions.

Yet today's industrial countries relied on the old, vertically integrated model to develop good infrastructure and have only recently pursued unbundling. So why should developing and transition economies take this new approach? This question is especially relevant given that the new model poses significant risks if not accompanied by appropriate structural and regulatory safeguards.

The simple answer is that the new model, implemented correctly, offers benefits too big to ignore—for governments, operators, and consumers. There is enough experience to guide correct implementation. Still, it should not be pursued in a specific country or industry without carefully assessing its institutional and structural prerequisites and without explicit attention to the concerns it raises.

Unbundling Is No Panacea...

The basic tradeoff between vertically integrated and unbundled forms of organization is between potential losses of coordination and scope economies and possible increases in transaction costs, relative to potential efficiency gains from competition and increased transparency (Gómez-Ibáñez 1999). But in many cases these tradeoffs have not been carefully assessed. Instead, simplistic approaches to competition and restructuring have ignored economies of vertical integration and challenges of replicating vertical relationships with market mechanisms—leading to many problems in utility restructuring and privatization.

The primary virtue of unbundling is that it promotes competition, ensuring that firms provide their services at efficient prices. Unbundling is likely to be particularly attractive when market size and density permit many operators to function, providing both active and potential competition (Kessides and Willig 1995).

But in many developing areas, markets are too small for substantial competition to emerge. In electricity, for example, where even a 1,000 megawatt system is small for introducing competition, 60 developing economies have peak system loads below 150 megawatts, another 30 between 150 and 500 megawatts, and possibly

another 20 between 501 and 1,000 megawatts (Bacon 1994). Thus the benefits of competition that come from unbundling will be limited in many developing and transition economies.

Moreover, the provision of many innovative, market-responsive utility services requires investments in physical infrastructure. In unbundled systems it may be difficult for providers of competitive final services to coordinate with monopoly owners of infrastructure networks—especially if their incentives for investments are not in harmony. Thus another factor required for unbundling is a mature, well-developed set of network facilities, so that there is little need for new investments where incentive problems are more likely. Yet circumstances in most developing and transition economies are exactly the opposite. These countries require substantial new infrastructure investments, either because their networks are underdeveloped or because they have not been adequately maintained or modernized (or both).

...And Requires Careful Regulation

Unbundling can reduce the need for regulation by isolating monopoly segments, containing their damaging consequences, and replacing regulation with competition. But even though fewer activities require regulatory oversight in unbundled systems, performance becomes much more sensitive to regulatory efficacy. In fact, some inefficient practices (such as internal cross-subsidies) that were tolerable in a monopoly environment can cause much more damage in the new setting.

To obtain the benefits of unbundling, policies need to harmonize regulatory oversight of monopoly activities with increasing competition (Baumol and Willig 1987). Otherwise, the interface between bottleneck components (those essential to the provision of final services and too costly to duplicate) and competitive segments can create such severe distortions that the mixed system is the worst of both worlds. Thus unbundling makes the regulatory task more complex, which is likely to be a problem in environments with weak institutional capacity—as in most developing and transition economies.

Privatization Has Been Oversold and Misunderstood

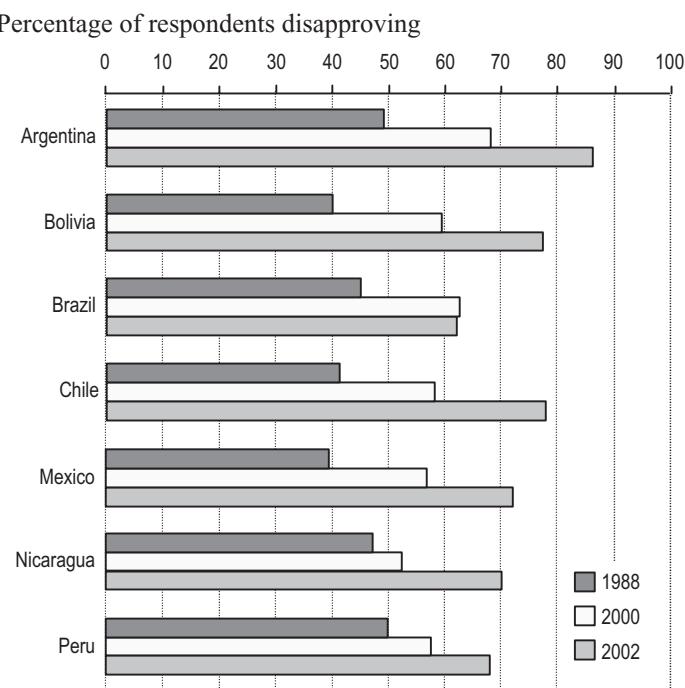
Just a few years ago, privatization was heralded as an elixir that would rejuvenate lethargic, wasteful infrastructure industries and revitalize stagnating economies. But today privatization is viewed differently—and often critically. Skepticism and outright hostility toward privatization are not limited to a few radical protesters. Opinion polls in several developing and transition economies, especially in Latin America, reveal growing public dissatisfaction with privatization. Disapproval ratings were higher in 2002 than in 2000, and higher in 2000 than in 1998. In 2002

almost 90 percent of Argentines and 80 percent of Chileans surveyed disapproved of privatization (figure 1).²

Public discontent with privatization has been fueled by price increases, job reductions, and the high profits of firms that have improved operating performance—as well as by economic and political crises that had little to do with government policy toward infrastructure. But these adjustments have been necessary for privatization to achieve its public interest objectives. As noted, inadequate revenue was a key problem of the old model. The choice was either higher prices or more taxation. Higher prices generally fall on those benefiting from services—in many developing areas, the middle and upper classes—whereas higher taxes are likely to occur partly through inflation taxes that hurt poor people and other vulnerable groups (although it should be noted that the inflation tax could be prevented by properly designed macro policy). Thus a sensible, and arguably less regressive, response is to realign prices with costs. That privatization makes such adjustments mandatory—to attract investors—is one of its main appeals.

