

Infrastructure Policy

Basic Design Options

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Abstract

The paper lays out basic design options for infrastructure policy. It first sketches mechanisms to assess demand. Then it sets out a hierarchy of issues starting with choice of market structure followed by conduct regulation. Ownership options are largely a function of market structure choices. The implications for finance—the topic

of much day-to-day discussion in infrastructure policy-making—follow from these various prior choices. The discussion naturally circumscribes the role for so-called public-private partnerships—their uses and pitfalls. Annexes provide checklists for choices of market structure and for diagnosing and benchmarking policies.

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Infrastructure Policy

Basic Design Options

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Introduction

For decades policymakers all over the world have announced goals for infrastructure services. Investment goals and access goals are popular ways of framing policy. Achievements often lag pronouncements. The goals may have been ill-chosen and the policies and institutions put in place to pursue them may have been inadequate. This paper sets out the basics of choosing goals and putting in place the machinery to achieve them.

The argument proceeds in six basic blocks. First, mechanisms for setting infrastructure goals or demand are discussed. Second, market structure options are explored followed by price regulation issues. Fourth, this yields the basic arguments about ownership choices as a by-product. Financing options then derive from these fundamental building blocks. Finally, the expansion of access to infrastructure for poor people may require special subsidies. Their design follows again the basic choices about market structure and pricing. Annex I sets out the basics about how to approach overall system development issues under different market structures. Several sections are introduced by quotes and stories that aim at motivating and illustrating the basic arguments of the section.

The structure of the arguments provides a checklist of design issues – with a particular hierarchy of decision-making that will always be present whether explicitly or implicitly (see Annex II for a checklist). The approach also yields a basic framework for diagnostic work, which combines a quick assessment of the state of infrastructure development with an exploration of fundamental policy options (Annex III). Examples illustrate the way in which options vary across all infrastructure sectors depending on key features of sector technology.² (Annex IV summarizes the basic options by sector.) Annex V lists the basic forms of ownership arrangements ranging from fully state-owned firms via various private-public partnerships to full privatization. Options also vary with key features of the country environment. The core is the ability of political systems to commit to basic policy approaches. Such ability needs to be assessed case by case – no simple country typology exists.

As by-product, the paper provides a framework for assessing the numerous proposals for “innovative” partnerships and financing techniques. In particular, so called Public-private partnerships (PPP) for infrastructure ventures have become popular. Combining the advantages of both private and public parties promises reductions in costs and risks. Tapping private financial markets is supposed to permit

² The following infrastructure sectors are covered: telecommunications, energy (electricity and natural gas), transport (roads, railways, ports, airports, bus systems), water and waste management

expanded investment while containing fiscal pressures. Thus access to infrastructure services can expand - a key goal of development policy.

At the same time experience serves some warnings. Some governments have used PPPs to postpone the day of reckoning by not accounting for future fiscal obligations. Expected cost advantages have not always materialized. Rather than exploiting the respective advantages of public and private parties, some ventures have hidden costs at the expense of taxpayers and consumers.

The discourse around PPPs emphasizes ownership form and financing approaches. This paper argues that such an emphasis risks cloaking the real issues and may undermine sensible approaches. Instead of ownership and finance the prime issues are the choice of market structure for an infrastructure sector, which determines the way prices are set, and the level at which prices are set. Financial and ownership considerations derive from the primary choice about price formation processes be they market-based or regulated.

Demand

“When high roads, bridges, canals etc. are in this manner made [i.e. based on user fees] and supported by the commerce which is carried on them by means of them, they can be made only where that commerce requires them, and consequently where it is proper to make them. Their expence too, their grandeur and magnificence, must be suited to what that commerce can afford to pay. They must be made consequently as it is proper to make them. A magnificent high road cannot be made through a desert country where there is little or no commerce, or merely because it happens to lead to the country villa of the intendant of the province, or to that of some great lord to whom the intendant finds it convenient to make his court. A great bridge cannot be thrown over a river at a place where nobody passes, or merely to embellish the view from the windows of a neighbouring palace: things which sometimes happen, in countries where works of this kind are carried on by any other revenue than that which they themselves are capable of affording.”

Adam Smith (1776)

In many countries infrastructure services are woefully deficient. Complaints, for example, about lack of water or electricity service, low quality service or infrequent service are commonplace. At the same time it is not unheard of that a new road serves the estate of powerful people or that water or power systems reach them first. Roads to nowhere and prestige projects recur all too often. The demand and supply of infrastructure services may thus both be deficient. Dealing with the issue brings out the central role of prices – as determinants of demand and as incentives to supply.

Demand or “need” is often determined with reference to some “norm”. Policymakers may come to believe that development requires a certain percentage of GDP to be invested in infrastructure. Such a norm may be derived from cross-country studies on past levels of investment. Or one may set stretch

goals for service quality such as continuous service 24 hours a day. Whether in any given situation it actually makes sense to spend a fixed amount of GDP or set a single service goal is generally not clear.

Consider, for example, a norm that says a country should invest 7 percent of GDP in infrastructure annually. The basic idea behind such a norm is some notion that economic performance, typically growth, requires a fixed proportional input of infrastructure. Yet, growth theory has shed the illusion that fixed proportions of factor inputs are required to produce a desired rate of growth (Easterly 2001). The big thing in growth is not investment. Choosing the right things and producing them at lower cost matters most. Systems that stimulate genuine innovation of both products and ways of producing them are at a premium.

Choosing the right product or service means choosing it in such a way that welfare is improved. Otherwise, people are on average getting poorer not richer. Providing them in more and more productive ways reduces costs and helps raise income and welfare further.

Applied to infrastructure this means first of all establishing the level and type of demand that is welfare improving. For this one should ideally rely on a mechanism that provides a test whether the benefits of a project or service exceed its costs. In most infrastructure sectors cost-covering prices provide a sound basic test whether a project is worth undertaking. Relying fully on user fees to fund infrastructure services make sense for almost all sectors with the exception mostly of roads where the cost of tolling may be prohibitive. In some cases the role of prices in calibrating demand may also be weakened when metering is very costly and, therefore, not fully applied. Yet, cost-covering prices still provide the strongest protection against wasteful investments.

Relying on prices to reveal demand implies that policymakers instruct potential providers to proceed on the assumption that they will not receive any fiscal transfers or subsidies and that regulation will allow them to set prices at cost-covering levels in the aggregate. Providers, whether publicly or privately-owned, will then estimate demand and calibrate it against costs just as any private investors in a normal market would do. The infrastructure provider will then invest and provide the service. She can only make money, if customers are actually willing to pay the required price. Thus it is assured that investments are welfare improving. Financing happens as in any other market and is again fundamentally the same for private or public enterprises. Firms seek to obtain bank or capital market financing based on the cash flow expected from cost-covering prices. Risks for creditors are limited by the equity of the provider. Proceeding in this way also means that policymakers themselves need not take a view on “need” or demand. They can delegate this to the service provider. Furthermore fiscal transfers are not required. All this assumes that policymakers are capable of committing credibly to the announced policy of cost-covering prices. This major issue is discussed below in section 3.

Where pricing is technically or politically not feasible, social cost benefit analysis provides the best way to assess the merits of an investment. As an example, it is worth considering the approach of the Chilean government using cost-benefit analysis for major road projects. When cost-benefit analysis is used to assess willingness-to-pay of users, governments can then provide fiscal transfers that mimic the role of

prices in a normal market. For example, for toll roads governments may pay “shadow tolls” to service providers based on the number of vehicles using a particular service.

All this is trivial, were it not for the fact that many projects and aggregate investment levels are chosen without explicit mechanisms to ensure as best as possible that welfare is enhanced and productivity raised. All too often neither cost covering prices are charged nor cost-benefit analysis performed.

Politically, cost covering fees can be contentious. Water services, for example, are provided at prices that cover on average only some 30 percent of costs throughout the developing world (Komives et al. 2005). Raising water tariffs tends to give rise to acrimonious debate. Yet, a service is worth the cost when customers’ valuation of benefits exceeds cost. That means people would be willing to pay, if they did not have the choice of subsidized provision. Prices below cost stimulate excessive demand and, to the extent that this excessive demand is met, reduce overall income and thus complicate poverty reduction as well as excessively damaging the environment.

If one wants to provide very poor people with access to certain infrastructure services, there is an argument for subsidizing that access in some fashion (see section 6). Yet, this is not an argument to drop cost-covering prices as a test for the value of service provision.

