

Private Infrastructure in Developing Countries:

Lessons from Recent Experience

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Abstract

Beginning in the late 1980s many developing countries turned to the private sector to provide basic infrastructure and utility services, such as highways, railroads, water, wastewater, electricity, gas and telecommunications. Recent studies show that private involvement typically benefited customers and reduced government fiscal problems without harming employees or enriching private providers excessively. There were enough high-profile failures, however, to discredit this reform in many quarters. Private involvement is likely to be more successful if it generates real efficiency gains rather than simply transferring costs among parties, if the systems of regulating the private companies are politically sensitive as well as technically competent, if the costs and constraints of private capital are no higher than they need be and if we are willing to adopt more modest and gradual schemes in difficult circumstances.

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Beginning in the late 1980s many developing countries turned to the private sector to provide basic infrastructure or utility services, such as highways, railways, water, sanitation, electricity, gas and telecommunications. One hope was that private providers would be much more efficient than the state-owned enterprises that they replaced so that they could offer better service at reasonable tariffs and without the need for large government subsidies. A related goal was that the providers could tap private capital markets to finance badly needed modernizations and expansions of capacity. The desire for private participation was complicated, however, because infrastructure was often thought to have elements of natural monopoly so that governments could not be sure that the private operators would pass on some or most of the savings in lower prices or better service. Infrastructure was also believed to generate wider public benefits, such as improved public health or national political integration, so that the government was often interested in a more extensive network than users alone would normally support. As a result, privatization was usually accompanied by some form of government regulation of tariffs, service quality and coverage, intended to protect consumers from the potential monopoly abuse and advance common social interests.

After nearly two decades, however, many people and governments in developing countries are much more skeptical of private participation in infrastructure. Critics often argue that consumers and workers suffer from higher prices and massive layoffs, while any resulting savings are either squandered by politicians or captured by private infrastructure companies, many of them foreign owned. The popular perception of failure troubling because it conflicts with an emerging empirical literature that suggests that private provision of infrastructure often delivers on its promises of better service at reasonable prices. But while private participation is typically beneficial, there have been enough highly publicized failures to give credence to the critics. Moreover, in some cases the shortcomings in performance were magnified by naïveté about the extent to which reform is a political as well as a technical task. In particular, we underestimated the importance of insuring that the benefits in the initial privatization are equitably distributed, that the systems of regulating the private companies are politically sensitive as well technically competent, that the costs of private capital are not higher than they

need be, and that more modest forms of privatization are employed in difficult environments.

Performance and Perception

Trends in Activity and Popular Support

Private participation in infrastructure takes many forms, the principal three being divestitures, concession contracts and management contracts. In a divestiture the government sells an existing state-owned enterprise (such as a telephone or railroad company) through a stock offering to the general public or an auction to strategic investors. In a concession the government offers a contract to invest in and operate an enterprise or facility for a limited duration, often for 20 or 30 years, with the assets reverting to the state at the end. Some concessions are to build and operate new or “greenfield” infrastructure facilities (such as a new power plant or gas pipeline) while others are to improve and operate existing or “brownfield” facilities or enterprises (such as a concession to expand and manage an existing port, highway or water company). Finally, in a management contract or lease the private company is responsible only for management and not investment; as a result, management contracts are shorter than concessions: usually 3 to 5 years, with options for renewal.

Privatization attracted over one trillion dollars of new private investment in developing-country infrastructure between 1990 and 2006 according to World Bank estimates.¹ Investment grew from negligible levels in the mid-1980s to a peak of approximately US\$114 billion in 1997, the year the Asian financial crisis began, fell for five of the next six years, and only began to recover in 2004. Preliminary figures suggest that by 2006 investments levels had reached their 1997 peak measured in current dollars but were still roughly 25 percent below the peak measured in constant dollars (see Figure 1). By sector, the bulk of the funds flowed into telecommunications, which also led the

¹ These figures are from the Public Private Infrastructure (PPI) database created by the World Bank. This database defines privatization as occurring if a private firm takes operational control of an existing enterprise or facility or a new concession. The investment is recorded in the year of the financial closing of the transaction and includes the sales price or concession fee paid to the government plus any additional investment commitments during the life of the concession. No effort is made to track actual investments after the closing, which may be higher or lower than the minimum commitments made.

recovery of 2004, with electricity second, transport third, and much smaller investments in gas, water and wastewater (Figure 1 again). By region, Latin America and East Asia led both the build up and the fall off of the 1990s, Eastern Europe and South Asia have led the recovery that began in 2004, while sub-Saharan Africa and the Middle East-North Africa have yet to see much private investment (Figure 2) By type of privatization, divestitures generated the most funds while concessions for greenfield projects were a close second, concessions for existing facilities were a distant third and management contracts usually did not register on this metric (Figure 3).

While many privatizations went smoothly, there was a steady stream of well-publicized controversies that fueled unease with the reforms. The earliest high-profile controversies occurred in Asia when the Thai government seized an elevated private expressway in Bangkok in 1993 and the State of Maharashtra in India cancelled Enron's concession to build a power plant at Dabhol in 1994. Following the Asian financial crisis of 1997-1998, Indonesia, Pakistan, and the Philippines forced many independent private power producers to renegotiate the take-or-pay contracts they had with government power companies, a process which exposed charges of corruption in the award of the original contracts. In Latin America, the first dramatic failure was the bankruptcy of roughly two dozen private toll roads in Mexico after the unexpected devaluation of the peso in late 1994. This failure was followed by the seizure of a water concession in Tucumán, Argentina (1996); violent rioting that stopped planned water and electricity privatizations in Cochabamba, Bolivia (2000) and Arequipa, Peru (2002); Argentina's unilateral reduction in utility tariffs in the wake of the government's default and devaluation in 2002; the cancellation of the La Paz water concession in 2005; Bolivia's nationalization of its natural gas industry in 2006; and Venezuela's nationalization of its electricity and telephone companies in 2007. Eastern Europe, which was much less active in privatizing infrastructure, had only one high-profile infrastructure failure when the M1/M15 toll road concession in Hungary went bankrupt for lack of traffic in 1998 and was nationalized in 1999.² In Africa, management or concession contracts have been cancelled in a number of countries, but the best-known disputes involve Senegal (2000),

² There were a number of serious disputes between governments and private operators involved in a water concession in Sofia and ports projects in Moldova and Latvia, but these did not receive the attention of the M1/M15 motorway (EBRD, 2007).

Tanzania (2005), and Mali (2005). The developed countries were not immune to bungled infrastructure privatizations either, the best known including California's electricity crisis in the summer 2000; the bankruptcy in 2001 of Railtrack, the private company responsible for all of Britain's railway infrastructure, and the bankruptcy in 2007 of Metronet, one of two companies with 30-year contracts to renew and maintain the London Underground's infrastructure and subway trains.

It is important to recognize that these severe disputes represent a very small percentage of the infrastructure privatizations. According to the World Bank database between 1990 and 2001 only 48 projects became so contentious that they were cancelled or renationalized, amounting to only 1.9 percent of the projects and 3.2 percent of the investment value during the period. Cancellations accounted for 11.3 percent of the private investment in water and sanitation, 9.3 percent of the private investment in transportation, and only a few percentage points of the investments in energy and telecommunications. (Harris, 2003; Harris *et al.* 2003).

Surges and slowdowns in new private investment are to be expected, moreover, since different regions and sectors vary in their stages of infrastructure and economic development. Much of the decline at the end of the 1990s was due to the reduction in new investment in Latin America, for example, and particularly in its telecommunications and electricity industries. However, that fall-off occurred in part because most of the large Latin American countries had already privatized their telephone and electricity industries. Many fewer Latin American telephone or electricity companies remained in public hands as candidates for divestiture and private investment. It is only natural that the recent rebound is being led by South Asia and Eastern Europe, both regions which are experiencing rapid economic growth but had seen relatively little infrastructure privatization to date.

Finally, all of the pressures that contributed to the spread of private infrastructure in the 1990s still remain. Infrastructure is still thought to be a key bottleneck to human and economic development, and the governments of the developing countries still lack the financial resources to meet perceived infrastructure needs. Indeed privatizations are still proceeding in Latin America, albeit at a very uneven and slower pace. The actions of

Presidents Chavez of Venezuela and Morales of Bolivia receive most of the attention in the press, but countries like Brazil, Mexico and Chile keep offering enough new projects that private investment in the region has been growing slowly in real terms since 2003 (Figure 2).

Nevertheless, it is clear that these controversies have helped erode support for private involvement in infrastructure, and made implementing or sustaining the reforms much more challenging. The shift in popular opinion is most obvious in Latin America, the region with the most experience. *Latinobarómetro* (2005, p.76), which surveys some 19,000 Latin Americans in 18 countries every year, reports that the percentage agreeing strongly or somewhat with the statement that “the privatization of state enterprises has been beneficial for the country” fell from 46 percent in 1998, when the question was first asked, to 21 percent in 2002, at the height of the Argentine financial crisis, and had recovered to only 31 percent by 2005. Moreover, analysis of the responses shows that support is lowest among the poor and in countries with the most extensive reforms (Carrera et al., 2005). Popular skepticism clearly contributed to the slowdown in activity in Latin America and to the failure of private provision to take hold in Africa, despite strenuous efforts by international financial institutions and other donors. An obvious concern is that the situation in Latin America may deteriorate, that Eastern Europe and South Asia, the regions now leading the new privatizations, may suffer a similar round of disenchantment, and that Africa may never see much success.