As for layoffs, state utilities in most developing and transition economies had high excess employment before reforms. Efficiency and competitiveness require eliminating

Figure 1. Public Opinion on Privatization in Latin America, 1998–2002



Data source: Latinobarometro (2002).

redundant jobs. Efficiency is especially important in infrastructure because such services are critical for manufacturing, transportation, and commerce—and so essential to boosting economic activity.

Moreover, the market's primary incentive is the prospect of profits for firms that succeed. So, although preventing monopoly profits is a legitimate goal for public policy, it should not lead to artificial limits on postprivatization profits or restrict such profits based on mechanistic formulas or populist demands. Otherwise, incentives for investment, innovation, efficiency, and productive growth—badly needed in the network utilities of most developing and transition economies—would be undermined or eliminated (Baumol 1993).

Finally, the role of institutions cannot be overlooked. Most developing and transition economies have suffered from much worse infrastructure performance than have advanced industrial economies. But the structure of ownership has not been the key explanatory variable for the differences in performance. After all, for many years state ownership prevailed in most advanced economies. The true explanation lies in the broader institutional context.

It can be argued that the performance of state-owned network industries reflects a variety of country characteristics both observable and unobservable, including institutional capacity, business culture, nature of organized interest groups, patterns of social conflict, and codes of conduct. It would be unrealistic to expect such features to change on a time scale comparable to that of privatization transactions—or to think that less attractive attributes would disappear overnight.

Strong institutions took a long time to develop even in advanced industrial economies. It is difficult to create such institutions overnight in societies that do not have the constitutional, political, and legal traditions required to support them. Thus achieving the public interest objectives of privatization will take longer than the time that has elapsed since such reforms were introduced in most developing and transition economies. Even East Asia's "miracle" economies took several decades of concerted efforts to produce notable results (Baumol 1993).

Reforms Require Proper Sequencing...

It is often hard or costly to change structural choices—such as the degree of vertical and horizontal integration—after privatization. Moreover, the absence of regulation that clarifies the rules of the game for potential investors may cause them to demand risk premiums that could later appear unreasonably high and generate public backlash against privatization, possibly leading to policy reversals. So, restructuring to introduce competition should occur before privatization, and regulation should be in place to assure potential buyers of both competitive and monopoly elements.³ But it is also important to keep options open—and to delay irreversible changes until their

benefits outweigh their potential costs. State ownership may be undesirable, but at least it retains the option of well-designed future privatization.

...And Each Sector Must Choose among Imperfect Options

There is no universally appropriate model for restructuring network utilities. The fact that state ownership is flawed does not mean that privatization is appropriate for all infrastructure activities and all countries. Before state ownership is supplanted by another institutional setup, it is essential to assess the properties and requirements of the proposed alternative—taking into account the sector's features (its underlying economic attributes and the technological conditions of its production) and the country's economic, institutional, social, and political characteristics.

The telecommunications sector offers perhaps the most compelling case for privatization and liberalization in developing and transition economies. Prices are typically too high and investment and penetration too low. In many countries, the economic implications of efficient telecommunications are extensive but underappreciated. Thus the benefits from relaxing restrictions on entry are potentially substantial. Issues of regulatory commitment to safeguard private investors are probably less important than issues of regulatory design to facilitate competitive entry and price reductions.

In many segments of the transportation sector—railways, ports, trucking, airlines, interurban busing—competition within and between modes is sufficient in most countries to justify substantial liberalization and privatization. But the case for privatizing transport network infrastructure is much less compelling than that for privatizing services operating on the network. Rail track, basic and access port infrastructure, and certain portions of airport facilities, where monopolies are unavoidable and substantial amounts of sunk capital are involved, must be regulated or even operated by the public sector.

In the United States, railroad liberalization worked splendidly because rail is competitive with roads for freight carried over long distances. In most other countries (except perhaps Argentina, Brazil, China, India, the Russian Federation, and parts of Africa), rail is uncompetitive for freight except for bulk items, many of which are in decline. In these countries “liberalization” is often code for restructuring, downsizing, and reorienting transportation toward roads.

In electricity, wholesale competition has worked well in industrial countries because of excess capacity, moderate demand growth, and the availability of natural gas (which enabled the entry of gas-fired plants at modest scale and relatively low cost). In contrast, electricity markets in many developing areas face capacity shortages, enormous excess demand, and periodic blackouts. Thus electricity restructuring and privatization are more problematic and dependent on administrative ability. California's experience has shown that market liberalization under conditions of tight demand (reserve margins

below 10 percent) can lead to high and volatile prices that would be politically unacceptable and would likely derail attempts at radical reform. Unbundling introduces price risks between generators and suppliers that require contracts and hedging instruments to guard against unanticipated events that dramatically affect spot prices. In interconnected systems operating under a variety of jurisdictions, spare capacity is a public good that may not be adequately supplied unless pricing policies are put in place to ensure its adequate remuneration (Newbery 2001, 2002).