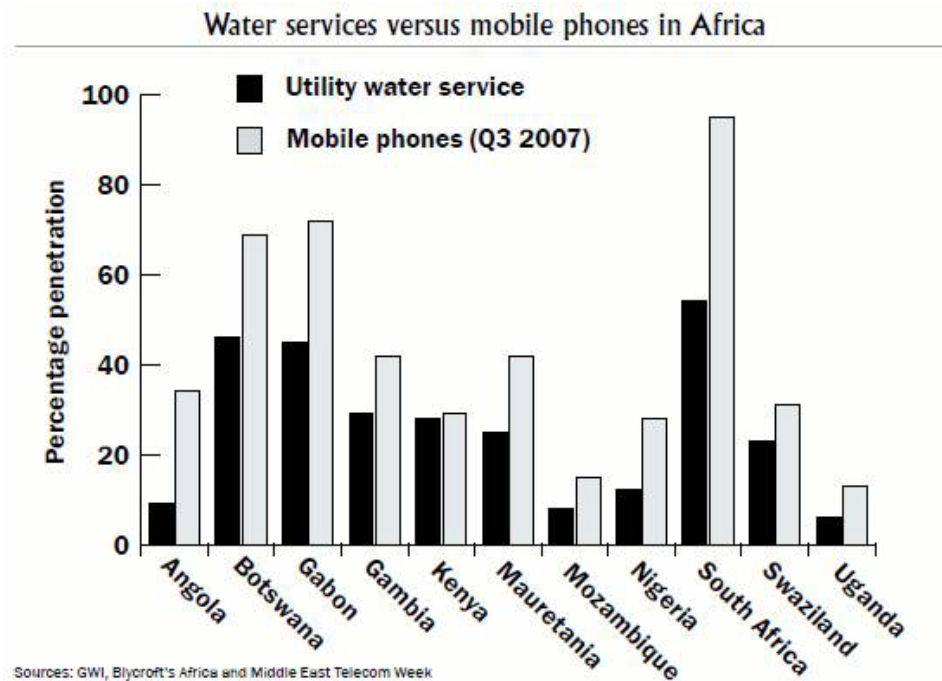
Special pricing issues arise in infrastructure sectors that are typically network-based and exhibit declining marginal costs. Average costs may then be higher than marginal costs. Pure economic efficiency considerations require a service to be priced at marginal cost. This would be too little to cover costs and supply the service. Hence, the standard argument is for governments to subsidize the difference between average and marginal cost. Yet, marginal cost pricing does not tell us whether a project is really worth doing as laid out in the above quote from Adam Smith. For example, the marginal cost of using a bridge may be zero, and there may be some demand at that price, but it does not mean that the bridge was worth building in the first place. Moreover, by introducing the possibility of fiscal transfers non-economic considerations more easily intrude on the choice of infrastructure services (Laffont and Tirole 1993).

Systems of full cost-covering fees thus remain the policy of choice on economic grounds. Where possible, price discrimination can help solve the particular efficiency issue that arises due to declining marginal costs. For example, in some natural gas systems price discrimination is allowed, traditionally in Germany for wholesale customers. As resale of gas is hard, it is possible to charge different prices to different customers. Marginal customers with low valuations just above system marginal cost can then still be served even though such prices are below average cost. Higher charges to customers with higher valuations make up for the shortfall in revenue. As pointed out in section 6, price discrimination may also help provide cheap service for poor customers while recovering costs from richer ones.

Section 1: Market structure

A tale of two sectors

For the most clear-cut demonstration of the role of prices and price formation processes consider access to water in Sub-Saharan Africa compared to access to phone services. Just about everywhere in Sub-Saharan Africa access to mobile phones is greater than access to modern water systems. And yet, official policy statements have been full of promises to enhance access to water for decades. Policy has not advocated access to cell-phones in similar ways. Hence, official policy stance does not seem the key factor.



Source: Global Water Intelligence 2008 Vol 9 Issue 5 May

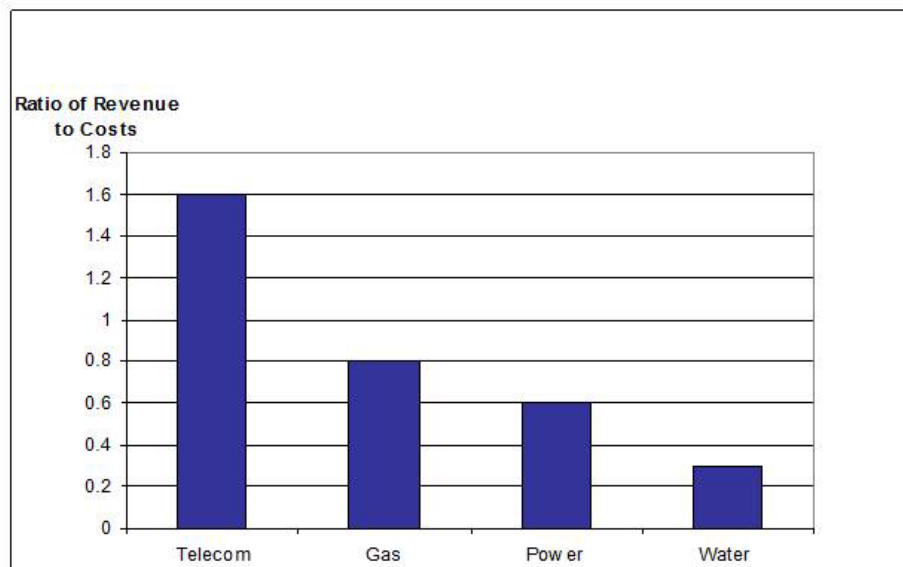
Maybe *de facto* administrative capability is more important. Both water and phones need some level of regulation. Yet, the regulation of modern phone systems is conceptually more challenging than the regulation of water systems. In all systems, regulation needs to set prices that cover costs. Costs need to be calculated and an allowed rate of return. So it is for water systems that typically have monopoly providers in any given area. In addition, in phone systems there are competitive and non-competitive segments that require regulation which deals with the segments and their interfaces. There are multiple players posing challenges to regulate interconnection. As a result, telecommunications regulation is more demanding than water regulation. Yet, it seems that African countries, including tough environments like the Democratic Republic of Congo are able to provide a regulatory environment that enables penetration of mobile phones, whereas they have trouble to the same for water. "Capacity" to regulate does not seem to be the deciding factor either.

So what can explain the divergent patterns of access? A striking difference between the two sectors is the level of prices relative to cost. In water, prices are typically barely capable of covering operating costs and tend to be at about 30 percent of total cost. In mobile telephony prices tend to exceed cost. Unsurprisingly system operators, whether public or private, who charge and collect prices that exceed costs have an incentive to expand systems and can do so. Providers who receive less than full cost have neither incentive nor financial ability to expand access.

BOX 1. Mind the Gap: Prices and costs

Prices of infrastructure services tend to be in the public domain. Yet, little hard evidence exists about the relationship of prices to costs in various infrastructure sectors. Two datasets provided by the World Bank allow sketching some basic developments. The World Development on Infrastructure of 1994 estimated that in telecommunications prices clearly exceeded costs, whereas in power costs were deemed on average to reach 60 percent of cost and only 30 percent in water³. A World Bank study on pricing and subsidies in water and power from 2005 allows a rough update of these numbers⁴. Accordingly, water prices have barely budged compared to costs. Electricity prices seemed to have reached around 80 percent of cost. No update was provided for telecommunications prices, but it seems a fair bet that prices continue to exceed costs to this day.

Cost Recovery by Public Utilities in Developing Countries



The irony is that low water prices are often defended with arguments that water is needed for life, that it is a human right. Cell-phones are neither necessary for life nor considered essential rights. Rather they

³ WDR 1994

⁴ Komives (2005)

tend to be considered relative luxury goods. Yet, people have more access to the luxury goods than to the basic necessity of water. The trick is allowing people to pay for what a service actually costs. There may then still be people, who cannot afford it, but access will expand and the problem of connecting further people will be made more tractable.