Typical Winners and Losers

Several observers have noted that the decline in popular support is at odds with recent empirical research that suggests that private provision of infrastructure has been largely, although not entirely, beneficial (Birdsall and Nellis, 2005; Carrera *et al*, 2005; Nellis, 2006; and Shirley, 2005). Many of the early studies of private infrastructure examined small numbers of cases in depth, an approach useful for identifying the factors that seem to contribute to success or failure but are less helpful for determining whether the typical project was successful or not. Some of the more recent studies develop data sets for large numbers of private companies and state-owned enterprises (SOEs) in an effort to estimate the typical effect of private participation on performance. These studies

often rely heavily on data from Latin American electricity distribution and water companies, which raises questions as to how much their results translate to other regions and sectors. The data also often end three to five years after privatization, which leaves doubts about the long-term effects. The results of the studies are fairly consistent, however.

Most studies agree that the efficiency of the firm tends to increase significantly during or after privatization. The focus is mainly on labor productivity since data on capital stocks are often unavailable, unreliable or inconsistent across firms. In an analysis of panel data from 1230 electricity and water enterprises in 71 developing countries around the world,³ Gassner (*et al.* 2007) and colleagues found that productivity improved in the two sectors, although by different means. In water, the number of subscribers connected increased by 62 percent and raw water production by 3 percent but without a statistically significant change in employment. In electricity, by contrast, there was no statistically significant change in connections or output but employment was cut on average by 30 percent and collection rates increased by 48 percent. The difference between the two sectors probably reflects a greater tendency for governments to require concessionaires to increase connections in water than in electricity both because water connection rates are typically much lower and because water connections generate important public health benefits.

Many other studies find similar gains in efficiency.⁴ In a careful analysis of panel data from 116 Latin American electricity companies, for example, Andres *et al.* (2006) found that the trends in output and connections did not change significantly with privatization but the trends in the quality of service (measured by the duration and frequency of interruptions) went up, employment went down and labor productivity went up. The largest gains were in the three years surrounding the transition from public to private but trends improved after the transition period as well. Estache and Rossi (2005)

³ The sample includes 302 enterprises with some form of private management and a matched set of 928 state-owned enterprises each with at least three years of data. Approximately 69 percent of the enterprises with private management come from Latin America and 22 percent from East Asia.

⁴ There are a few studies that find private participation makes little difference in efficiency of utilities in developing countries, but they often have smaller data sets and are from earlier periods. Estache and Rossi (2002) find little difference in public and private water companies in Asia but they rely on a cross-section of 50 companies in a single year.

examined 127 electricity companies in Latin America and found that private firms subject to certain forms of regulation used 20 to 60 percent less labor per unit of output than their public counterparts. And Estache *et al.* (2002) estimated that productivity increased in Brazilian and Argentine freight railways after privatization, not because outputs increased but rather because inputs, particularly labor, decreased.⁵

Consumers usually captured enough of the efficiency gains to benefit, as a group, from privatization. Prices often increased with privatization: Gassner and colleagues (2007) found a statistically significant increase in prices among their water companies but not their electricity companies, for example, while Andres *et al.* (2006) found a statistically significant increase in prices among their electricity companies. But the price increases were often accompanied by improvements in access, reliability, and quality that provided offsetting benefits. In one of the most frequently cited of the recent studies, McKenzie and Mookherjee (2003, 2005) calculate the effects on consumer welfare of electricity, water and telephone privatization in Argentina, Bolivia, Mexico and Nicaragua. Prices for electricity and water increased in many cities while the average price for telephone service declined almost everywhere and connections to all types of utilities increased almost everywhere. The connection gains were greatest for poor households in the middle-income countries (Argentina and Mexico) where overall access levels were already relatively high, but greatest for middle-class households in the low-income countries (Bolivia and Nicaragua) where overall access was initially relatively low. McKenzie and Mookherjee calculated that the total consumer surpluses increased for in most countries and sectors, the principal exceptions being two cases where the price increases were exceptionally large: electricity throughout Nicaragua and water in Cochabamba (but not in other Bolivian cities). The gains were on the order of 0.5 to 2 percent of total household expenditure and were typically larger in percentage terms for low-income or middle-income households than for high-income households.

The few other studies that attempt to calculate the combined effect of price, access and quality changes on consumer welfare often arrive at similar results. For example, Clarke *et al.* (2000) examined in detail the first eight years of the private

⁵ A number of other studies show similar results for other types of infrastructure such as Ros (1999) and Ros and Banerjee (2000) for telephones and Estache *et al.* (2002a) for ports.

management contract for urban water supply in Guinea. The prices charged before privatization were well below costs so they had to be increased approximately seven fold over the first five years. However, connections increased by 50 percent, the water was now treated so that it met World Health Organization (WHO) drinking water standards and the supply was improved enough to permit 24-hour service. Considering only the increases in prices and connections (and not the improvements in purity or reliability), Clarke and his colleagues calculated that consumers gained on net an amount equivalent to 75 percent of their expenditures on water the year before privatization, roughly similar to the gains McKenzie and Mookherjee had estimated in Latin America. Other recent studies that also calculated positive consumer gains include Boston Institute for Development Economics (2006) and Plane (1999).

The general public seems to have benefited as well through the fiscal impacts of the reforms, although the extent to which this is true is more controversial and unclear (Birdsall and Nellis, 2005, pp. 23-24). The privatizations often generated substantial fiscal resources in the form of both the purchase prices or fees the government received for the enterprise or concession and the reduction in on-going government budgetary support. Some observers believe these funds were generally spent wisely to reduce debt or taxes or to increase social spending (Mackenzie and Mookherjee, 2005, pp. 72-73). To the extent that these funds allowed governments to cut taxes or expand social services, the net effect was probably progressive if only because the poor were less likely to be connected to the utility network before privatization and thus benefited little from the old SOE subsidies (Estache *et al.* 2002, p. 13). However, the fiscal windfalls were not used wisely in every country. In Brazil, for example, Macedo (2000) argues that the fiscal gains from the privatizations of the early and mid 1990s were squandered on a futile defense of the Brazilian currency. And in other countries observers disagree about how the fiscal dividend was spent. In Argentina, for example, some argue that the bulk of the proceeds went to retire debt and increase social spending (Ennis and Pinto, 2005, pp. 212-213), while others believe that they were wasted defending the peso (Mussa, 2002 as cited by Birdsall and Nellis, 2005, p. 24).

The effect on employees is also more controversial, but some recent studies suggest that employees do not suffer nearly as much as critics claim. In their in-depth

study of four Latin American countries, for example, McKenzie and Mookherjee (2005) found that privatization was often accompanied with workforce reductions of 30 to 75 percent. But infrastructure and utility layoffs accounted for at most 2 percent (in Argentina) and as little as 0.13 percent (in Bolivia) of the total workforce in the country. Moreover, employment in the infrastructure and utility sector often rebounded within a few years as the demand for services expanded. In Mexico, where the employment reductions were substantial, researchers were able to follow the experience of laid off SOE workers for a year and discovered that 40 to 50 percent of them found employment in the same sector at no reduction in benefits. And based on the increase in sector employment, McKenzie and Mookherjee estimate that 80 to 90 percent of the laid off Argentine workers were reemployed within four years.

Finally, the private enterprises providing infrastructure services do not appear to be earning unreasonable returns, again contrary to popular perception. Sirtane et al. (2005) found that the average return on investment fell far short of the costs of capital for 34 private companies in 9 Latin American countries. The returns were estimated from audited financial statements through 2001, and thus do not reflect the adverse effects of the Argentine financial crisis. The average historic return was negative 24 percent, largely because most of the projects were still in relatively early years when investments tend to be high and earnings low. Returns climbed to 7 percent, a little more than half of the average estimated cost of capital of 13 percent, if earnings over the remaining life of the concessions were projected to increase as fast as the historic growth of the GDP in the host country. And returns increased to 9 percent if the management fees paid to the parent companies were considered hidden dividends. Only if the firm was credited with projected earnings in perpetuity, beyond the life of the concession, did the projected returns climb to 14 percent, just above the cost of capital. These averages hid substantial variation, however, with telecommunications companies generally much more profitable than water and wastewater companies and electricity enterprises in between. Estache and Pinglo (2005) found similar results for 120 companies in 31 developing countries, although they did not adjust for management fees or include telecommunications companies. Companies in the poorest countries, in the Latin American and African regions and in railroad and water industries had the lowest returns. Perhaps the most

convincing evidence that returns typically are not excessive is that several prominent international energy and water companies have decided to cut back their investments in developing countries

Explaining the Discrepancy

One explanation offered for the discrepancy between performance and perception is that the benefits of reform are diffused broadly and are almost invisible while the costs are highly concentrated and obvious (Harris, 2003; Birdsall and Nellis, 2005; Shirley, 2005; and Nellis, 2006). The fiscal benefits in reduced taxes, increased social spending or macroeconomic stability may be large in the aggregate, for example, but probably amount to only a few dollars per household per month and are not linked in the public mind to infrastructure privatization. Similarly, McKenzie and Mookherjee's estimates suggest that the benefits to the average customer are on the order of 0.5 to 2 percent of their income and often depend on a complex calculus trading off higher prices against improved access or service quality. By contrast, the costs to any laid-off employees are large, even if many are rehired within one or two years, and clearly attributable to the reforms. And if customers see their prices increase without compensating improvements in access or quality, the effect is also obvious and the blame clear. Such a pattern of benefits and costs makes it easier to mobilize opponents than supporters.