The scope for introducing competition is far more limited in the supply of water than in other network utilities. Local networks of pipes and sewers remain quintessential natural monopolies. Moreover, unbundling is not as attractive because increased competition in supply will likely provide far fewer benefits than in other network utilities—the costs of producing water (a potentially competitive activity) are low relative to the value added at the transportation stage (where natural monopoly prevails), though this may vary across countries. Greater opportunities exist to introduce competition in sewage treatment. Overall, concessions and leases will likely be the most effective way of increasing competition in this sector.⁴

What Effects Have Reforms Had?

Future efforts at privatization and regulatory reform in developing and transition economies will be shaped by their economic and political features as well as by assessments of the record so far—both in those countries and elsewhere. Assessments of performance are complicated by the short period of experience with privatization, restructuring, and regulatory reform in most developing and transition economies. In addition, crucial economic variables are subject to severe measurement problems. Because privatization, restructuring, and regulatory reform have generally occurred simultaneously, it is almost impossible to identify their separate effects econometrically.

Leaving aside these measurement difficulties, empirical evaluations of privatization and restructuring are largely favorable. Although experiences have varied considerably across countries and industries, most infrastructure reforms have improved many aspects of performance. Investment and service coverage have increased. Productivity and cost-effectiveness have risen. Service quality has improved. Prices have become more closely aligned with underlying costs. Services have become more responsive to consumer and business needs and to opportunities for innovation.

Effects on Investment and Service Expansion

Between 1990 and 2001 more than \$750 billion was invested in 2,500 private infrastructure projects in developing and transition economies (Izaguirre 2002). This investment varied enormously across regions, with nearly half going to Latin

America and the Caribbean (mainly through divestitures) and more than a quarter going to East Asia and the Pacific (mainly in greenfield projects). Meanwhile, Sub-Saharan Africa and the Middle East and North Africa each received just 3 percent of private investment—reflecting much weaker reforms. Investment also varied considerably by sector, with most going to telecommunications and power.

Investment peaked at around \$130 billion in 1997 and by 2001 had fallen to about \$60 billion. This sharp drop was due mainly to the deteriorating global market for private financing of infrastructure assets—reflecting financial crises, stock market collapses, and corporate scandals—though lack of economic reforms might also have played a role.

Reforms have expedited service expansion in a variety of sectors and countries. Telecommunications coverage has seen the largest jump, but significant increases have also occurred in electricity, transportation, and access to safe water (Harris 2003). The size of such changes depends enormously on the extent to which the market is liberalized and the effectiveness of regulation. For example, increased competition has been particularly powerful in boosting telecommunications coverage. Networks have expanded almost twice as quickly in Latin American countries that have allowed competition in telecommunications after privatization as in countries that simply converted to private monopolies. But even private monopolies have expanded faster than public ones (Wellenius 1997).

By relaxing the financial constraints facing state enterprises and establishing stable and fair regulation, electricity reforms have promoted investment and accelerated network expansion. In Argentina installed capacity grew from 13,267 megawatts in 1992 to 22,831 megawatts in 2002—an increase of nearly 5 percent a year. During the same period the route length of transmission lines increased from 16,958 kilometers to 22,140 kilometers (2.7 percent a year). Similarly, in Chile's main system installed capacity jumped from 2,713 megawatts in 1982 to 6,737 megawatts in 2002 (4.4 percent a year), whereas the route length of transmission lines went from 4,310 to 8,555 kilometers (3.7 percent a year). The impressive expansion of generating capacity in Argentina and Chile was achieved by private operators while also keeping prices low (Fischer and others 2003; Pollitt 2003). Before reforms, service coverage in Peru increased slowly—from 44 percent in 1986 to just 48 percent in 1992. But in the five years after reforms were introduced, service expansion accelerated, and by 1997 coverage was more than 68 percent (Rudnick 1998).

Effects on Operating Efficiency

Privatization and deregulation have significantly improved physical performance, service quality, and other aspects of efficiency in many developing and transition economies. The most dramatic gains have been in telecommunications (due to

revolutionary technological changes and the sector's substantial scope for competitive entry), where privatization and related reforms have lowered repair requests and raised call completion rates and the probability of receiving a dial tone.

Other infrastructure sectors have also made swift advances. Railroad privatization significantly shrank labor forces in almost every case, ranging from an 8 percent reduction in Côte d'Ivoire and Burkina Faso to 44 percent in Estonia, 66 percent in Mexico, and 92 percent in Argentina. These reductions have usually been due to programs to reduce labor redundancy rather than to service cuts (Thompson and others 2001; Thompson 2003). Rationalization of the labor force, especially when combined with traffic growth, has dramatically increased labor productivity. In many Latin American rail systems, output per employee (measured as the sum of ton-kilometers and passenger-kilometers) has doubled, tripled, or even quadrupled (Thompson and Budin 2001).

Reforms have had remarkable effects on the quality of electricity supply. In Chile the average time for emergency repair service declined from 5 hours in 1988 to 2 hours in 1994. In addition, power outages due to transmission failures have fallen steadily since privatization (Rudnick and Zolezzi 2001). Energy losses, including theft, have also shrunk, from 21 percent in 1986 to 9 percent in 1996 (Fischer and Serra 2000). Similarly, in Argentina privatized distribution companies have cut their losses substantially (Feller 2001). For example, Edenor's losses fell from 26 percent of its distributed electricity in 1993 to just 10 percent in 2000 (Edenor 2001). In the greater Buenos Aires area the hours of supply lost per year dropped from 16.8 in 1994 to 5.0 in 2001 (CAISE 2002). Technical losses in transmission also fell, from 6 percent in 1992 to 4 percent in 2000.