The story of water and phones throws up an additional important factor. Traditional landline telephony did not expand fast. State-owned monopoly phone companies had limited interest in expanding service. Prices were higher relative to cost than for water, but not always sufficient to cover the full cost of system expansion including the cost of capital. Incumbent managers and employees of such companies had no particular personal interest in expanding systems. They could have a relatively easy life by administering a fairly static system, while asking for bribes on the side from customers, who were begging for connections and service. The unofficial payments could exploit the gap between official prices and monopoly prices – for the private benefit of officials in such companies. There was little incentive, however, to maximize the value of the firm in state-owned firms.

The advent of mobile telephony changed this. Private companies had an incentive to maximize the value of their firms and thus expand systems. Competition kept a check on prices. Of course, the sector also benefitted from technical progress that tended to reduce prices such that price levels did not typically become political flashpoints. With enough cash flow in the system all complex regulatory problems were solved. In the water sector no amount of clever financial engineering or special ownership forms like concessions or leases could get around the basic fact that without adequate cash flow investment cannot happen. When prices cover all costs, finance becomes easy and ownership discussions can be focused on efficiency concerns rather than on shifting risks to taxpayers.

At some level this is trivial. Yet, again and again debates primarily focus on ownership and financial engineering when the core issue is lack of cash flow and the resulting lack of deal flow as investors call it. Many PPPs de facto just try to paper over the problem by seeking to shift some risks or costs to the public sector and thus the taxpayer, for example, via guarantees of various types. Instead, the prime question for policymakers is how price setting happens and what level of prices this yields. The ideal way is to have prices set in competitive markets that have pricing freedom. Prices are then set at or above cost covering levels. Competition keeps a check on excessive profit. Administrative price regulation is not needed and politicization of pricing can thus be reduced.

Market structure options

The following basic market structure options exist:

- Head-to-head competition or “competition in the market”
- “Competition for the market”
- Free entry into an unregulated natural monopoly business
- Regulated natural monopoly – with or without legal protection against entry

- **Head-to-head competition or “competition in the market”:** As in normal competitive markets customers have a choice of who to buy from; firms are free to set prices. To obtain profit firms need to offer at a price that is better than that of their competitors for a given quality. That places a check on pricing power. An exit mechanism for failing firms exists – sale, liquidation or some form of restructuring. Scope for head-to-head competition exists in the following infrastructure sectors or sub-sectors.

Telecommunication providers are the most prominent example. In natural gas there can be effective competition from competing fuels, for example fuel oil. There have been systems such as the German gas system where prices remained unregulated and entry into the pipeline business was possible. In Hong Kong SAR, China, even residential prices for natural gas were until a few years ago unregulated. In the power sector a modicum of competition may be feasible among generators as well as among electricity traders and sellers in larger electricity systems.

In transport there can be various forms of head-to-head competition. Transport ventures, such as bus or truck companies, may compete. Where multiple ports or airports in relatively close vicinity are economic some level of head-to-head competition is possible. Freight rail companies may face effective competition from road transport over significant distances. Where water is provided by small vendors selling bottles or other containers of water, for example in cities like Lagos, head-to-head competition is the norm.

- **“Competition for the market”:** Head-to-head competition may not be feasible due to natural monopoly features. The duplication of network infrastructure tends to be inefficient. A single fully built-out network can often underbid any competitor⁵. History has a number of examples where initially firms were free to compete head on, but later the market structure converged to monopoly provision. For example, in Canadian cities water utilities originally competed by laying competing pipeline networks to supply firms and households. Eventually, only one water utility for a given area remained and others left the market. In other cases, a monopoly provider started and was not challenged either because competitors could not undercut it or because entry was forbidden by law.

Even when there is a natural monopoly it may be possible to auction off the right to provide a monopoly service for a certain period. When it is possible to re-auction such a monopoly franchise relatively frequently based on the lowest price, prices can be set via auctions mimicking price competition in the market. Firms that lose at auction exit the particular market. Repeated auctions have been used to award bus franchises or waste management contracts.

⁵ Networks are said to have “natural monopoly” characteristics. Marginal costs tend to fall for additional connections making profitable entry into segments of the network infeasible as long as the network monopoly is free to charge any prices it likes. From a social point of view a well-run monopoly is cheaper than multiple competing providers due to the falling costs of the monopoly provider.

The assets of such companies, for example, buses or garbage trucks can be deployed elsewhere if a company loses a franchise. Auctions can then be held at intervals of typically one to three years that may effectively render price regulation unnecessary.

When assets are specific to a service area repeated auctions are not a sufficient mechanism to select providers and set prices continuously. It is, of course, possible to award any franchise for a natural monopoly by auction and to use the auction to set the initial price. However, repeated auctions of the same franchise tend to be impractical and no auction format has been found that can solve the price-setting problem repeatedly so as to render price regulation unnecessary. For example, when auctioning off water franchises and the incumbent water provider loses, it would be excessively costly to remove the pipeline of the incumbent and have the winner lay new ones – contrary to the case of basic bus and garbage companies. If the assets have to stay, then the following issue arises. If one holds an auction to determine the price of a service, the bidder needs to know the price of the assets. The assets in the ground have, however, no significant market value outside the franchise area. The value of the assets is thus a function of the price that the provider can charge. But that is yet to be determined at auction. So somehow the asset price needs to be fixed before the auction. That is de facto equivalent to regulating prices directly. Hence infrastructure subsectors with natural monopoly characteristics, where repeated auctions can set prices efficiently without regulation, are rare.

Existing evidence on the performance of different systems of infrastructure service provision suggests that real competition is worth its costs. This applies to systems with head-to-head competition as well as to systems that rely on repeated auctions for price-setting⁶.

BOX 2. The fundamental benefits of competition

Many, if not most, accounts of the presumed benefits of competition make the standard textbook arguments about allocation efficiency. Competition, where feasible, ensures that the optimal quantity of a good or service is produced: that means production is expanded to the point when an additional unit of a good or service exceeds its cost. Pricing power of firms is kept in check through pricing freedom as competing firms can expand market share and profit, if one sets prices higher than necessary. This type of argument is all about doing the best with a given set of techniques.

The typical allocation benefits from moving to more competitive arrangements are in the order of a few percentage points of gains in consumer surplus – once and for all. In this vein, much of the debate about pricing policy and price

⁶ Relevant empirical assessments are found in the following publications: Andres et al. (2008), Gassner (2008), Kessdies (2004), Li and Xu (2004), Newbery (1999), Pollit and Smith (2002), Winston (1993), Zhang (2008)

regulation is focused on allocation benefits – preventing exploitation of consumers.

The real power of competition derives, however, from the incentive it provides to come up with new and better ways of doing things – what has been called “dynamic” benefits. The benefits from genuine innovation may be much higher than allocation benefits and may recur as new ideas are implemented. These benefits are about new product or service offerings, not fine-tuning existing ones. Market structures that stimulate genuine innovation via some form of effective competition may well outweigh the benefits of “perfect” price regulation.

The basic idea may be conveyed in the following dialogue⁷: Imagine an analyst is facing the head of a utility with a monopoly position. She is trying to argue the benefits of competition in a market segment where it is feasible, say telecommunication or airlines. She extols the generic benefits of competition. Then the head of the utility says: “This is really impressive. Can you give me an example of what competition will do for me in my sector?” The analyst scratches her head and comes up with an example. “Excellent” says the head of the utility. “We will implement that. We are the monopoly; we can do anything. Do you have another example of what competition will do?” The analyst tried hard and comes up with one more example. “Excellent” says the head of the utility. “We will implement that. We are the monopoly; we can do anything. Do you have another example of what competition will do?” Sooner or later the analyst runs out of examples. What will happen with real competition cannot be anticipated fully. But when competition is introduced, chances are that everyone will be surprised. Ex post, innovations may seem obvious. Ex ante they are not, for example, the move to a hubs-and-spokes system in airlines after deregulation⁸. That is the real power of competition.

- **Free entry into an unregulated natural monopoly business:** Firms enter freely. In each service area a single firm survives with the power to set monopoly prices. The threat of entry forces firms to provide a service that customers are willing to pay for, even though it may approximate the monopoly price level. Price structures will be shaped by the incumbent monopoly provider to reduce the threat of entry. Typically, policy studies ignore such systems as they seem to allow unwarranted monopoly power. Yet, such systems exist in surprisingly many places. They have been documented in 32 countries for electricity and 49 for water. Many more cases are likely to exist, because traditionally they have not been considered in studies of infrastructure. Cambodia provides a telling example. De facto over 600 electricity providers in cities and villages are

⁷ The author heard this dialogue example from Larry Ruff, an expert in electricity reform, currently senior consultant at Competition Economists Group North America.