But an equally important explanation is that the exceptions are often as politically salient as the average, and that there have been enough bad exceptions to lend credence to the critics of privatization (Birdsall and Nellis, 2005; Shirley, 2005; and Nellis, 2006). While private participation typically improves performance, many privatizations have not gone well. Even if the average customer and employee are better off or not greatly harmed in a particular privatization, there are sometimes groups of customers or employees who suffer significantly. Negative outliers seem to be more influential than positive outliers, moreover, since the press and the public pay more attention to conflict and failure than to harmony and success. The old saying is that bad news makes good news copy. And privatization makes an especially tempting target since any complaints are likely to fall on receptive ears. The public in many developing countries is already skeptical about the fairness of market reforms and their government's ability to control

large private companies, and therefore not surprised to learn that there are problems with private provision of infrastructure.

Both of these explanations suggest that reformers should pay as much attention to the political as the technical aspects of reform. Insuring that the benefits of reform exceed the costs is often technically challenging. But it is also important that the distribution of benefits and costs be, and be perceived as, reasonably equitable. And it is equally important that a fair distribution be maintained over the life of the project, not just at its inception. These tasks are made more difficult by the fact that the reformers may not have the incentives or skills to be concerned enough about the political dimensions of the reforms. As one long-time observer of these efforts explains:

The technicians and advisors who design reforms are focused on and skilled in economic and technical rationality, not political sustainability. Foreign advisors and donors are unlikely to understand the demands and compromises required by local circumstances. Politicians may have too short a time horizon to care about long-run acceptance or may believe with some justification that a reform with widespread benefits will eventually be popular regardless of its flaws. (Shirley, 2005, p. 203)

If private participation in infrastructure is to be both economically sensible and politically acceptable, four topics deserve greater attention: the initial terms of privatization, the scheme for regulating tariffs and service quality, the high nominal costs of private capital, and the constraints of difficult circumstances.

The Initial Terms of Privatization

Insuring that the initial terms of privatization are perceived as fair can be difficult for several reasons. One obstacle that often receives a great deal of attention is the tendency for SOEs to be overstaffed, which heightens the fear that labor will suffer from layoffs. The severity of this problem varies considerably, however, depending upon the sector and circumstances. Excess labor is less of a problem for infrastructure than for most manufacturing, agriculture or services simply because infrastructure is relatively

capital extensive, so that achieving high labor efficiencies is not quite as critical. Within infrastructure, moreover, greenfield projects raise fewer problems than brownfield projects because Greenfield projects do not involve an incumbent workforce and arguably increase total employment if the project would not have been undertaken in the absence of private finance. Infrastructure industries where demand is increasing rapidly, such as telecommunications, are also less problematic since laid off workers are likely to be more quickly reabsorbed. The labor problem is most serious in industries like railroads where the network is typically too large rather than too small so that the initial layoffs are deep and industry employment is unlikely to recover. Labor problems are also serious when unemployment in the economy as a whole is high so that finding a job in another sector is difficult.

A more pervasive and consistent problem is the pressure on government to capture part of the proceeds for budgetary purposes. In setting the terms for the sale of an infrastructure concession or company, governments face a tradeoff between the tariffs they will allow the private firm to charge its customers and the price the government will receive for the concession. The higher the permissible tariffs are, the greater the sale proceeds to the government. The impetus for privatization is often a fiscal crisis which puts pressure on the government to raise tariffs just before or during privatization to achieve a high sales price. And even if there is no fiscal crisis, a high price helps justify the privatization in the short term by making the government less vulnerable to charges that it sold valuable public assets for a pittance. A high sales price creates a long-term political liability, however, since consumers must pay higher tariffs for many years as a result. And the benefits the public receives from the sales proceeds are soon lost in the black hole of government budgets while the tariffs are an obvious and constant irritant.

Another pervasive obstacle to politically acceptable or equitable terms is the tendency of infrastructure SOEs to charge unrealistically low tariffs. In the early 1990s, on the eve of many of the privatizations, water tariffs in developing countries typically covered only one third of the costs of the service while electricity and gas tariffs covered only 60 or 80 percent of these costs. With such low tariffs the SOEs usually accumulated large investment backlogs. It was common for water and electricity to be rationed to several hours per day, for example, and for many households to be without water or

electricity service because the government infrastructure company lacked the resources to expand its network of transmission pipes or lines. In this context, even a substantially more efficient private company would find it difficult or impossible to survive collecting only the old tariffs. And if the company were charged with providing more adequate and reliable supplies, or with extending coverage to unserved areas, then substantial tariff increases would be inevitable. The reality is that the very low tariffs are unsustainable, but privatization becomes the scapegoat for the increases.

A related obstacle is that customers are often heterogeneous, with different initial conditions and interests. Conflicts often arise because the tariffs that SOEs charge incorporate cross subsidies from some types of customers or services to others. Usually these cross subsidies are from less to more politically influential groups. For example, the charge per kilowatt hour of electricity or cubic meter of water is typically higher for industrial users than for households or farmers. Similarly, users of long-distance telephone services were often, at least until recently, charged prices in excess of costs to keep the monthly charge for basic residential service low. In other cases the cross subsidies have a rationale that has eroded over time. Charges to connect new users to a utility network have historically been set below cost on the grounds that existing users benefit from expansion because the new users allow the company to exploit economies of scale in common facilities, such as electricity generating or water treatment plants. In the case of water and wastewater there was also the argument that the general public benefited because connections reduced the spread of disease. Over the years, network expansion and technological changes have weakened the rationale for undercharging new connections outside of water and wastewater, but the practice persists.

Privatization often exposes these differing interests by increasing the pressure on companies to “rebalance” tariffs so that they are more reflective of costs. Rebalancing is usually required if the industry has been reorganized to allow private firms to compete in providing selected activities. The introduction of competition in wholesale electricity markets or in long-distance telephony makes it harder to sustain traditional cross subsidies from industrial to residential electricity users or from long-distance to local callers. Rebalancing is also encouraged by the need to motivate private providers to

expand and maintain services. A firm is more likely to expand its network, for example, if it is allowed to charge a connection fee that covers most or all of the connection costs.

Altering these traditional patterns of cross subsidies creates winners and losers among consumers. For example, the traditional practice of undercharging for connections is not that controversial for an SOEs since the SOE usually does not have the financial resources to expand its networks anyway. But if the SOE is replaced by a private firm that is allowed to raise connection charges to cost-recovering levels, then existing customers with connections will be protected, but many potential customers may feel aggrieved because they can not afford to join the network. Alternatively if the private firm is instead required, as a condition of its concession, to expand service coverage without raising connection charges, as is often the case, then existing customers may become dissatisfied because they are now forced to cross-subsidize new customers. Either way the private firm is likely to be blamed for this dilemma.

Many of these problems are illustrated by the privatization of the Argentine telephone company in 1989. By most measures the reform was an astonishing success: in the first 10 years of private service the number of fixed lines increased from 3.0 to 8.4 million, the number of mobile lines from a handful to 6.4 million, the network was converted from analog to 100 percent digital, waiting times for new phone service and repairs dropped dramatically. Meanwhile, the real price for a typical basket of residential services remained roughly constant while the price for a typical basket of commercial services dropped by roughly half (Urbiztondo and Gomez-Ibanez, 2002).

The reform remained highly controversial, however, in part because the government, concerned about the price it would receive, raised tariffs just before the sale and gave the private companies exclusive rights to provide service in their territories for five years, with the possibility of a three year extension.⁶ Moreover, competition from international calling services forced the government to allow the companies to rebalance rates in 1997, dropping charges for long-distance calls and increasing the basic monthly subscription fee. The initial increase was probably unavoidable because tariffs had been

⁶ The exclusivity did not cover mobile telephones and data transmission services, where entry was permitted

eroded badly by inflation in the late 1980s and the SOE was losing about \$1.5 billion per year on the eve of the sale. But the combination of the increase and the monopoly franchise made consumers suspicious from the start, and the subsequent rebalancing shifted costs from rural, high-income and businesses customers who used more long-distance services than urban, lower-income, and residential customers who consumed less. The average Argentine telephone customer must have benefited enormously, even considering the initial tariff increase, but the average hid a variety of circumstances including some who probably lost because they already had a long-distance line or made mostly local calls.

Some argue that the frequent emphasis in privatization on cost-based tariffs is technically as well as politically unwise. It may be inappropriate to charge tariffs that cover the full costs of services, such as water, which provide important public health or other benefits to non-users. And the pressure to recover investments that have a 40- or 50-year life within the span of a 15- to 25-year concession contributes further to excessive tariffs. A shift to cost-based tariffs also usually involves decreasing the charges based on usage while increasing the fixed charges for a connection, changes that shift more of the financial burden on poor households with low usage rates. In addition, critics point out that the industrialized countries often subsidized the development of their infrastructure, and to expect that developing countries should not is hypocritical. But the argument about significant non-user benefits applies to only a few types of infrastructure. Moreover, concessionaires often inherit a substantial existing facility and usually are required to recover, through tariffs, only the costs of operations and of the incremental investments they make. The notion that governments can continue to heavily subsidize infrastructure also ignores the budgetary constraints that drive many governments to private participation in the first place. This is not to deny that subsidies and cross subsidies may be useful to even out the distribution of costs and benefits in a privatization, but the reality is that they can be used only sparingly.