Reforms have also led to significant improvements in the operating performance of ports. Privatization generated significant efficiency gains in the operations of Kelang Port Authority, Malaysia's largest port (Peters 1995). Crane handling improved from 19.4 containers an hour in 1985 to 27.3 in 1987, bringing Kelang's performance close to Singapore's (Tull and Reveley 2001). The return on fixed assets grew at an average annual compound rate of just 1.9 percent in 1981–86 but jumped to 11.6 percent in 1986–90, a result of improvements in productivity and throughput, not higher prices. Workers also benefited from the gains in productivity: By 1990 they were paid 60 percent more an hour in real terms, put in 6 percent more hours, and produced 76 percent more than before privatization (Galal and others 1994).

Port reforms in Argentina also show the powerful effects of deregulation and competition. Before reforms, port operations were costly and inefficient because of restrictive labor practices, overregulation by multiple agencies with poorly defined responsibilities, and weak organization. As a result Argentine ports were losing market share to roads and to more efficient Chilean ports. Deregulation and privatization had dramatic effects on port investment and performance. In the port of Buenos Aires annual container traffic jumped from 300,000 TEUs (20-foot equivalent units)

in 1991 to more than 1 million in 1997, the number of cranes increased from 3 to 13, labor productivity almost quadrupled, and the average stay for full containers dropped from 2.5 to 1.3 days (Estache and Carbajo 1996). Privatization and deregulation have produced similar improvements in port performance in other countries (Gaviria 1998).

Effects on Allocative Efficiency and Financial Performance

Before reforms, the failure of many governments to adequately increase service rates, especially during periods of high inflation, effectively decapitalized their infrastructure systems. Thus one of the main attractions of infrastructure privatization is the expectation that it will make price reform a policy priority. The assumption is that private investors will be unwilling to invest in infrastructure unless governments agree to implement prices that reflect costs. Indeed, many countries are dismantling longstanding policies of underpricing and cross-subsidies.

Electricity reforms have better aligned prices with underlying costs to reflect resource scarcity, as efficiency requires. In many countries this has meant increasing prices that previously were too low (Joskow 2003). But in some countries prices have been falling because of the efficient exploitation of regional natural gas networks and new production technologies (mainly combined-cycle gas turbines). In Argentina the average monthly price per megawatt-hour in the wholesale electricity market fell from about \$45 (with peaks of more than \$70) in 1992 to about \$15 in 2001. Similarly, in Chile the node price (including energy and capacity charges) of power delivered to Santiago fell from \$30 per megawatt-hour in October 1982 to \$23 per megawatt-hour in October 2002 (in October 2002 dollars; Fischer and others 2003; Pollitt 2003). Between 1986 and 1996 wholesale prices dropped 37 percent, and final prices fell 17 percent.

The low prices of electricity and high rates of investment in Argentina and Chile have been accompanied by strong financial performance by the companies involved. In Argentina, the financial performance of the largest state-owned company, Servicios Electricos del Gran Buenos Aires, was very poor before privatization. After, the average rate of return on equity in generation was 5.6 percent during 1994–99. The transmission company, Transener, earned a 5.1 percent rate of return on equity in 1998. Distribution companies Edenor and Edesur earned 8.3 percent and 7.2 percent pretax returns on net assets during 1994–2000. In Chile, Chilectra's average nominal rate of return on equity during 1996–98 was 32 percent. Endesa's return on equity peaked at 16 percent in 1994 (Fischer and others 2003).

Postreform pricing in several developing and transition economies has provided considerable benefits to rail users. Among 17 privatized railroads (mostly in Latin America), 15 had lower freight tariffs in 1999 than when the concessions started (mostly in the mid-1990s). Rates dropped 8–54 percent in Latin America and 14 percent in Côte d'Ivoire. For the six countries involved, these tariff reductions

saved about \$1 billion a year in transport costs (Thompson and others 2001). Moreover, these estimates understate the total savings because they do not reflect the competitive pressures that lower rail tariffs exerted on trucking and other competing transport modes.

But in some countries price reform has been slow, with infrastructure prices still far removed from their underlying costs. For example, in 2000 in most transition economies household electricity prices still covered less than 50 percent of long-run marginal costs and industrial prices less than 70 percent (Stern 2002).

Effects on Distributional Equity

To mitigate the public discontent associated with restructuring and privatization, more comprehensive assessments are needed of their welfare effects—moving beyond standard analyses of their impacts on firm profitability and industry performance to include their effects on workers and households at different income levels. Moreover, distinctions between low- and middle-income countries need to be made more carefully. In low-income countries nearly all rural and many poor urban residents lack access to basic infrastructure services. Thus the policy reforms that normally accompany restructuring and privatization—such as eliminating cross-subsidies and moving toward cost-reflective prices—mainly affect higher-income groups. But in middle-income countries—such as those in Latin America and especially transition economies—such reforms can hurt poor people because many of them (mainly in urban areas) have access to basic services. The solution is not to halt the needed reforms but to put in place safety nets and tariff rebalancing schemes that do not involve radical, across-the-board price increases.

Recent empirical work offers insights on the distributional effects of infrastructure reforms. Studies in Argentina, for example, have found that all income classes benefited from the efficiency, quality, and access improvements resulting from the utility privatizations that began in 1990. More efficient infrastructure services also affect most other economic activities and promote general economic growth—enhancing economic opportunities for poor people. When these general effects are taken into account, the poorest groups seem to benefit the most from the increased productivity and access brought about by privatization and related reforms (Benitez and others 2003).