⁸ Winston (1993)

unregulated monopolists. Where they exist, such small service providers provide service to a significant number of households, often more than 50 percent.

Such systems can be socially desirable when large regulated firms do not function well. Consider the case of electricity. Typically, when a large utility does not provide good service many firms and households use standby generators to assure power supply. Yet, normally regulations forbid citizens to string a wire from their generator to their neighbor. Thus entry into the “wires business” tends to be forbidden. When it is not, people can purchase larger generators and connect a whole township or village at lower cost than relying on standby generation for each party⁹. The resulting mini-power firms may charge monopoly prices, but people may prefer that to low-quality service from the major utilities. Similarly, small pipeline systems or water vending systems “by the bucket” may spring up when small entrepreneurs are allowed to buy bulk water from the official utility for resale and the utility does not benefit from some form of “exclusivity” or legal protection against entry.

When unregulated free entry is allowed into power or water systems access can expand significantly. This is most clear cut in areas, where official utilities simply do not venture. The most dramatic example may be Somaliland, the northern part of Somalia that enjoys a modicum of peace. Here, for example, private electricity companies provide service, sometimes even laying competing color-coded lines to households. Cambodia provides ample examples also for private small water systems that use small plastic pipes to supply villages or townships. Where willingness to pay is adequate small water treatment plants can also be part of such systems. In water these small systems can actually deliver service at unit costs that are not significantly above the unit costs of large modern systems. Existing studies suggest costs that are about 1.5 times that of modern, well-run utilities (Kariuki and Schwartz, 2005). In power, unit costs can easily be double or more say 20 to 40 cents per Kwh, but still well below the opportunity cost of having no access or erratic service. Those costs can often reach 100 cents per Kwh or more.

- **Regulated natural monopoly:** Under this option, firms provide monopoly service under prices set by a regulatory body. Prices are reset by regulators periodically, typically every two to five years, to take into account shifting demand and cost developments. The monopoly may be combined with a legal prohibition of entry or not. In the latter case, pricing decisions will depend on potential entrants’ options.

In regulated monopolies firms lose pricing freedom. At least the level of prices is set by some regulatory body. The regulator may also determine full price structures. Alternatively it may leave some flexibility to firms under some form of price cap system, where the regulator may

⁹ Such options can make sense even within cities. For example, in Lagos for years there have been proposals by entrepreneurs to connect townships within the city to mid-sized generators so as to save everyone the cost of standby generation – only to be thwarted by the legal monopoly of the national power company.

set a weighted average price ceiling for a basket of prices. The regulated firm may then vary the structure of prices so as to maximize profit subject to the overall constraint.

Price regulation is open to a variety of pressures on the price setting process that may not arise in competitive markets. Regulators may be under political pressure to lower prices ex post. This is the problem of the “obsolescent bargain” leading to some level of de facto expropriation of firms. Firms in turn may anticipate such risks and underinvest to begin with. Thus the core issue of the regulated approach to pricing is the establishment of a credible regulatory commitment (see section 3).

Finally, there is the question whether one should provide legal protection (exclusivity) against entry for a natural monopoly business? This may be desirable when policymakers require the monopoly provider to cross-subsidize customers in a way that encourages inefficient entry (see section 5). New entrants may then target the customers that pay for the subsidy and offer a cheaper service thus undermining the cross-subsidy system. In the face of threats from entry it could also be that incumbent providers even with complete pricing freedom will not be able to charge a sustainable set of prices that keep entrants out and still deliver the amount of service that would be socially optimal (Train, 1991). If the regulatory system is competent and independent of extraneous pressures there may then be a reason for legal entry barriers. When this is in doubt, there may be no reason to provide legal protection.

In particular, the option of free entry even within the franchise area of a utility may help provide services with quality parameters that are more attractive to poorer customers than the standard offering of the main utility. Connections may be cheaper. Service package may provide more basic, but cheaper service. Payments terms may be handled more flexibly. The main utility could, in principle, always undercut new entrants if it had sufficient flexibility with regards to pricing, service standards and labor costs. Yet, incentives to do so may be lacking; hence the value of allowing entry (Kariuki and Schwartz 2005).

Sometimes policymakers worry that introducing markets may be more difficult than dealing with a monopoly provider. Typically, this is not the case. The free entry option set out above is precisely the default setting when governments have weak capability. It is also historically the normal initial approach to much of infrastructure provision. Some level of competition exists in some of the most challenging country environment, as in the electricity sector in Somaliland (Nenova and Harford 2004).

Mobile telephony provides a vivid example that even relatively complex forms of competition can function under difficult circumstances, for example, in the Democratic Republic of Congo. Mobile telephony shows that many low income countries are capable of dealing with the regulatory issues that arise in this market such as interconnection agreements among telecommunications providers.

Finally, competition for the market is not harder than regulating monopoly firms. It just forces governments to be more transparent and structured when running an auction to reveal the initial price for a service.

Complex forms of head-to-head competition, for example, between electricity generators only make sense in markets large enough to sustain a decent number of competitors. That rules out most low income countries. In others, such as India, it has proven feasible to organize power trading.

Section 2: Price regulation

A tale of nationalization and privatization

Historically, most infrastructure systems started with some form of unregulated private ownership – a bit like the free entry system we still find in a number of developing countries. The UK road system was originally privately funded and constructed. The first piped water system in France was set up by the brothers Perrier in pre-revolutionary Paris¹⁰. The fate of the Perrier pipeline system – nationalization following the French revolution - also highlights a key issue with infrastructure systems that are essentially natural monopolies.

Throughout history privatizations and nationalizations have succeeded each other in many countries. The basic story of why this happens goes like this. For some reason governments are unhappy with private providers. They may, for example, seek ways to reduce tariffs, be it to help politically important retail customers, to control inflation or to support industry via cheap infrastructure. For example, Prussian railways were nationalized to improve the competitiveness of Upper-Silesian coal with English coal.

Prices then easily drop below the full cost of service including investment and the cost of capital. This forces state-owned firms to slow down expansion and compromise on service quality. To some degree governments are able to support firms with subsidies. Yet, when fiscal constraints bite subsidies are cut. Service deteriorates further. Unhappiness with service provision leads to calls for reform.

Privatization is held up as a solution. Private investors claim that their superior efficiency will solve the problem. Fiscally constrained governments eventually seek to combine a solution to the quality of infrastructure with raising funds for the fiscal authorities. Infrastructure firms are privatized. The sales price reflects private expectations of future prices and the risk of governments reneging on regulatory commitments. Initially great enthusiasm reigns among private firms seeking to make outsized returns.

Then consolidation and a more somber mood set in. Some governments struggle to stick to their pricing commitments. In other cases, precisely because governments do what they said they would, investors ex post reap sizeable returns because the risks priced into the sales price did not materialize. A case in point is Argentina's telephone system that was privatized in 1989 when risks were very high exemplified by inflation still in the order of 1000 percent at the time of privatization. Some pressure to expropriate private firms ex post emerges. Calls for excess profit taxes or price reductions are widespread – as in England and Wales after the successful privatization of water and electricity. At the same time private

¹⁰ The first railroads in Japan and Thailand were concessions or “BOT (Build-operate-transfer)” schemes.

firms find that the utilities business is just that: a business with limited upside but significant downside, because regulators limit profits and pressures exist to reduce prices further or enhance access and quality without commensurate compensation.

When the level of prices becomes insufficient to expand systems and to provide quality service calls for reform arise. The value of private firms falls. Eventually governments may decide to buy up private firms at fairly cheap prices and try to solve the problem through nationalization. Yet, because prices are low, state firms cannot perform either without subsidy¹¹. Thus the cycle starts again.

Some countries, depending on the sector, have seen several cycles of privatization and nationalization, some only one and a few none. The key to end the cycle is the ability to commit to adequate prices that allow infrastructure firms to perform, whether they are privately or state owned.

Establishing regulatory commitment

Typically governments announce some form of regulatory regime for infrastructure service providers – be they private or state-owned firms¹². Firms then invest. Then it becomes clear what actual demand is like and firms operate the system to meet demand. Finally, regulators rule on the actual revenue that firms can make. At this stage regulators may de facto renege on the pre-announced pricing rule if they are under pressure to lower consumer prices or reduce profits deemed too large. Private firms know that agents of the sovereign may do so. This is a form of political risk. Firms underinvest when political risk is of significance. State-owned firms equally shy away from money-losing operations. Even in countries with strong legal systems and long regulatory traditions pressures to renege on ex ante rules can be strong. For example, in the United States in the few cases where utility regulators are actually elected by consumer-citizens pressures to curb prices have tended to undermine service provision.