The single most effective way to insure that the distribution of benefits and costs can be made politically acceptable is to search out projects where private participation generates substantial real efficiency gains and avoid those where the primary effect of private involvement is to transfer costs or benefits from one party to another. Real

efficiency gains involve reducing the amount of inputs that are required to produce a given output or improving the quality and quantity of output for a given input.

Argentina's private telephone companies generated real efficiency gains, for example, by cutting the number of employees and the amount of capital needed per subscriber, and by providing millions of new lines at cost much lower than subscribers were willing to pay. Transfers, by contrast, involve changes in who pays for inputs or who receives outputs without any changes in what outputs are produced or how. If, for example, private involvement is primarily an excuse to raise tariffs enough to cover costs or to lay off excess workers who have little prospect of finding other work, then it simply transfers resources from customers (who pay higher tariffs) or laid off workers (who lose their salaries) to taxpayers (who no longer subsidize the SOE).

The importance of real efficiency gains is that they provide the wherewithal to compensate parties that might otherwise lose from reform. If privatization is mainly about transfers, then it is a zero-sum game: no one can win without someone else losing. But if privatization generates real efficiency gains, then there is at least the possibility that all parties can be made winners. The surpluses that Argentina's private telephone companies generated with new lines, for example, might have been used to soften the blow of rate rebalancing on residential customers or to provide assistance for older laid-off workers who might face a longer period of unemployment before they found other work.

It is surprising how often even experienced politicians ignore the need to make the initial distribution of benefits and costs more equal and how important real efficiency gains are to making that distribution possible. For example, the collapse of the Cochabamba water concession, one of the most famous debacles in the history of recent privatizations in Latin America, was due in part to the insistence of the mayor of Cochabamba that the concessionaire be required to build the Misicuni dam and a connecting tunnel and aqueduct. Cochabamba had chronic water shortages so new sources of supply were needed, but a less expensive option was to extract more water from the existing reservoir system. The mayor was warned that building the Misicuni dam would require substantial tariff increases but he had been campaigning for the dam for years and must have seen the privatization as an opportunity not to be missed. The

dam was not an efficient investment in that there were cheaper ways to supply the city, which made it harder to insure that users would be better off in the long run. Moreover, the concession called for immediate tariff increases, long before the dam would be complete, and for the expropriation of small well-fed water cooperatives that had developed on the periphery of the city because the public water company had not expanded its network. When the intensity of opposition to the tariff increases became apparent, the mayor joined the project's critics (Finnegan, 2002; Bechtel, 2005).

Systems of Regulation

A second source of controversy has been the systems created to regulate tariffs and service quality. The initial terms of the privatization establish a poor or a favorable starting point, but it is the regulatory system that must cope with that legacy and with any new problems that arise. The challenge is to design regulatory systems that can handle disputes in a manner that is regarded as fair by both investors and consumers.

At the risk of much simplification, two different approaches to regulating private infrastructure providers have been employed: contractual and discretionary (Gomez-Ibañez, 2003). Under the contractual approach the government awards a private firm a long-term contract to improve and/or manage an infrastructure facility, usually through a process of competitive bidding. The contract attempts to describe completely the obligations of the private firm to the government and vice versa during the life of the concession, and can not be changed unilaterally by either party. There is a regulatory agency, but its job is limited to monitoring the firm's compliance with the contract and applying any sanctions the contract calls for.

The great advantage of this approach is that fixing all the obligations in a contract prevents the two parties from behaving opportunistically. Otherwise the firm would be vulnerable because of its fixed investment in the project while the government would be vulnerable because the firm is the monopoly provider of a critical infrastructure service. In addition, awarding the contract by an open and competitive tender assures customers that the tariffs and other terms of the concession are fair. The main drawback of this approach is the risk that the contract will prove to be incomplete in that it fails to foresee

an event that makes the agreement unworkable for one or both parties. In such cases, the parties face a difficult choice of whether to renegotiate the contract even though they are still vulnerable to one another or to live with the contract's unsatisfactory terms until it expires.

The discretionary approach assumes that it is too difficult to draft a complete contract and instead establishes a regulatory agency that has the discretion to unilaterally change tariffs and other terms of service. The agency is typically insulated somewhat from pressures to behave opportunistically by, for example, separating the agency from the ministries that supervise other aspects of infrastructure policy, appointing the regulators who head the agency to fixed terms and making them removable only for specified causes and funding the agency from a special surcharge on utility bills instead of through the normal legislative appropriations process. The agency remains accountable through its authorizing statute, which establishes the issues it must consider and the procedures it must follow in setting tariffs. And there is usually some procedure for consumers or firms to appeal the agency's decisions to a third party, often the courts or another independent tribunal. But the guidelines in the statute are usually broad, so that the agency has substantial scope in interpreting them.

The great advantage of the discretionary approach is flexibility: there is no need to foresee all the possibilities and provide appropriate contingencies because the regulatory agency has the discretion to deal with the unanticipated. One disadvantage, however, is that the task of determining fair tariffs and other terms is technically very difficult, especially since the firm has more information about its costs than the regulatory agency.⁷ Of equal concern is the possibility that the agency will not use its discretion wisely but will instead be "captured" by "special" interests that prevent it from striking an appropriate balance between consumer and investor interests. And these drawbacks loom large in countries with a shortage of technical skills or a tradition of cronyism or corruption.

⁷ The contractual approach avoids this problem by using the competition for the contract to insure that the tariff and other terms are fair.

The contractual approach has been used widely in developing countries because it appears so simple and fair, but experience demonstrates that we have seriously underestimated the difficulties of writing workable contracts and the political costs of renegotiation. In a seminal study of over 1000 infrastructure privatizations in Latin America and the Caribbean between 1982 and 2000, Guasch (2004) found that 74 percent of all water and sanitation contracts and 55 percent of all transportation contracts had to be renegotiated, most within only a few years of their signing. (Renegotiations were far rarer in telecommunications and electricity, but largely because the contractual approach is less common in those sectors.) Some of the early failures were due to inexperience in writing contracts in that they involved events that should have been anticipated or contingencies that were obviously inadequate. The problem has persisted, however, in part because the desire to finance investment typically leads to concessions of 10 to 30 years and it is extremely difficult to foresee all the important developments that will occur during the life of such a long contract, especially in a rapidly developing economy. It has proven particularly hard to write politically acceptable and economically practical contingencies for the major macroeconomic and foreign exchange crises that seem to plague developing countries periodically. Finally, there is the strong suspicion in many cases that the winning firm deliberately bid unrealistically low, anticipating that the government would renegotiate once the firm experienced trouble rather than go through the disruption of re-tendering the concession.

The renegotiation of concession contracts has been an enormous political liability for privatization, especially because citizens of developing countries are often mistrustful of their governments. Most contracts include provisions for arbitration or renegotiation to cope with unforeseen contingencies, but the clauses are typically modeled after those found in contracts between two private parties and do not recognize the public and political nature of disputes involving infrastructure concessions. In a dispute over a private contract the two parties negotiate directly, but in dispute over a concession contract the government negotiates with the firm on the consumers' behalf. And because it is hard to design a renegotiation that is as open and transparent as competitive bidding, the public's suspicions are often aroused and the legitimacy of the privatization program undermined.

The discretionary approach is less common in developing countries but is used in activities, such as telecommunications and electricity distribution, where technologies and demands are changing so rapidly that it is obviously difficult to write a complete contract. The record of discretionary regimes is much harder to evaluate if only because there is no explicit contract to breakdown. International institutions and consultants have been understandably concerned that the discretionary regulatory agencies have the technical skills and independence needed to do their jobs. And there is some evidence that skills and independence matter. In their study of 34 Latin American private utilities, for example, Sirtaine *et al.*(2005) found that the rate of return the firms earned tended to be closer to their cost of capital if the regulatory agency had a healthy budget and was governed by a commission with several members rather than a single person. But this emphasis on technical skills and independence has led some regulatory agencies to neglect the need to build and maintain popular support for the privatized industry. Controversial decisions are sometimes taken with only token public input and with little effort to build public acceptance, leaving the impression that the regulatory system is out of touch with, or even dismissive of, popular concerns. The opposite problem is also common: when the regulator views his primary role as defending consumers against monopoly, leaving the firm with so little popular support that it is difficult to approve realistic tariffs.