Recent research analyzing the welfare effects of utility privatizations in four Latin American countries (Argentina, Bolivia, Mexico, and Nicaragua) found no clear pattern in price changes—in about half the cases, prices fell. But there were adverse distributional effects on the bottom half of the income distribution due to job cuts in the privatized utilities. Against these negative distributional effects of layoffs have to be offset the improvements in service quality, increased access for poor people, and the changed structure of public finances, which benefited poor people more than other income groups (McKenzie and Mookherjee 2003).

Given the importance of network utilities, removing pricing distortions is crucial to economic reform in developing and transition economies. Still, there are good reasons to avoid abrupt, across-the-board price changes, which can cause large, unnecessary adjustment costs for consumers and firms alike. Even optimal prices, if instituted extremely quickly and without sufficient notice, can lead to a difficult transition process that is far from optimal. Thus policymakers should plan from the outset for a smooth transition to efficient pricing levels and structures.

Developing Good Regulation Remains a Major Challenge

Among the most critical tasks for policymakers in developing and transition economies is designing and implementing stable, effective regulation for network utilities. In many advanced industrial economies the challenge has been reforming existing regulations and reducing unwarranted governmental intrusion. By contrast, in nearly every developing and transition economy the most pressing issue is designing regulatory mechanisms for privatized utilities from scratch.⁵

Regulation that provides a credible commitment to safeguarding the interests of both investors and customers—particularly when economic shocks create political pressure to shift the balance of power among competing interest groups—is crucial to attracting the long-term private capital needed to secure an adequate, reliable supply of infrastructure services. Successful reform requires regulation that clarifies property rights, allocates them sensibly, and ensures private investors that their sunk investments will not be subject to regulatory opportunism.

For regulation to promote welfare by facilitating investment, innovation, and allocatively efficient pricing, its institutional design and substantive content must be consistent with country circumstances—particularly the country’s size, institutional endowments (including checks and balances), technical expertise, auditing technologies, fiscal condition and tax system efficacy, and the economic characteristics of its industries (Laffont 2000). Thus it is inappropriate and often costly for developing and transition economies to uncritically replicate the regulatory frameworks of advanced industrial countries.

What Makes for Effective Regulation?

Regulatory procedures must be predictable, accountable, and transparent. Regulatory bodies should:

- Have competent, nonpolitical, professional staff—expert in economic, accounting, engineering, and legal principles and familiar with good regulatory practices.

- Operate within a statutory framework that fosters competition and market-like regulatory policies and practices.
- Be subject to substantive and procedural requirements that ensure integrity, independence, transparency, and accountability (Kahn 1996).

Where Do Things Stand?

On paper, developing and transition economies have made considerable progress in establishing the institutional requirements for effective, independent regulators. But in practice the record is mixed, with discouraging developments in many countries and sectors. Moreover, it is unclear how well these agencies will work in the future.

Political interference has undermined regulatory independence in many developing and transition economies. Governments, especially line ministries, have been reluctant to consign important regulatory functions to independent agencies. Many regulatory agencies report to sector ministries and are filled with government representatives. Before privatization the state controlled every aspect of the infrastructure sectors in developing and transition economies. Ownership, operational, policy, and regulatory functions were typically fused, even when exercised by different government agencies. Thus it is not surprising that line ministries would resist having their postreform role limited to policy oversight: assessing industry developments, reviewing the adequacy of policy in light of these developments, and enacting legislative changes.⁶

Thus around the world, lack of regulatory independence has been one of the clearest institutional shortcomings. Even some early Latin American reformers with regulation based on the U.S. model have failed to achieve independence. Power regulators have a fair degree of autonomy in El Salvador and Nicaragua and to a lesser extent in Ecuador and Honduras (IADB 1999). But in Chile and Colombia, the independence of power regulators is uncertain because their boards include government ministers and they rely on budget allocations made by ministry officials (Fischer and Galetovic 2000). Lack of independence allegedly led the executive secretary of Chile's regulatory commission to resign in 1999. Political interference has also undermined the independence of electricity regulators in Guatemala and Peru (IADB 1999).

Argentina's two power regulators, the National Electricity Regulatory Authority and the National Gas Regulatory Authority, are reasonably independent. But there have been concerns about the lack of transparency and predictability in some of their decisions and the absence of external scrutiny of their administrative practices (Estache 1997). Transparency problems also initially plagued the country's water regulator. During its first few years, the telecommunications regulator lacked both independence and transparency. Mexico's telecommunications regulator suffers from similar shortcomings (Noll 2001).

In Jamaica the multisector Office of Utilities Regulation, which became operational in 1997, has been handicapped by defective legislation. It can only offer advice, because line ministries retain control over decisionmaking (Stirton and Lodge 2001). Similarly, in Costa Rica government interference, especially in tariff adjustments, has weakened the independence and effectiveness of the multisector Regulatory Authority of Public Services (IADB 1999).

In Hungary the energy regulator's independence is limited by a lack of autonomous revenue, fixed-term appointments for the board of directors, and well-defined criteria for appointing and dismissing directors. In addition, civil service salary caps make it difficult to attract qualified staff (Stern 1999). In telecommunications the head of the sector's regulator reports to the minister of transport and communications (Rosston 2000).