To render a price regulation regime sustainable one needs to consider various mechanisms to curb ex post opportunism on the part of regulatory authorities. The mechanisms comprise i) the nature of the pricing rules themselves, ii) the legal framework under which rules are made and administered and iii) the organizational arrangements for administering the rules.

Pricing rules and commitment

Consider first the pricing rules. The greatest danger of ex post expropriation exists when some form of UK-style price cap is used. The idea behind price cap or incentive regulation was to provide firms with an incentive to perform efficiently. Thus a price would be set. If firms could provide quality service at lower cost than anticipated they could keep the resulting profit. Ex post profits may seem “too high” when the

¹¹ South Africa provides a vivid illustration of the politics of pricing in a state owned water system. Government efforts to raise prices so as to cover more costs were strongly attacked by opponents under an anti-privatization banner, even though no privatization was actually proposed, just price reform. The word “privatization” provided emotional pull.

¹² For state-owned firms governments may use performance contracts such as the contrat-plans found traditionally in France

firm was more efficient than expected. Also, prices are independent of how much capacity is utilized. When demand is low regulators may feel pressure to reduce revenues because the price charged is not just based on the cost of capacity actually used but also on that of unutilized spare capacity.

US-style rate of return regulation provides less incentive to perform efficiently, but ex post profit is limited to a maximum rate of return. Based on the “used and useful” doctrine regulators can also vary allowed revenue and provide lower revenue during low demand states and higher ones during high demand states thus matching revenue and utilized capacity more closely. The incentives to renege on the regulatory compact are thus lower under US-style regulation and investors are more likely to invest and expand an infrastructure system, even though during low-demand states they may not obtain sufficient revenue to cover all costs¹³.

In practice the differences between price cap and rate of return regulation are in any case not so sharp. A pricing rule that enhances commitment may well be superior, particularly in countries where expanding access and thus new investment is a priority.

Legal and contractual framework

Any pricing rule will be laid down in some form of legal document. It may, for example, be written in the law, in a regulatory statute, a license or a contract. Depending on the country different types of legal arrangements may have greater or lesser commitment value. Where independent regulators are functioning well a statute based approach may be adequate. In countries where investors seek protection from potentially arbitrary regulators they may prefer contracts¹⁴ that are subject to supervision by courts or even regulation enshrined in the law, which may make it hard to change. The legal form that regulation sensibly takes is thus dependent on the quality of the institutions safeguarding and administering the regulation.

Organizational and procedural arrangements

At the same time a trade-off exists between establishing commitment and leaving room to adjust regulations in response to unforeseen circumstances. Managing the trade-off between providing firm commitment and discretion is the key design issue in establishing regulatory institutions. Typically the search is for insulating the regulatory body from undue political interference and influence-peddling by regulated firms, while at the same time providing the regulator with some necessary flexibility in applying rules. Autonomy of the regulator needs to be balanced with accountability. The detailed design parameters are fairly standard and include such issues as whether to locate the regulator in a ministry or at arms-length from the executive branch, who nominates and selects regulators, who pays them and how, how much budgetary autonomy they obtain, the circumstances under which regulators may be dismissed, the processes they have to follow to establish transparency and so on, often with minute

¹³ Other schemes exist that can help build credibility. For example, the German electricity company, RWE, originally escaped nationalization by allowing government to share 50-50 in its profit. This is similar in spirit to the sharing of resource rents sometimes found in mining contracts, for example resource rent taxation.

¹⁴ Some call this “regulation by contract”, for example Gomez-Ibanez (2003). It is fundamentally not different from other incarnations of regulatory rules, but happens to rely on court-based enforcement to some degree.

detail. By way of example, regulators under “sunshine laws” in the US are not allowed to talk to each other one on one. Others have to be present to hear what they are saying so as to prevent “backroom deals”.

Dealing with problem firms

Not only regulators or policymakers may fail to honor a bargain, firms may do so as well. Firms may bid low in an auction to obtain a regulated franchise and later attempt to renegotiate contracts, notably prices (Guasch 2004). State-owned firms may become virtual states within the state. Firms may also simply perform poorly. They may clearly violate undertakings or they may perform poorly without explicitly breaking commitments. Poor performance may lead to higher prices or lower quality. At the time of a price review regulators may then be under pressure to accommodate poor performance being de facto held hostage by incumbent firms.

To some degree the process of choosing a firm when a franchise is awarded can mitigate such risk. Pre-qualification rules help select financially and technically strong providers. Performance bonds can provide a financial incentive for firms to live up to agreements. Choosing firms that have an interest in maintaining good reputation helps, rather than fly-by-night operators who may not be around for long¹⁵.

Yet, no such mechanism is perfect and even well selected providers may develop problems after some years. Whoever is in charge, policymakers, regulators or concessionaires need the ability to change providers that end up not performing. Typically, the rules of a franchise, for example, a concession contract, can set out deliverables and standards. Such documents may run into hundreds of pages detailing requirements of service. Alternatively such requirements may be laid down in licenses, laws or other types of regulations. When firms do not meet their obligations, they may be liable to pay fines, make up for sub-standard service or at the extreme face termination. For example, French concession contracts just as British privatization licenses contain clauses that allow for termination based on defined faults committed by operators.

Still, a regulatory body of infrastructure firms may come to the view that the firm is just not performing well enough even without committing legally sanctionable faults¹⁶. Hence it can be useful to allow for termination without fault. Again this may be accomplished in various ways, such as in concession contracts that by definition run out after some time or as in British privatization licenses where the secretary of state is given the power to terminate a franchise without fault. Typically, such “concession” periods extend to one or more decades to provide adequate certainty to providers. A big issue tends to

¹⁵ Colorful words are sometimes used to describe such bidders, for example, “coyotes” in some Latin American countries.

¹⁶ This is just as in the case of an employment relationship, where a supervisor may judge the quality of the work of an employee poor even though no transgression has occurred that is verifiable in dismissal proceedings.

be the incentive for franchisees to invest as the end draws near. This depends crucially on compensation rules for the case of termination without fault¹⁷.

State-owned firms can also be terminated, when there are competing ones to take over. Normally this happens when state-owned firms operate outside their own country. At home it is much harder to displace them. Still governments can change management. Yet, the time horizons and career possibilities of individual managers may provide for less interest in guarding a good reputation than those of firms seeking to operate for a long time in multiple jurisdictions.

Section 3: Implications for ownership

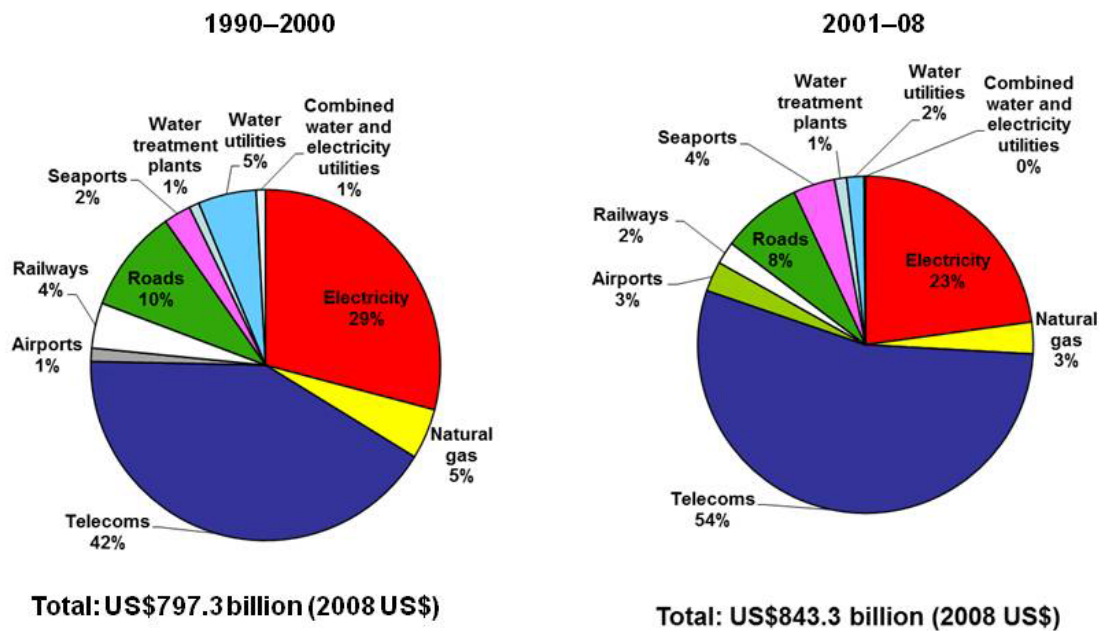
The structural choices outlined above lead into choices of ownership. Where competition in the market or for the market is chosen, the default option tends to be private ownership. A common feature of these structural options is that incumbents are “free to fail”. New entrants can out-perform them and force them to exit the market in some fashion. Free entry and exit are the essence of competition. For such systems private ownership tends to be the preferred ownership form. Private investors have their own money on the line. They have an incentive to make the firm work. When they fail it is their own money on the line rather than taxpayer funds.