The importance of understanding the political dimensions of regulation are illustrated, again, in the privatization of Argentina's telephone company. Certain decisions were deferred at the time of privatization, including when to end the private firms' period of exclusivity and how to rebalance tariffs as exclusivity ended. The architects of the reform presumably felt that the initial increase in tariffs and privatization were controversial enough for the time being, but they left the regulatory agency to deal with very difficult problems. Initially the agency was independent but in 1996 it was converted into an office that reported directly to the Secretary of Telecommunications. The private companies petitioned for rate rebalancing as early as 1994, before the earliest date when exclusivity was scheduled to end, arguing that unexpected competition from international call-back services was undermining their profitability. Public hearings showed how controversial the companies' proposal was, but when the regulatory agency

released its own rebalancing scheme two years later, it initially refused to hold a public hearing and then, under the threat of lawsuits, held the hearing in a provincial capital. The agency argued that the previous hearings had been held in Buenos Aires and it was important to obtain views of other consumers, but critics contended that the location was chosen deliberately to avoid urban customers who would suffer most from the reforms. It is conceivable that the agency or the Secretary had been corrupted by the companies, and the lack of regulatory independence didn't allay those suspicions. But the staff was, to all appearances, technically competent and genuinely convinced that some form of rebalancing was inevitable. It would have been challenging enough to design a rebalancing proposal that was both economically realistic and politically acceptable. But any chance the agency had for selling such a scheme was lost by its insensitive behavior.

A hybrid between the contractual and discretionary approaches has emerged in many developing countries. In this scheme a concession contract is awarded competitively for a term of 10 to 20 years but the contract specifies the tariffs only for the first 5 or 10 years. After that initial period, tariffs are readjusted periodically, often every 5 years, by a regulatory agency that enjoys substantial discretion. The same regulatory agency usually monitors contract compliance during the initial period so that it has a chance to develop expertise before it must set tariffs. The hope is to combine the best of the two approaches: the simplicity and fairness of competitive tendering with the provision for discretion when it is likely to be needed. However, the hybrid is also vulnerable to the weaknesses of both approaches since the contract must be reasonably complete during the initial period and the regulatory agency must exercise its discretion wisely.

A more radical option that deserves greater consideration is to dispense with regulation altogether. Private provision has been more successful in telecommunications than any other sector, and especially in the difficult regions of sub-Saharan Africa and the Middle East. The success is due to many factors: investors in mobile systems have less capital at risk (in part because customers are required to provide their own handsets), companies can easily cut off service to customers who don't pay their bills and tariffs are less politically sensitive since telecommunications is considered less of a necessity as water or electricity. But a key component has been the willingness of many governments

to regulate mobile telephony only loosely if at all, especially in countries where entry has been allowed and two or three mobile operators have grown large enough to provide effective competition for one another and the old fixed-line company. The level of competition, while not perfect, may also be strong enough to allow regulation to be relaxed or abandoned in some other forms of infrastructure. Seaports, freight railways, and airports are the most obvious sectors where regulation might be largely dispensed with, particularly in large countries.

Where regulation is necessary, more might be done to reduce the chances and political costs of contract renegotiation. Experience suggests that the risk of contractual disputes can be reduced significantly, for example, if sponsors take the time to be certain that the contract is clear on major issues and is based on the best available information so that there are fewer surprises. It also helps if the contract prohibits renegotiation for minor problems and if the bidding is transparent and very aggressive bids are scrutinized (Guasch, 2004, pp. 19-21 and Boston Institute for Development Economics, 2006). In the case of discretionary schemes, it is important that the agency has reasonable resources and independence, but also that the regulators understand that true independence requires political skills and sensitivity. Finally, with either approach, it is helpful if a key investor in the company has experience and intends to stay in the sector and the region for the long term, so that the firm's expectations are realistic and it behaves responsibly when problems arise.

The High Cost of Private Capital

A third challenge is to cope with the high cost of private capital. The basic difficulty is that private capital is usually nominally more expensive than public capital. Estache and Pinglo (2005, p. 59) estimate that around the turn of the century, the weighted average cost of capital (debt plus equity) for a typical private infrastructure provider in developing country was 15 percent in a low-income country, 11 percent in a low/middle-income country, and 10 percent for a middle-income country. The interest rates on sovereign debt for these countries were presumably several percentage points lower since they include only the country risk and not the systematic risk inherent in a

utility investment. The interest rates on a loan from a development bank were probably 2 to 3 percent during this period, while the special concessional loans available to the poorest countries from the World Bank amounted to grants since they carried no interest and had very long repayment terms.⁸ The higher cost of private capital makes it harder to hold down tariffs, especially since infrastructure is so capital intensive.

Economists argue that the nominal difference between private and public cost of capital is at least partly an illusion because public finance imposes hidden costs on taxpayers. Under private finance, private investors absorb the loss if the project proves to be a financial disaster and cannot repay its debts. But if the project is financed by sovereign debt or a loan to the government from a development bank, then the taxpayer must cover the loss if the project can not pay. This argument assumes that the private investor assumes all or most of the commercial risks, which is not always the case. Many of the take-or-pay contracts for new public power plants that developing countries signed during the 1990s were structured similarly to sovereign debt, for example, in that the government assumed both the demand and the foreign exchange risks (Wells and Ahmed, 2007). Even where the assumptions hold, moreover, the argument that the difference in interest rates is an illusion is not likely to be understood by the general public. But the public is likely to notice if utility tariffs rise when private debt and equity replace public debt.

These problems are compounded because private investors in infrastructure are often foreigners rather than nationals. Foreign involvement stems in part from a desire for technical expertise that is not available locally. Consortiums bidding for concessions are usually required to include a member with a track record of operating similar services, for example, and that often means a foreign firm in countries where there is little recent local experience with private infrastructure. But foreigners also dominate because the capital markets in many countries are insufficiently developed or too illiquid to raise sufficient funds, especially for larger transactions. The thinness of local capital markets is often due not just to the low income levels of the countries but to weak legal

⁸ Estache (2005, p. 20) reports that taking into account commitment and other fees, the effective interest rates on normal development loans from the World Bank was 44 basis points over LIBOR with other development banks ranging from 35 to 154 basis points over LIBOR.

protections for private property, contracts, and the rights of minority shareholders. Even foreign-sourced debt, though more readily available, has at times been unsuitable for financing infrastructure. Since infrastructure facilities are expected to last 25 years or more, long-term, stable financing is desirable. But in many countries a history of macro-economic stability makes lenders wary of long commitments.

This dependence on foreigners often comes at a cost, the most obvious being the potential for resentment and misunderstanding on both sides. Foreigners may suspect that they will be treated poorly simply because they are foreign, and locals often come to resent the fact that foreigners own and profit from essential local services. The potential for misunderstanding is usually heightened by inexperience, and many of the European and American infrastructure companies that went abroad in the 1990s had never invested in developing countries before. The involvement of foreigners also generates additional issues to quarrel over, notably the treatment of foreign exchange risk. Most foreigners want to repatriate their profits eventually. Since swaps and other risk management instruments are not available at reasonable cost for the currencies of many developing countries, investors and lenders often request exchange rate guarantees or the indexing of utility tariffs to foreign currency movements. If a subsequent exchange crisis forces the government to devalue the local currency, as in Asia in 1997 or Argentina in 2002, consumers find it hard to understand why the foreign-owned utility should expect to be made whole while the rest of the country's households and businesses suffer.

Political risk poses a particularly difficult problem. Investors prefer to avoid risk, all else being equal, so the riskier an investment, the higher the return investors require. Infrastructure investments in developing countries are usually perceived as risky, if only because the services are politically sensitive and the facilities durable and immobile. It can be hard for an investor to withdraw his capital in the event of a dispute with government over tariffs or other issues. Yet giving the investors a substantial premium for perceived political risk may be self-defeating if it fuels popular outrage about the returns the investors require. Finding ways to reduce real or perceived risks would seem better than simply passing them on in the form of higher returns and tariffs.

Unfortunately, several schemes introduced in the last twenty years to make foreign investment in developing countries safer do not seem to have worked well. Political risk insurance has become more widely available, offered by the foreign investors' home government and by international financial institutions such as the World Bank (through MIGA, the Multilateral Investment Guarantee Agency) and the Asian Development Bank. The World Bank's International Financial Corporation (IFC), the European Bank for Reconstruction and Development (EBRD), and other regional banks have invested in private infrastructure projects that they believe are attractive but might not be funded without their involvement and implicit endorsement. But the most important innovation has been the spread of bilateral investment treaties that give foreign investors the option of international arbitration if they feel mistreated by their host government. Many of these treaties call for arbitration at the International Center for the Settlement of Investment Disputes (ICSID), which is housed at the World Bank, and allow foreign investors to collect on damages awarded by attaching the government's overseas assets.

To the extent that MIGA, IFC and the regional banks are more adept at evaluating political risk than less experienced investors, their insurance or participation may provide a useful signal that risks are lower than they appear. But if others invest primarily because they believe that the involvement of the World Bank or the regional banks is a deterrent to aggressive government behavior, then those investors may be tempted to behave irresponsibly by taking a tough line in any future controversy. In addition, access to international binding arbitration does not seem to have reduced conflict: the ICSID has been swamped with 69 disputes initiated by private infrastructure providers between 1997 and 2007, many in the wake of the Asian and Argentine financial crises, and the resulting backlog will take years to resolve. More important, Wells and Ahmed (2007) argue that the arbitration procedures are so rigid and one-sided as to be unworkable in the long term. ICSID arbitrators have been stricter in enforcing contract terms and calculating damages than the courts of developed countries are in similar domestic contractual disputes. And while foreign private investors can take developing countries to arbitration and seize their overseas assets for not complying with promises made, the

developing countries can not take the investors to arbitration or seize their overseas assets when the companies fail to keep their part of the bargain.