The Czech Republic also lacks independent regulators for energy and telecommunications—not surprising given the government's ambivalence toward specialized regulatory agencies in the early years of transition (Stern 1999). As a result, the Ministry of Finance has the final say in regulating gas and electricity prices, whereas the energy regulator is part of the Ministry of Industry and Trade (Newbery 2000c). Similarly, the primary regulator for telecommunications is part of the Ministry of Transport and Communications (Kessides and Ordover 2000).

Poland's energy regulator, by contrast, meets most of the formal requirements for independence. Latvia's multisector regulator enjoys financial independence from the state budget and has shown strong commitment to transparency and accountability (Vanags 2001). But its independence is compromised by the close affiliation between its board members and the political parties that nominate them.

In Romania telecommunications regulation lacks coherence, while gas regulation lacks any semblance of independence (Newbery 2000b; Noll 2000). The minister of industry and trade appoints the chair, vice chair, and three members of the gas regulator's board of directors, ensuring ministerial control. In electricity, however, Romania has taken bold steps to create independent regulators, as has Bulgaria. Romania's National Electricity and Heat Regulatory Authority is a U.K.-style independent entity, whereas Bulgaria's State Commission for Energy Regulation incorporates, at least on paper, elements of U.S.-style independent commissions (Stern 2000).

A 1998 study of infrastructure regulation in six Asian developing countries (Bangladesh, India, Indonesia, Malaysia, Pakistan, and the Philippines) found significant weaknesses in coherence, independence, accountability, transparency, and predictability. On a scale from A (best practice) to E (highly unfavorable for private investment), only electricity regulation in the state of Orissa (India) ranked better than C in four of these areas. It was followed by telecommunications regulation in all of India, which did better than C in three areas. Elsewhere the results were dismal: Only one other sector ranked better than C in any area (the independence of

Pakistan's electricity regulator). The rankings were similar across sectors in each country, suggesting the importance of country characteristics in regulatory design (Stern and Holder 1999).

Other Asian governments have also been reluctant to cede control to new independent regulators. For example, during the first phase of Sri Lanka's telecommunications reforms (1991–96) the government insisted on keeping the regulatory agency a government department—despite clear evidence that it was unable to attract needed expertise (Samarajiva 2001).

Many African countries have established regulatory agencies for their utilities. These agencies face serious challenges, including obtaining adequate expertise, financial resources, and statutory authority. Many are simply extensions of sector ministries, which maintain a tight grip on regulated sectors and still perform key oversight functions. A recent analysis of telecommunications regulation in 29 countries in the region indicates problems with independence and transparency (Pyramid Research 1999). On a scale of 1 (worst) to 4 (best), 23 of the countries received scores of 1 for autonomy, and only 2 received scores higher than 2. Rankings for transparency were better, though 10 countries still received scores of 1, and only 2 scored higher than 2. Scores for credibility and efficiency were similarly lackluster.

Insufficient statutory authority among telecommunications regulators has led to enforcement failures in several African countries. In Ghana, the incumbent fixed-line monopolist (Ghana Telecom) inhibited entry by charging—with impunity from the regulator—very high interconnection fees (Ahortor 2003; Laffont 2003). It also entered the cellular business despite being legally prohibited from doing so. In Tanzania, the dominant mobile operator (Mobitel) entered a region in direct violation of the regulator's order. In Côte d'Ivoire, the regulator has been unable to force the incumbent fixed-line operator, CItelecom, to comply with the service quality and network expansion terms of its concession contract (Laffont 2003).

Recent surveys indicate that most regulatory agencies in developing and transition economies are not legally required to hold open meetings. Nor are they obligated to provide written justifications for their decisions (World Bank 2001). In many countries, the regulatory framework lacks coherence, with responsibilities splintered across regulatory agencies and line ministries (Willig 1995; Noll 2000).

One emerging lesson is that although formal requirements for integrity, independence, transparency, and accountability are essential for effective regulation, they are far from sufficient. The experience so far raises doubts that governments will observe the spirit of the law and implement proper, consistent regulatory procedures—especially when their choices are influenced (and constrained) by external pressures and loan conditions.

Still, it is important to remember that it took many years for advanced industrial economies to achieve regulatory effectiveness. For example, it took decades for the United States to reach an equilibrium in which the independence of regulatory agencies

was recognized and supported by administrative procedures, ex parte rules, and judicial review. In developing areas, regulatory structures have been created from scratch and are still in early stages of development. Although progress toward regulatory effectiveness has been slow, at least the trend is in the right direction—greater independence, accountability, and transparency than under state ownership (Gutierrez 2002).

An Agenda for Action: From Institution Building to Policymaking

There is much to applaud in the restructured and privatized network utilities of developing and transition economies—from their new architectures to the commitment of those who crafted them, operate in them, and regulate them. But even in countries where restructuring has been carried out in a way that promotes the public interest, a host of significant problems have emerged.

Many of these second-generation problems are endemic to infrastructure everywhere and largely reflect issues that arise after privatization, especially when combined with unbundling. Yet lack of resources (especially economic, accounting, and other technical expertise), inexperience with regulating private utilities, and preoccupation with institution building during the first stage of reform have created some unique challenges in these countries.

Designing Retrospective Analysis and Data Collection

Revisionism on several fronts is affecting infrastructure restructuring and privatization. Choosing the right restructuring strategy is harder than early optimists claimed, and privatization and related institutional reforms are less impressive in practice than earlier believed. Growing public discontent with these reforms may partly be the result of the failure of some governments to publicly articulate the economic and social rationales, prerequisites, and expected outcomes. Thus it may simply reflect public misunderstanding. Still, this discontent points to the importance of careful analysis of what works, what can go wrong, and why.