BOX 3. Sectoral patterns of PPPs

Introducing some form of private participation in infrastructure is easiest when prices cover all costs. The difficulties of obtaining such price levels are greatest in the politically charged retail tariff setting for water and electricity. In these sectors prices remain typically below cost-covering levels and thus complicate any attempt to attract new investment. Mobile telephony first, benefitted from a feeling that it was a luxury good of sorts and from rapid cost declines due to technical progress. Hence, prices are still attractive to investors. Other sectors where pricing tends to be politically relatively easy are sectors that sell to large commercially minded customers, such as ports, airports or freight rail. In these sectors private participation has progressed and helped with expanding access.

¹⁷ A concession scheme that yields a compensation payment mechanism as a by-product of bidding is the Least-Present-Value-of-Revenue bidding scheme (Engel et al. 2001)

Total investment commitments to infrastructure projects with private participation in developing countries, by subsector, 1990-2008



Still there has been much private participation in water and power. How that has been achieved with such low prices at first sight poses a puzzle. The fog clears when looking at the details. Most private participation in the power sector – about 83% over the last 20 years – has been confined to generation and eschewed the sensitive distribution segment. This presumably allowed governments to avoid tackling retail pricing head on. In many cases power utilities were squeezed between higher generation prices and continued low retail prices. The rise of retail prices from 60 to 80 percent of cost over the last decade or so may have allowed government gradually to face up to cost pressures.

In water on the other hand private participation remains, unsurprisingly, very limited. As in power some 70 percent of private participation deals are in water treatment plants, much of it in China, but not in the sensitive retail part of water systems. Cost pressures there may have been contained for private concessions by auctioning them off on the lowest water price. That de facto gave private bidders the existing assets for free and thus allowed price to stay low for a while until assets have to be replaced.

State-owned firms may also compete with private ones or with other state-owned firms. In electricity, for example, France’s EDF is a frequent bidder in “privatization” processes abroad. Yet, state-owned

firms often benefit from open-ended taxpayer support¹⁸. That enables them to stay in a market even if they are not performing well. By the same token new entry is deterred as de facto subsidized state-owned firms can undercut private commercial ventures. There are occasionally well functioning competitive state-owned systems such as the Norwegian power system. Also, sometimes governments allow state-owned firms to fail as if they were private. But usually political pressures militate against this.

The same presumption for private ownership applies to free entry approaches where workable competition may be problematic. In these cases it is still possible for new entrants to displace an incumbent, for example, through a corporate takeover. That requires the ability to purchase a company and thus change ownership.

Choices of ownership are less-straightforward when choosing a regulated natural monopoly. Existing evidence shows little evidence that private providers systematically outperform public ones¹⁹. The key consideration is whether one wants a system that is designed to allow firms to be changed when they do not perform well, for example, under concession contracts. In this case, it may be advantageous to use private firms. When state-owned firms fail governments may, of course, resort to some form of privatization. Having it clear from the beginning that firms can fail and be replaced by others either by re-awarding franchises or by allowing corporate takeovers may be the more prudent policy. Generally, private firms operate a bit more at arms-length from government agencies than state-owned firms. Conflicts of interest are thus easier to avoid or manage.

The choice of ownership form may not just extend to the basic choice of private vs. state-owned. There is a continuum of ownership arrangements, loosely called “public-private partnerships” (PPP) ranging from fully state-owned firms to fully privately owned ones. The most basic choice that governments have is to unbundle ownership such that business segments that lend themselves to head-to-head competition or competition in the market are separated from segments that do not. For example, ownership of physical infrastructure in a water system may be separated from responsibility for physical and commercial operations under lease or affermage systems. Governments then have the option to bring more competition into one part of the system. However, there may be co-ordination costs between the provider of physical infrastructure and the operator. For example, higher quality infrastructure may reduce operating costs for the operator. Alternatively, governments may change management in state-owned firms. If such changes are possible, this can be an effective method. Another way of changing management is to use management contracts with non-state providers.

¹⁸ When a company like EDF operates in a foreign market and is bailed out by French taxpayers that may, of course, not trouble the foreign country.

¹⁹ Kirkpatrick and Zhang (2006), Nellis (2011),

Section 4: Finance

Two tales of finance

Two basic stories are out there about financing infrastructure development. One claims that government funds are insufficient to finance all needed investments. Quotes from private parties exemplify the argument “The World Bank estimates that in the next ten years, developing economies alone will need to invest over \$200 billion per year, \$2 trillion by 2005, in basic infrastructure. ... Raising these vast sums and effectively implementing this development is clearly far beyond the capability of governments alone.”²⁰ Some World Bank staffers also take this view: “...public sector resources in developing countries are insufficient to finance demand for investment in increasingly integrated infrastructure services.”

Adherents of this basic view argue for private finance of infrastructure ventures. Much ink and negotiation time is spilled on “innovative finance schemes” to raise private investment funds.

The other story emphasizes the cost of private finance as in this recent review of private financing for public projects in the United Kingdom. “The cost of capital for a typical PFI [Private Finance Initiative] project is currently over 8%—double the long term government gilt rate of approximately 4%. The difference in finance costs means that PFI projects are significantly more expensive to fund over the life of a project...”²¹

Taking the stories at face value there is, of course, a possible synthesis. Private finance may be expensive, but one may just not be able to do without it. So the policy recommendation would be: “If you want to expand infrastructure services, bite the bullet and accept expensive private finance”. Much of the debate about innovative infrastructure finance may then be seen as an attempt to limit the cost of finance via some type of public-private partnership, where governments shoulder some of the risks.

Both stories are misleading. Typically, governments can finance infrastructure just as well as private firms. It is only when they are credit constrained and thus cannot borrow extra amounts at current rates that some form of private finance may be superior. As for the cost of capital, governments typically pay lower interest rates than private parties in the same jurisdiction, because taxpayers stand behind the credit. That is a social cost that is not reflected in ostensible interest rates. In general it is not clear that this cost is lower than the ostensible risk premium of private finance.

Basic accounting

What does it mean that governments do not have enough money to fund all infrastructure needs? It may well be that they do not have sufficient tax revenues to fund all desirable infrastructure projects without borrowing. But private financiers have no tax revenues at all. How can they finance projects? They, of course, do so when they feel that there is enough revenue from a project to service debt and

²⁰ Michael Cobb, International Development Consultants <http://www.idcworld.com/finance.htm> (part of a current sales pitch)

²¹ House of Commons Treasury Committee, Private Finance Initiative, 19th August 2011, p.3

equity. Where does the revenue come from? Private financiers need a mix of user fees and/or government subsidies that generate sufficient cash flow to amortize a project.

Yet, when there is enough revenue from user fees and/or taxes to pay for infrastructure ventures, governments can also borrow from the private sector and pass the funding to infrastructure projects. That tends to be called government funding rather than private finance of infrastructure.

Governments may want to reduce their fiscal deficit and, therefore, turn to private finance. This may look good on one set of accounts, but overall it does not change the financial position of a government, when the government is creditworthy. Consider the following illustrative cases.

Some governments decide to privatize infrastructure ventures so as to obtain added resources. However, when one considers the balance sheet of a government, all this does is to convert an illiquid asset (the infrastructure company) into a liquid one. Net wealth remains unchanged, if the sale is at market prices. To obtain liquidity governments could also have borrowed an equivalent amount. If they sell an infrastructure company, they lose its future revenues. If they borrow, they need to pay debt service in the future. When credit constraints play no role, these transactions are equivalent.