One obvious solution to the higher nominal costs of private finance is to use as much lower cost public financing as possible. Public finance is unlikely to be sufficient to finance all the investments needed, so that some reliance on private finance is inevitable. The World Bank and other donors made the shortage worse by their reluctance to lend to infrastructure SOEs during the 1990s, when enthusiasm for privatization was at its height. That policy has been relaxed and development agencies are now more willing to lend to governments to finance assets that private concessionaires might build or manage, thus hopefully getting something of the best of both worlds. Mixing public finance with private management creates some complications: for example, it is harder to write a contract that holds private managers accountable for the performance of the firm when the design and timing of investments is not under their control. But mixed finance can help hold utility tariffs down.

Another possibility that deserves more attention is to reduce the reliance on foreign financing by strengthening the domestic capital markets of developing countries. Some countries have developed local markets for infrastructure debt. Banks are not ideal financiers of infrastructure because they usually insist on floating rates and relatively short terms. But local banks have played an important and apparently healthy role in financing infrastructure in a number of countries, such as Thailand. And in Mexico, banks were able to sell infrastructure bonds directly to depositors during the early 1990s. Pension funds and insurance companies are more able to offer fixed rates and long terms, and several countries, including Chile, have managed to persuade pension and insurance regulators that infrastructure debt is not too risky an investment. Debt from banks, pension funds, and insurance companies is attractive because they usually have enough at stake and enough sophistication to monitor their investments carefully. Local equity has been raised for many infrastructure projects as well, although usually it is held by a few firms or individuals rather than widely. Widening the equity market would be helpful not only to increase the potential pool of capital but also to potentially strengthen popular support for private companies. But widespread participation in equity markets requires

laws and regulations to protect minority shareholders and courts that are willing to enforce them, both ingredients often lacking in many developing countries.

Finally, anything that can be done to reduce political risk will be helpful since political risk greatly increases capital costs. Foremost among the possibilities are insuring that the distribution of benefits and costs in the initial privatization and subsequent regulation are fair.

Adapting to Difficult Circumstances

A final challenge is to adapt to circumstances where private provision of infrastructure is particularly difficult. The current fashion among scholars of economic development is to focus on the institutions required for successful reform. The argument that institutions matter is hard to deny: private participation in infrastructure is bound to be more difficult where courts lack the independence and integrity to enforce contracts, for example, or where corruption makes investors or consumers wary that they will get a fair hearing before a government regulatory agency. But it is hard to know how to adapt private participation to circumstances where institutions are weak, beyond limiting the investments at risk or abandoning the approach altogether. Both the contractual and discretionary approaches to regulation depend on the integrity of government, for example. Integrity is probably easier to maintain in the commercial courts than in a discretionary regulatory agency if only because all sectors of the economy have a stake in the performance of the courts while the regulated infrastructure companies and their customers are the only ones with a stake in the performance of the specialized regulatory agency. But in a very weak institutional environment sustaining private participation is likely to be difficult unless the investors are connected to the political elite, have relatively little capital at risk, or enjoy some special advantage in technology or other areas that protects them from takeover.

Several other basic characteristics that affect the prospects of private participation in infrastructure are the level of income, population and geography of the countries involved. Private participation has proven to be much harder in poor, small and largely rural countries. All regions have countries with these characteristics: Bolivia, Ecuador,

Honduras and Nicaragua in Latin America, for example, or Cambodia, Laos and Papua New Guinea in Asia. But the largest concentration of such countries is in sub-Saharan Africa. Sub-Saharan Africa has a per capita income of \$496, slightly higher than South Asia (\$441) but well below Latin America (\$3,888) or Eastern Europe and Central Asia (\$1,998). The countries in the region are, on average, small and rural: only 3 of the 47 countries have populations above 40 million⁹, while another 7 have populations between 40 and 15 million.¹⁰ The remaining 37 countries have populations of less than 15 million, and an average population of 4 million.¹¹ Only 33 percent of the population in sub-Saharan Africa lives in urban areas, a figure comparable to that in Southeast Asia (39 percent) but less than half that of Latin America (77 percent).

It is no coincidence that sub-Saharan Africa received less than 4 percent of the private investment in infrastructure in developing countries between 1990 and 2003 or that half of the investment in sub-Saharan Africa went to a single country—South Africa—with the remaining 46 countries dividing up the rest. Moreover, 65 percent of the investment in sub-Saharan Africa went to one sector: telecommunications. The second most important sector, energy, received only 22 percent of the investment, mostly in the form of new generating stations built by Independent Power Producers (IPPs) and backed by take-or-pay contracts with state-owned electricity companies. There has been relatively little private investment in electricity distribution and transmission and almost none in water and sanitation, although not for the lack of trying. In the electricity sector, for example, approximately half of the countries in sub-Saharan Africa have attempted to involve the private sector in the management of their distribution companies, but in most cases either the effort was aborted before the contract was awarded or the contract was cancelled after only a few years (Benoit, 2005). The number of success stories in electricity or water distribution can be counted on one hand.¹²

⁹ Nigeria with 121 million, Ethiopia with 69 million, Democratic Republic of Congo with 51 million and South Africa with 45 million (total population 286 million)

¹⁰ Tanzania with 36 million, Kenya 32 million, Uganda 25 million, Mozambique 19 million. Madagascar 17 million, Ivory Coast 16 million, and Cameroon 15 million. (total population 160 million)

¹¹ The 37 smallest countries had a combined population of 166 million persons out of the total 605 million persons who lived in sub-Saharan Africa in 2002.

¹² The usual list of successes includes the water services in the Ivory Coast (which has been operated as a private concession since 1960), Mozambique and Senegal and electricity in Uganda.

Poverty makes private participation difficult, in part because it increases the problems of access and affordability. Access to infrastructure services is a much more significant problem in sub-Saharan Africa than in the rest of the world. The disparity is greatest in electricity: in 2002 only 15 percent of households have access to electricity in the average sub-Saharan country compared to 31 percent in the average South Asian country, 79 percent in Latin America, and 88 percent in Middle East and North Africa. But sub-Saharan Africa is also behind other regions in access to clean water sources and sanitation, and telecommunications (Estache, 2005). As for those who are connected, affordability is a potentially more serious problem. One study estimated that 55 percent of households in Africa and India would have difficulty paying electricity and water bills of US\$10 per month, an amount roughly sufficient to cover costs, whereas only 35 percent of households in East Asia and 10 percent of households in Latin America would experience similar difficulties.¹³

In a poor country the infrastructure companies are also much more economically and politically prominent, which further complicates reform. The companies are often among the largest and most profitable enterprises in the economy, particularly in countries where the private sector is dominated by small-scale agriculture and traders. Since the utilities are among the few places where large amounts of cash are concentrated, they become attractive targets for governments in need of resources. In Africa it is common for government agencies not to pay their electricity, water, or telephone bills, for example, only the most obvious of many means to siphon off utility resources to support the general government activities. And because the utilities are among the few large enterprises, they offer some of the only well-paid professional and managerial jobs in the country. Private participation becomes more problematic because it is harder for the government to commit to a defined share of the utilities' resources. Furthermore, private participation becomes more controversial if expatriates assume some of the best jobs in the country, usually earning many times more than the nationals they replaced.

¹³ The threshold for affordability was set at 5 percent of income based on the observation that very few poor households spend more than 5 percent of their income on water or more than 6 to 8 percent of their income on electricity (Foster and Yipes, 2006, p. 17).

Finally, poverty makes countries more dependent on and resentful of foreign aid and advice. Many of the early adopters of private infrastructure in Latin America and Asia—such as Argentina, Brazil, Mexico and India—did so because macroeconomic or sectoral crises convinced the governments that reform was necessary. While crises have played a role in encouraging local support for reform in sub-Saharan Africa as well, the more decisive factor seems often to be pressure from multilateral or bilateral aid agencies. In the 1990s particularly, private participation was usually imposed as a condition for further loans or grants to the infrastructure sector, and adopted grudgingly by national governments. Pressure from the aid agencies helps the governments avoid responsibility for the performance of the sector, since they can always blame outside forces. And the lack of local conviction means that the policy reforms are poorly implemented and closely monitored by critics ready to seize on the problems that usually develop.

Many of these problems are magnified if the population is small and the geographic area is large. Small populations and low densities make it harder to exploit economies of scale in management and the physical plant. A small national company can not justify or afford highly specialized or expert staff, a disadvantage that a large international company can overcome, but at the risk of provoking local resentment. Often demand is insufficient to support efficient scale plants, particularly if the population is dispersed. In electricity, for example, the minimum-efficient-scale gas-fired generating station is around 100 to 200 MW, which is as much as the entire generating capacity of some of the smallest countries. And the customers in secondary cities are often served by isolated distribution systems powered by very small diesel-powered generators. Similarly, a modern container terminal requires a volume of 200,000 to 300,000 TEUs per year, when Nigeria, the most populous country in the region, generates only about 400,000 to 500,000 TEUs per year. The inability of many small countries to support a minimum efficient scale electricity plant or container port on their own, much less to foster competition among several electricity generators or ports, increases the costs of their utility services.