Lack of empirical knowledge is among the main hindrances to infrastructure policy analysis and reform in developing and transition economies. Given that most reforms began in the early 1990s, until recently there were not enough data to evaluate different ownership, structural, and regulatory options and their dependence on country circumstances. But there is now a growing list of experiments in infrastructure reform, enabling reflection on lessons and identification of the most important issues to address and options to consider.

Empirically, untangling the links between distinct policy decisions and ultimate industry performance will require systematic collection of cross-country infrastructure data. International financial institutions—which at times have imposed covenants to address performance in these sectors and have collected financial and other data to monitor it—are ideally suited to this effort. However, in many cases the data have not been collected consistently and with a view to supporting the needed types of analysis.

Addressing Second-Generation Reforms

Experience and economic logic suggest that postprivatization improvements in performance will be limited, and probably unsustainable, unless accompanied by appropriate second generation regulatory reforms. These include:

- Designing pricing policies that strike a balance between economic efficiency and social equity.
- Developing rules governing access to bottleneck infrastructure facilities.
- Adapting regulation to address emerging problems, changing circumstances, and new information in regulated infrastructure sectors.
- Finding new ways to increase poor people's access to services.

Many of the rules and principles for resolving second-generation regulatory issues have been developed in the context of advanced industrial economies. To be effective in developing and transition economies, they must be modified.

Price Reform. Past pricing policies and subsidy mechanisms in the infrastructure sectors of developing economies were seriously flawed and usually failed to achieve their stated objectives. Rather than providing affordable services to poor people, they undermined the financial viability of the utilities, resulted in rationing of services, and exacerbated inequality.

Infrastructure services are often considered essential both to the public and to the effective functioning of the economy. Because some of these services are extremely price and income inelastic, their pricing has important distributional implications (Newbery 2001). Not surprisingly, moves toward cost-reflective tariffs often encounter strong political opposition. As a result, most governments that have liberalized infrastructure have not accorded sufficient prominence to adjusting infrastructure prices. Deviations from optimal pricing also reflect lack of appreciation of how alternative pricing schemes and subsidy mechanisms could do a better job of achieving economic efficiency and social equity.

Thus price reform is among the most urgent and challenging tasks for policymakers in transition and developing countries. It is also a policy area where replicating approaches in industrial countries will likely prove extremely problematic and where technical assistance from multilateral organizations and other external advisers

has been highly unsatisfactory. The literature provides little guidance for managing the move to cost-reflective prices. Specific challenges include what standards to apply, how fast to proceed, and how to promote universal service in a competitive environment. In particular, there is need for further applied policy research to evaluate the potential use of price differentiation and price flexibility for achieving revenue adequacy and expanding services to poor people.

Alternative Subsidy Mechanisms. Most developing and transition economies have used cross-subsidies ostensibly to promote desirable social goals (such as ensuring that essential services remain affordable to poor segments of society) and positive economic externalities (such as those associated with universal service). But many subsidy programs involve almost no targeting: Price structures do not discriminate between rich and poor people, so everyone benefits. In fact, because many poor people do not have access to infrastructure services (such as private water connections), poor households capture only a small fraction of subsidy resources (Foster and others 2003). Furthermore, distorted prices impose significant costs by sending the wrong economic signals to consumers, suppliers, and investors. Economic theory and regulatory experience suggest that cross-subsidies are incompatible with open entry and competition (Baumol 1999). Thus there is an urgent need for alternative subsidy mechanisms that are more targeted and transparent, minimize the distortions in the behavior of utilities and their customers, and do not conflict with market liberalization.

The requisite policy approach for pursuing universal service goals in a specific industry is likely to be sensitive to the country's political and institutional endowment and fiscal condition, consumer incomes and preferences, and the industry's economic characteristics. For example, even though cross-subsidies can create significant distortions leading to welfare and financial losses, and the use of general tax revenue to support social goals is less distortive, it would be premature to call for the outright elimination of cross-subsidies in all circumstances. In many developing and transition economies the cost of public funds can be very high because government revenue is raised with distortive taxes. So reliance on cross-subsidies might be preferable in developing countries with especially inefficient tax systems. Moreover, alternative subsidy mechanisms could require elaborate and costly administrative systems. In such cases cross-subsidies might have to be tolerated as a second-best solution.

Thus additional work is needed to understand how these factors affect the optimal design of support mechanisms: whether support for universal service should be funded out of general tax revenues or perhaps out of a broadly based tax on revenues from the industry's products and services; the extent and scope of subsidies; and more targeted methods for delivering subsidies without distorting competition.

Access to Bottleneck Infrastructure Facilities. A vexing task for regulators is designing terms and conditions of access to bottleneck infrastructure facilities by competing

service providers. These facilities are essential inputs in the production or delivery of final products and cannot be economically duplicated. Examples include the local loop (“final mile”) in telecommunications, the transmission grid in electricity, the network of pipelines in natural gas, and the track in railroads. Access policy is the keystone of the contemporary response to the problem of residual monopoly in infrastructure. Indeed, it is at the forefront of discussions of ways to facilitate competitive entry into activities that have traditionally been run by franchised monopolies. The access issue is especially difficult in situations where several firms compete in the sale of a final product, but one is the monopoly owner of an input that is indispensable in the supply of that product. The problem is how competition in the final product market can be preserved and not tilted to favor either the owner of the bottleneck input or its rivals.