Finally, some infrastructure services rely on tax funded payments as revenue. This is, for example, the case for toll roads that are funded by a “shadow toll” paid from tax revenue as a function of road utilization. When governments “privatize” these roads, they sell the right to operate the road to a concessionaire, but the obligation to pay shadow tolls in the future remains. Governments could also have borrowed against the future stream of shadow tolls – without “privatization”.

“Private finance” programs may actually be motivated by government attempts to hide obligations through off-balance sheet operations. For example, when the borrowing for a toll road is not by the state it does not show up as a public sector borrowing requirement or fiscal deficit. However, the future obligations to pay shadow tolls remain. The government thus has as much of a future obligation to pay as before, but it does not show up in most fiscal accounts. For that to happen, governments would need to maintain accounts that are more akin to those of corporations, which would, for example, imply publishing a balance sheet for the government as well and accounting for the present value of guarantees (Irwin and Mokdad 2010).

Normally, all these “privatization” activities only make sense, if private provision brings more efficient investment or operations. This may be the case, but in natural monopoly areas, the supporting evidence for superior private performance is weak in general. Hence, as discussed above, the case that remains for “privatization” is the decision to change providers if and when the government judges that the incumbent is performing poorly.

Credit constraints

There may, however, be a special case for private infrastructure on financial grounds when governments are credit-constrained. Some governments may not be credit-worthy, even if they receive user fees from infrastructure customers. Financial markets may not trust that the state will apply the user fees to service financial obligations in the future and fear the government may be tempted to divert user fee income to other uses. This may also be the case when the infrastructure venture is run by a separate state-owned enterprise and it is feared that the government may withhold or tax the revenues in some fashion.

In this case, privatization can act like a form of collateralization. The act of privatization establishes an arms-length vehicle (a firm) that receives the user fees for the infrastructure service it provides. The creation of private property rights may in many jurisdictions provide stronger protection for investors than promises by the state or its enterprise. This form of collateralization or introduction of “hard budget constraints” may make finance flow again to infrastructure ventures and help expand systems. The strongest evidence on the superiority of private solutions over public ones is consistent with this (Galal 1995). For example, the infrastructure privatization episodes analyzed in the heydays of privatization in the 1990s show that the main benefit was a relaxation of constraints on investment. This then led to system expansion and greater overall benefits. At the same time the government may obtain liquidity in this way that may be very valuable when it is credit-constrained.

BOX 4. Pricing and funding through ancillary services

A number of infrastructure services cannot be charged for easily. Prime examples are roads. Here it may be possible to use ancillary services to provide revenues for the venture. For example, a toll road franchise may be combined with the right to let services concessions for gas stations as well as restaurant or hotel service at rest stops along the highway. Going further, it is possible to provide a toll road company with rights to real estate development along parts, or all, of the highway. When granting a highway concession the full package of rights and obligations can be auctioned so as to obtain the best price for the whole package. Airport franchises are another example, where the right to concession services (shops, restaurants etc.) at the airport, are a major source of revenue.

Such add-ons to the basic infrastructure service can make funding possible, while avoiding recourse to the regular government budget. This is a way of making an infrastructure service independent of fiscal processes and can help insulate the service provider from undue political influence.

At the same time, there is danger of excessive subsidization. Uneconomic projects may be rendered possible by providing enough support of this type. Hence cost

benefit analysis should routinely be used to ascertain that the infrastructure service is likely to be welfare enhancing.

Fundamentally, this argument for some form of private finance solution is similar to that for project finance over corporate finance. Project finance is the incorporation of a project as a separate firm. Instead of backing the financial obligations of the project with the whole balance-sheet of the sponsoring corporation, the project is only backed by the cash flow it generates itself. However, the sponsoring firm has no longer access to the cash flow for other uses. This loss of flexibility may make financial sense, if the sponsor's credit position may be excessively weakened by taking the project on-balance sheet or if a separate project vehicle may allow tapping investors with a special preference for the type of risk associated with the project (see below).

The very loss of flexibility under some form of collateralization of project revenues can be advantageous. At the same time, making matters less flexible entails special transaction costs (Klein et al. 1996). Whether it is a "privatization" process or a project finance arrangement, there are a host of legal and contractual issues that need to be clarified that were not in need of clarification as long as a larger balance sheet – that of the state or a corporation – stood behind financing schemes.

The cost of capital

So far there is no clear case to choose private finance for infrastructure on "financial grounds", except in situations of severe sovereign credit constraints. At the same time, the ostensible cost of government debt is higher than that of private debt. Almost everywhere the sovereign borrows at a cheaper rate than sub-sovereign entities, including private parties. Is it, therefore, generally preferable to use sovereign finance?

To a large degree sovereign finance is cheaper than private finance simply because government borrowing benefits from unremunerated credit insurance by taxpayers. If taxpayers charged a market price for the insurance, the difference between public and private borrowing would often disappear (Klein 1997). Note also that a regulatory regime that assures franchisees of a return leads to risk premia of finance that approximate that of the sovereign as no significant financial risk is borne by investors.

Yet, there are other cases, where the difference in the cost of private and public finance for infrastructure is due to other factors. First, many forms of private finance schemes are for infrastructure ventures that use incentive contracts shifting performance risk to service providers. This could take the form of price-cap regulation or other incentive contracts. When performance risk is shifted to a

provider, it means – by definition – that there is a risk of financial failure²². Hence, risk premia for such finance are higher than for sovereign borrowing for infrastructure where the sovereign has to repay no matter what. In fact, when a government awards an infrastructure franchise to a state-owned firm under an incentive contract, a similar risk for creditors arises. One is the risk that an infrastructure franchisee may lose the franchise for reasons of no fault as under a concession contract²³.

Second, private rates for finance may be high, because there are unnecessary man-made risks embedded in the private scheme that are not there for sovereign finance. The core risk is the one discussed above, namely government commitment to the rules of the game. This includes all political risks, not only adherence to the announced regulatory rules, but, for example, also to general rules about expropriation and in the case of foreign finance to rules of currency transfer and convertibility. To some degree such political risks can be insured by supra-national or foreign agencies such as MIGA. When government commitments are credible, the risk disappears, no insurance is required and the risk premium on finance for this reason disappears.

Traditional social-cost-benefit analysis sometimes assumes that governments have a way of spreading risk that is not available to private parties and, therefore, genuinely renders sovereign finance cheaper than private finance. Basically, when governments can spread razor-thin amounts of risk over very large numbers of taxpayers to finance projects the return on which is uncorrelated with economic growth this might be the case (Arrow and Lind 1970). Yet, this is not possible for many governments and as a general proposition it would not hold – or all finance should be sovereign (Klein 1997).

In sum, private finance is neither a solution to bad project economics, nor excessively costly. The decision to go for some form of private rather than state solutions generally needs to rest on grounds of efficiency of an incentive regime, not on grounds of finance. The only time when private finance can per se have some notable advantages is in times of fiscal crisis with severe credit constraints for the sovereign.

Financing structures

Many times one hears calls for “innovative” financing structures to unlock extra infrastructure investment. Some structuring deals with real risks and allocates them better. Other types of structuring are more like snake oil trying to hide reality. Consider first the main structuring issues.

Whether an infrastructure is incorporated as a state-owned or private firm, the key factor driving financial structuring options is the choice of market structure for the infrastructure sector, in which the

²² It is, of course, possible to devise contractual arrangements that allow for failure in some respects, while keeping finance for major physical infrastructure sovereign. For example, management contracts or leases may have incentive schemes that reward and penalize providers, while the infrastructure is funded with a sovereign guarantee. To the extent that the franchisees finance themselves, such financing is exposed to some risk of non-performance.

²³ See Engel et al. (2001) for a discussion of schemes to minimize the cost of the risk arising from ending a concession-type arrangement.

venture operates. Broadly, one can distinguish situations where firms earn their revenues in markets with real competition and those where they receive a regulated return on a monopoly position. In the first case, there is market risk; in the second, there is not. Without market risk, investors are often willing to provide high levels of debt, say 70 to 75 percent of project cost. Thus equity levels would be just 25 to 30 percent.

In competitive markets, new disruptive entry is possible and by the same token exit and bankruptcy of incumbents. Therefore, when there is market risk, financiers tend to require significantly higher equity cushions.