The small population also strains the pool of talent available to administer reform. The task of formulating infrastructure policy or regulating a private utility does not decrease in proportion to the size of the country, so that small countries always have a

more difficult time staffing policy and oversight bodies. In a small country, moreover, the group with the education or experience to fill the key policy and regulatory jobs is typically relatively small and its members well known to one another. The situation makes it especially difficult to pick a regulator who will be perceived as independent since most candidates usually have a history of working closely with (or strongly against) either the private officials in charge of the regulated company or the government officials in charge of infrastructure policy.

Many of these problems are illustrated by the privatization of Mali's electricity and water company, Energie du Mali (EDM), which provides electricity to 13 percent of the country's 13 million residents. Mali's electricity is expensive because the country is landlocked and diesel fuel has to be trucked many kilometers from the coast, and because 20 of the 32 communities served by EDM are so remote that they are not connected to the national grid but served by small isolated distribution systems. The country's hopes for cheaper electricity have historically rested on developing its hydro resources, and EDM built a small dam in 1967 and a larger one in 1980, both with French technical and financial aid. When the World Bank and other aid agencies discovered, in the mid 1980s, that the turbines in the second dam were not being adequately maintained, they conditioned loans for rehabilitation on management reforms at EDM. And when these reforms failed to take hold and Mali, Senegal, and Mauritania wanted to build a third and much larger dam at Manantali, the key donors met in Paris and agreed that Mali would not receive its share of the funding unless it hired a private company to manage EDM, raise tariffs and increase collection rates. A four-year management contract was awarded to a consortium headed by a large French utility company, Saur, in 1995 but collapsed after three years amidst disputes between the Malian's and Saur about why EDM's performance had not improved. The donors then insisted that EDM be offered as a 20-year concession, so that the private managers would have greater control and responsibility for performance, which was awarded through competitive bidding to Saur again in 2000 only to see Saur withdraw in 2005.

The immediate cause for the concession's breakdown was a major flaw in the tariff adjustment formula that became apparent in 2002, when the formula called for a significant increase in electricity tariffs even though Manantali's turbines were coming

on line, allowing EDM to replace expensive diesel with cheap hydro power. The tariff formula might have been renegotiated had it not been for deep resentment and poor behavior on all sides. The donors were partly responsible for imposing reform, although they had some internal allies and their desire not to see aid wasted was understandable. Saur bore a big share of the blame by insisting for too long that the contract should be honored despite the obvious injustice of the tariff formula and then by not being very forthcoming with data needed to set a reasonable tariff. But the company made an easy target for politicians and became an issue in the presidential elections, especially since Mali's electricity tariffs were still among the highest in West Africa and the compensation for the 12 expatriate managers was reported to amount to one-quarter of payroll for the over 5,000 Malians who worked for the company. The technical staff in the Ministry of Mines, Energy and Water was also unsympathetic, possibly because many of them were ex-EDM officials who thought they could do at least as well as the expatriate managers. The regulatory agency, although nominally independent, was headed by an ex-EDM general manager and who seemed to compete with the politicians in attacking the company publicly, which left the firm completely isolated with no local support. Not surprisingly, fact finding and mediation sponsored by the World Bank and other donors failed.

One obvious solution to the challenges faced by the poorer, smaller and more rural countries is to promote regional cooperation in the provision of infrastructure. The attraction of this approach is, of course, the potential to reduce costs by exploiting economies of scale. In transportation, some types of regional infrastructure are emerging through the normal competitive process as, for example, Abidjan, Tome and Lagos vie to become the leading container port in their corner of the African coast. In other sectors, regional infrastructure is likely to require deliberate planning by the countries and donors, as in the case of the Manantali dam or the proposal to build high-voltage electricity transmission lines connecting gas-producing states on the coast of West Africa with their gas-poor neighbors. Regional systems require cooperation and raise understandable concerns about dependence and reliability, but the prospect of lower costs can be a powerful lure. Regional infrastructure can be compatible with private participation, especially if it is advantageous to have the common facility managed by an independent

party. The Manantali dam, for example, is managed on behalf of Mali, Mauritania and Senegal by Eskom, South Africa's electricity company.

An alternative but complementary approach that governments and donors are beginning to explore is very small scale infrastructure. At first glance small scale systems would seem to increase a poor country's problems rather than solve them. Small scale suggests higher unit costs. If people with the skills needed for reform are stretched thin at the national level, moreover, then they are likely to be even scarcer at the local level. Indeed, it is notable that many of the high-profile infrastructure disputes mentioned earlier involve municipal or other sub-national governments. Not only do sub-national governments have fewer skills and resources to resolve disputes but they also have a narrower perspective than the national governments, and thus may be less concerned about the chilling effect that a serious dispute may have on investments in other sectors or parts of the country.

But small scale is not necessarily high cost if the problem is to increase access to infrastructure services in secondary cities or remote communities, as is often the case in poor and rural countries. An isolated electricity system sacrifices economies of scale in generation, for example, but saves on the cost of long-distance transmission lines. And when systems are small they sometimes can be built to different standards with, for example, water pipes on the ground or buried shallowly instead of in deep trenches. As the community grows and the system expands it can be gradually upgraded and eventually, in the case of electricity, connected to the national grid.

A key advantage of small systems is that they might be built and operated by local firms and financed with local capital, thus easing the resentments and complications of foreign investment. Small systems have very low capital requirements not just because they are small but also because the technologies used are often involve a lower ratio of capital to operating costs. A small diesel generator has relatively high operating costs for fuel and maintenance but low initial costs, for example, and pipes above ground or in shallow trenches are harder to maintain but avoid the investment in excavation.

One sign that this strategy holds promise is that small private utility systems are surprisingly common, even in the absence of government efforts to promote and support

them. Statistics are hard to come by since these small providers are not typically subject to effective government regulation or reporting requirements. Based on a review of 400 infrastructure studies and reports for discussions of small providers, Kariuki and Schwartz (2005) estimated that there were approximately 7,000 small electricity providers in 32 developing countries and 10,000 small water providers in 49 developing countries. Many of the small water providers operate standpipes or tankers distributing water generated by conventional utilities, but others have independent water sources and small distribution networks. The small electricity providers are usually operators of small diesel or hydro generators and distribution networks or sell and service home diesel or solar generating systems. Many of the systems are cooperatives, particularly in countries with a tradition of cooperatives like Kenya, Colombia and Bangladesh, while others are owned and operated by individuals or families. Small private providers are most common in poor and rural countries and, as one might expect, in small towns or in settlements on the periphery of cities where the conventional utility has failed to expand its network. Despite their numbers, the small providers still don't reach many people. Kariuki and Schwartz (2005) estimate, for example, that small electricity providers serve only 10 to 50 million customers and mostly in Asia.

Assistance on finance, engineering and regulatory issues is probably needed if small systems are to be more widely implemented, but so far there have been only a few pilot efforts of this type. Kenya is experimenting with means of encouraging microfinance institutions to lend to small private utilities, for example, and Nicaragua is providing government aid (Mehta, Virjee and Njoroge, 2007; Ley, Martinez and Foster, 2006). u . successful. But some of the efforts appear cumbersome and perhaps overly committed to the use of sustainable technologies, such as solar or hydro power, at the expense of providing affordable and quality service. Moreover, while financial aid is undoubtedly helpful, technical and regulatory assistance may be equally valuable. On the engineering side, the national government or some other institution might recommend designs for systems that are safe yet easy to build and maintain. On the regulatory side, the government might draft and distribute model concession contracts and maintain an arbitration panel to resolve disputes between communities and operators. The Rural Utilities Service of the U.S. Department of Agriculture provides a model in that it offers

technical assistance as well as loans and grants for small cooperative and for-profit electricity, water, and telephone systems in the United States. The agency is the successor to the Rural Electrification Administration, which was established in 1935 at the height of the depression and is considered one of the great successes of President Roosevelt's New Deal.

This strategy would leave the companies serving the largest urban areas, such as EDM, still in public hands, while private providers run both the regional and the very small systems. The efficiency of the EDM's would likely suffer for lack of private involvement according to the recent research on the performance of private infrastructure. But experience tells us that private involvement in these firms is very difficult, and it may be possible to get some improvement in their performance as public enterprises (Gomez-Ibañez, 2007). More promising is the possibility that, over time, the capacity of local private infrastructure providers in small towns will develop to the point where they can take over the larger systems.