The economic literature offers two main approaches to efficient pricing of essential input facilities: the efficient component pricing rule (also known as parity pricing) and the Ramsey pricing rule (Laffont and Tirole 1996; Baumol and others 1997). But despite their internal consistency and powerful theoretical results, neither approach (especially the Ramsey pricing rule) is readily translatable into workable rules and access pricing schedules. Considering the circumstances in developing and transition economies, there is a need for further research to identify variants of these rules that are less complex technically and less demanding informationally.

Balancing Regulatory Commitment and Flexibility. An indispensable precondition for effective privatization and sustained private investment is a country’s institutional capacity to restrain arbitrary administrative action and credibly commit to a stable policy process. Developing mechanisms that enforce substantive and procedural restraints on administrative discretion and limit regulatory opportunism is especially important in infrastructure, where the establishment of transportation and distribution networks requires large, mostly sunk investments. Without government commitment to policy stability, frequent changes in regulation can have the same effect as outright expropriation of sunk investments (Levy and Spiller 1996).

Yet a good regulatory system must also adapt to emerging problems, changing circumstances, and new information and experiences in regulated sectors. Regulatory flexibility is especially imperative in sectors experiencing rapid technological and market changes. Thus there is a need to strike a delicate balance between regulatory commitment and flexibility—to limit regulatory discretion while avoiding the rigidity and paralysis of micromanaged privatizations or concessions.

Inflexibilities built into privatization agreements are often a severe impediment to solving postprivatization regulatory problems. Such inflexibilities were probably needed to create commitments to reform, protect consumers, and attract the private capital required for privatization. But they also make it difficult to solve emerging problems because many parties find adaptations threatening to the privatization commitments that protect their interests and the entire fabric of reform.

One way to limit government discretion in a socially desirable manner is to require regulators to publicly articulate the basic economic principles that they use for policy analyses and decisions. These principles could be included in a statute or a concession agreement and should guide postprivatization governance. They must cover issues ranging from safeguarding the value of investments in infrastructure (without going so far as to shield investors from market-based risks) to protecting consumers and ensuring efficient, equitable tariff setting. International financial institutions could make an important contribution by helping to develop guidelines for revising regulatory mandates and rules and for renegotiating privatization contracts—guidelines that adhere to accepted principles of the economic public interest and embody much of the best available economic learning (Willig 1999). To date, few if any regulatory agencies in developing and transition economies have articulated such principles.

Designing Effective and Practical Regulatory Regimes

Empirical assessment of economic regulation reveals that in a variety of circumstances its effects deviate substantially from efficiency. Regulatory failure arises from a combination of the information problems facing regulators and the complex agency relationships inherent in the control structure of every regulatory setting. Even in the United States, where regulatory oversight has been supported by expert economic analysis, the disappointing performance that followed the economic regulation of the 1960s and 1970s raised doubts about time-honored regulatory solutions to allocative problems.

In developing and transition economies regulatory failure is exacerbated by lack of technical and economic expertise in critical areas. This may require regulators to avoid sophisticated interventions that impose heavy informational and analytical requirements. Indeed, in some circumstances in these countries the costs of regulation may exceed its benefits, and the public could be better off relying on unfettered competitive market forces.

There is an urgent need to:

- Deepen understanding of how to design effective and practical regulatory mechanisms when technical and economic expertise are scarce.
- Identify options for the structural reorganization of industries that reduce the need for regulatory oversight.
- Develop more precise criteria for distinguishing when regulatory intervention is required and when it is not.
- Develop models for optimal allocation of scarce regulatory resources among firms and sectors of different size and with different technologies, information asymmetries, and political constraints.
- Identify appropriate, perhaps less sophisticated, tools of intervention better suited to regulators in developing and transition economies.

Notes

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1. This refers mainly to the period after World War II. Private ownership in electricity was initially the norm in many countries in Europe and North and South America. State ownership spread later, especially after World War II, either because of ideological reasons (as in England and France) or because political constraints on prices forced private firms into bankruptcy (as in Latin America). Similar situations prevailed for railroads and water in many countries. Telephone services became captive of state-owned post offices in Europe and Japan, but not in Canada, the United States, or, initially, Latin America.

2. The results of such polls can be very sensitive to how the questions are asked. As Klein (2003) notes, according to such polls only 21 percent of Peruvians seemed to generally support electricity privatization. But when asked specifically about privatization implemented transparently and accompanied by increased investments as well as prices set by a regulatory process, more than 60 percent favored it.

3. Wallsten (2002) finds that investors have been willing to pay more for telecommunications firms in countries that established a regulatory authority before privatization.

4. Concessions refer to any arrangement in which a firm obtains from the government the right to provide a particular service under conditions of significant market power.

5. The regulatory function was not entirely avoided under state ownership. For example, service quality still had to be monitored, and prices for infrastructure services had to be set. The main difference lies in the characteristics of the regulatory process, which was ad hoc and opaque under the old regime but has to adhere to certain transparent requirements of due process in the new setting.

6. In fact, as Estache (2002) has observed, governments are more active players in the regulatory game than at first appears because of some perverse incentives. Large rents that are left by regulation to the privatized utility operators imply large income taxes. Fiscally constrained governments might therefore be tempted to use the regulatory process to prevent the redistribution of rents in order to enlarge their fiscal payoffs from privatization reforms. Thus, there could be considerable scope for implicit collusion between privatized operators and governments to weaken the regulatory process.

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