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**Table 1:
High-Profile Controversies Involving Private Infrastructure**

Asia

- Bangkok (1993): takeover of Second Stage Expressway
- Maharashtra (1994): cancellation of Enron's Dabhol power plant
- Indonesia, Pakistan, and the Philippines (1998): renegotiation of Independent Power Producer (IPP) contracts after Asian financial crisis
- Manila (2001): withdrawal of water concessionaire
- Manila (2004): withdrawal of airport concessionaire

Latin America

- Mexico an toll road bankruptcies (1995)
- Tucuman, Argentina (1996): cancellation of water concession
- Cochabamba, Bolivia (2000): cancellation of water concession
- Arequipa, Peru (2002): cancellation of electricity concession
- Argentina (2002): economic crisis and devaluation leads many concessionaires to initiate proceedings before the International Center for the Settlement of Investment Disputes (ICSID) and others to withdraw
- La Paz (2005): cancellation of water concession
- Bolivia (2006): nationalization of gas industry
- Venezuela (2007): nationalization of electricity and telephone companies

Eastern Europe

- Hungary (1998): bankruptcy of M1/M15 toll road concession

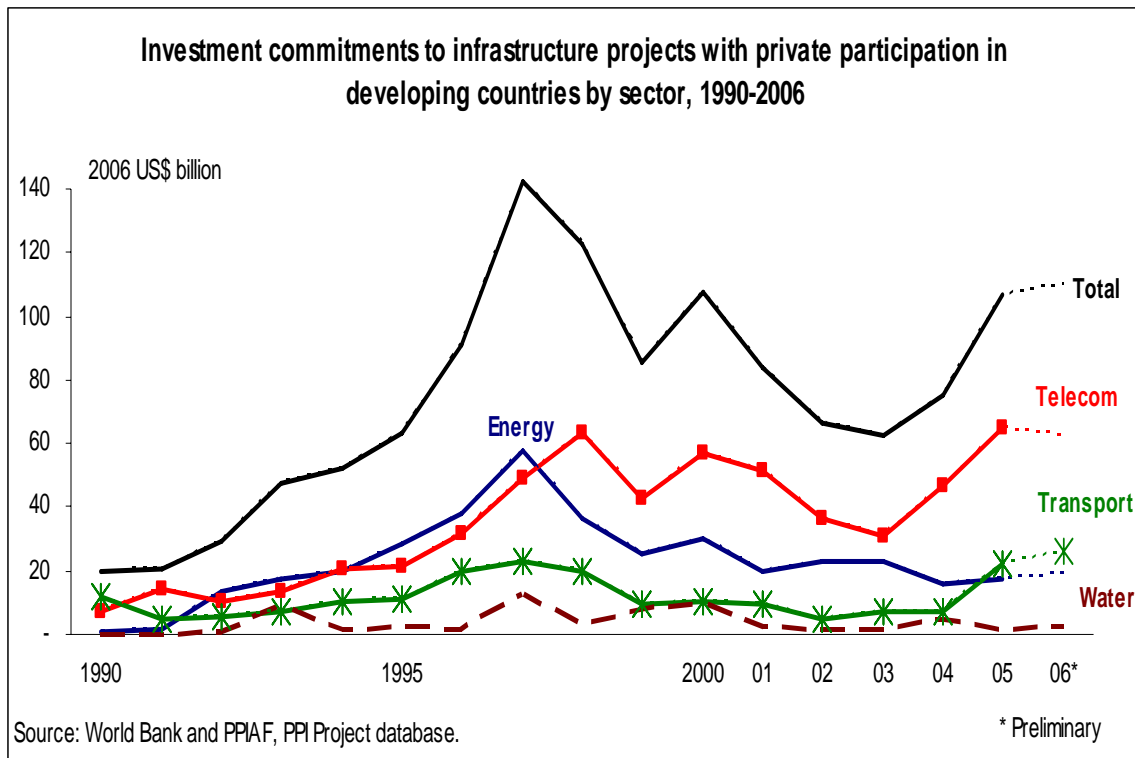
Africa

- Senegal (2000): cancellation of electricity concession
- Tanzania (2005): cancellation of water concession
- Mali (2005): withdrawal of electricity and water concessionaire

Industrialized Countries

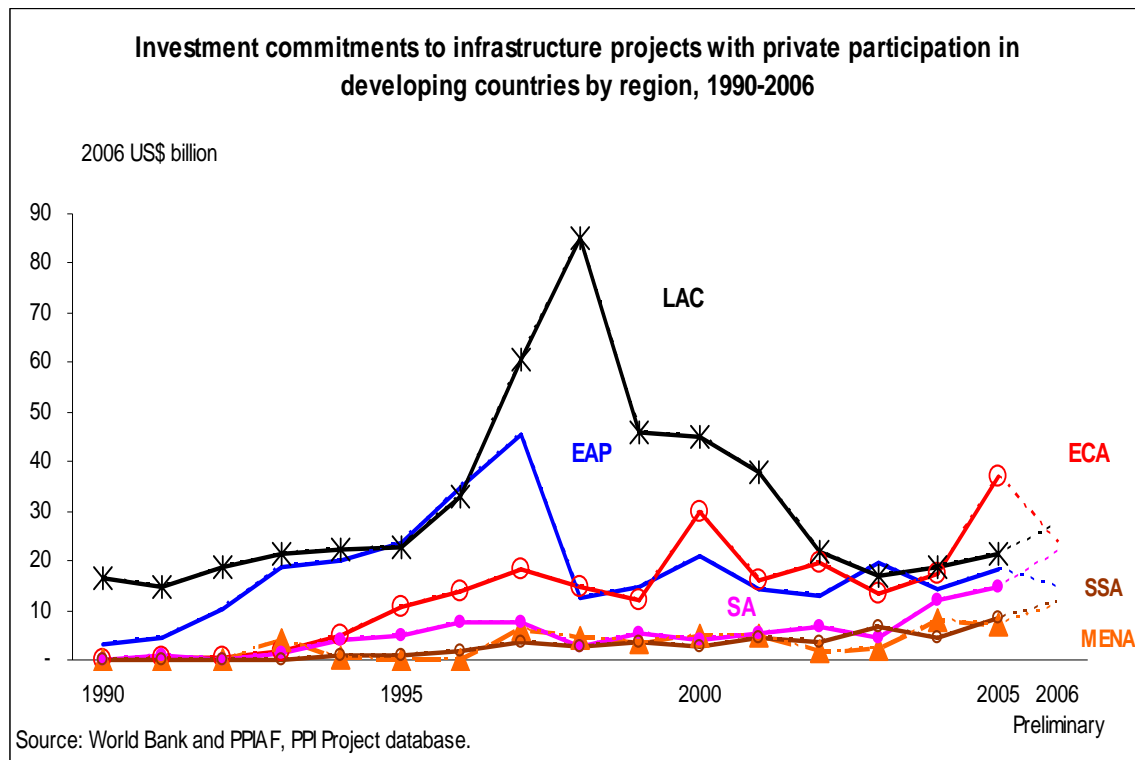
- California (2000): electricity crisis
 - Britain (2001): bankruptcy of Railtrack, the privatized railroad infrastructure company
 - Britain (2007): bankruptcy of Metronet, one of two private firms with 30-year contracts to renew and maintain London underground's infrastructure and rolling stock
-

Figure 1: Private Investment in Infrastructure in Developing Countries by Sector, 1990-2006 in constant 2006 dollars (2006 figures preliminary)



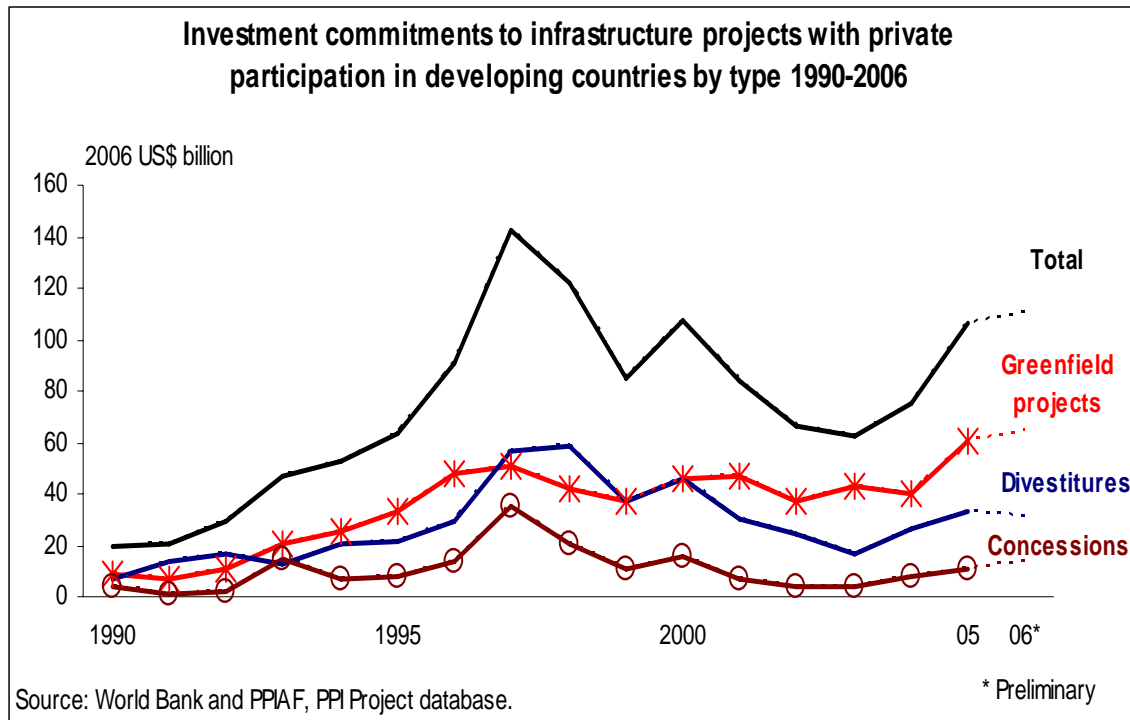
Source: Izaguirre (2007).

Figure 2: Private Investment in Infrastructure in Developing Countries by Region, 1990-2006 in constant 2006 dollars (2006 figures preliminary)



Source: Izaguirre (2007).

Figure 3: Private Investment in Infrastructure in Developing Countries by Type of Project, 1990-2006 in constant 2006 dollars (2006 figures preliminary)



Source: Izaguirre (2007).