Sometimes arguments are made that subjecting infrastructure projects to the discipline of private finance will bring efficiencies via “capital market discipline”. In regulated sectors, regulators tend to set prices at levels that cover the cost of capital making bankruptcy a remote risk. This also means that the discipline that capital markets bring to such an infrastructure company is only as strong as the regulation that sets the price. Capital market discipline itself is not a significant factor. In such cases the risk premium on private finance will tend to be low.

Many infrastructure ventures are long-lived and are easier to finance if long-term debt is available. Prima facie this makes some form of securitization advantageous. Typically, the best-placed debt financiers for the construction phase are banks who can analyze and supervise the project closely. At the same time, banks tend to fund themselves with short maturities and are sensibly reluctant to invest in long-term assets. Hence, as in the case of housing finance, it makes sense for banks to originate loans and supervise construction, but then to sell the loans to investors with long-term liabilities such as pension funds or insurance companies. These are typically not set up to supervise the gestation and construction of infrastructure ventures, but are typically well-placed to invest in long-term assets once they function. Project finance schemes for infrastructure ventures allow, of course, securitizing the assets of a particular venture.

Securitization may also play a special role in financing of ventures exposed to market risk. There tends to be a high probability that the company will earn some level of revenue. A “senior” tranche of revenue can thus be used to securitize relatively high-quality cheap debt. Other more risky tranches of more expensive mezzanine debt can be issued against more uncertain parts of the cash flow.

Special guarantees may also be useful to unlock infrastructure finance. Political risk guarantees can help countries obtain financing while establishing credibility. However, any commercially minded insurer will not write political risk guarantees for governments unwilling to improve the risk. In that case there is nothing to insure. There is just a “certain” risk to be borne and paid for. On the other end of the spectrum, governments that have fully established credibility do not need any political risk guarantee.

When it comes to credit guarantees there is no prima facie reason to prefer guarantees to loans or vice versa. The price of a loan without default risk plus that of the guarantee is equivalent to a normal loan

with default risk. It could be that transaction costs for one transaction are cheaper than for the other and this would then lead to a preference.

More generally, however, the world of infrastructure is full of “innovative” schemes. Some exploit regulatory arbitrage. For example, a guarantee might need less regulatory capital than the same risk embedded in a loan²⁴. Some schemes try to find ways of avoiding complications with decision-making. For example, off-balance sheet finance for private infrastructure would not affect the public sector borrowing requirement as typically reported. In that case, governments might be able to skirt, for example, parliamentary approval. In many cases, complex financial engineering shifts risks to taxpayers in not always fully transparent ways to paper over inadequate cash flow from a project. When governments are and remain creditworthy this is like an (non-transparent) subsidy. When credit constraints kick in, the schemes may become useless, because the sovereign cannot or does not want to honor the guarantee.

Overall, financial structuring can help finance infrastructure ventures, but nothing can be done about projects that suffer from inadequate cash flow. Only sound pricing decisions can help. That includes decisions to have taxpayers subsidize a service. But this is not a financing decision, it is a pricing decision. This leads to the last building block of infrastructure policy – subsidy schemes.

Section 5: Access and subsidies

“When the toll upon carriages of luxury, upon coaches, post-chaises etc. is made somewhat higher in proportion to their weight, than upon carriages of necessary use, such as carts, waggons, etc. the indolence and vanity of the rich is made to contribute in a very easy manner to the relief of the poor, by rendering cheaper the transportation of heavy goods to all the different parts of the country.”
Adam Smith (1776)

When prices are set at levels that cover all costs of an infrastructure project including the cost of capital, systems will be built out until all customers are served that have willingness-to-pay (consumer surplus) greater than the cost of service. That means everybody who values the service more than it costs is served.

However, policymakers may also want access to infrastructure to be extended to customers with willingness-to-pay below the cost of service. First, it should be noted that poor people often pay higher prices per unit, for example, of water or energy than rich people. Water vendors may charge prices that are several times that of unit costs of modern water services. As exemplified, for example, by the market for water in Lagos, that does not typically reflect excise profit-taking but cost of service. The electricity that poor people typically buy first is a battery to power basic appliances like a TV and refrigerator. This is one of the most expensive forms of power. Hence, merely allowing people to pay full

²⁴ That was the case with liquidity guarantees for off-balance sheet securitization for banks before the recent global financial crisis.

price for a service tends to expand access. Based on the limited evidence available access to water or power may cover several extra tens of percent of the population, if effective pricing schemes are implemented. This may require allowing free unregulated entry as discussed in the first section.

Some poor people may pay high unit costs for service, but they buy very little. For such small quantities it may not be economic to build out an infrastructure system. Finally, willingness-to-pay studies show that in many countries there are very poor people who still cannot afford modern service and continue to live with low quality provision, for example, walking many hours to fetch water of questionable quality.

Where possible, price discrimination is a way to charge rich people more and poor people less as in the quote from Adam Smith at the beginning of this section. Price discrimination is an efficient form of cross-subsidy. One way to discriminate prices is to offer populations with low willingness to pay a special and appropriate price-quality mix. For example, poor people may not be able to pay regularly, but when they have money. Water vending systems from buckets are a way of accommodating this. They may get simpler pipeline systems. They may get a flexible service offering and more appropriate quality standards – better than what they have, but less demanding than found in some of the most modern water or power systems. For example, it may be worth having access to water even if it is not fully treated. For many uses, such as flushing toilets treated water is not needed. Boiling may be the preferred way to make sure drinking water is safe. They may get more flexible payment terms. As discussed before, allowing entry of “unconventional” service suppliers can be helpful ranging from for-profit vendors to community-based organizations.

Governments may also provide subsidies to deal with affordability concerns. Yet, many subsidies do not effectively enhance access. For example, subsidies in an existing utility may simply help those already connected. The subsidies may then just benefit the better-off as evidenced in a number of studies (World Bank 1994, Komives et al. 2005). A key issue is thus focusing subsidies on expanding access. This may, for example, be done by providing subsidies for new connections. A second core issue is targeting subsidies to poor people. This requires either means-testing as in the Chilean water subsidy system or targeting certain areas where poor people tend to live or so-called life-line rates that provide a minimum level of service at low rates. In the latter case, there remains, of course, the issue that such subsidies benefit all customers regardless of income level.

The level of subsidies required depends obviously on the cost of service. Required subsidies may be calculated in the same way as regulators calculate required tariffs or they may be established via auctions such as water connection subsidies in Cambodia.

User fees tend to be paid when service is actually delivered. Similarly, subsidies can be made dependent on service delivery by infrastructure providers. However, many times subsidies are embedded in financing terms upfront. This is obviously preferred by providers and it suits those who can sweeten financing terms with subsidy, because they get more business. However, incentives to deliver efficiently suffer.

The subsidies may be funded by recourse to various types of tax revenue or they may be funded in the form of cross-subsidies. Here some consumers pay tariffs in excess of cost, for example, urban consumers which allow the franchisee to live with lower tariff for poorer customers, say in rural areas. The way in which such cross-subsidies can be used depends on the scope for competition in the infrastructure sector. When there is head-to-to head competition, expensive tariffs in urban areas may attract new entrants that undercut the incumbent who is cross-subsidizing from urban tariffs. In this case, a general tax scheme on all providers can be implemented as in the case of several telecommunications regimes, where a general levy goes into a “universal access” fund.

Cross-subsidies have one potential major political benefit. They may render service provision possible without dependence on the regular fiscal budget. Cutting the link (“the umbilical cord”) between fiscal accounts and utility accounts can serve as an important shield against undue political interference in utility business and enhance the credibility of pricing policy. This is similar to the argument for privatization so as to protect the financial integrity of a utility.

In sum, subsidies can help. Yet, the first line of defense for expanding access remains the choice of market structures that provide the incentives and the flexibility to provide service to the maximum number of citizens based on cost-covering prices.

Annex I:

Market structure and system development approaches

When there is a single firm in a market for infrastructure services the development strategy for the system as a whole appears simple: draw up a least-cost master plan and let the monopoly implement it. When, however, multiple firms operate in a market, system development may require interconnection rules (including access pricing principles) and incentives for firms to build out systems in a sensible way. A variety of approaches may be used. In the following some illustrative cases are mentioned. The precise way to enable adequate system development depends on the technology of the sector and the chosen market structure. The key point is that regulation can render all market structures compatible with sensible system development strategies.

In network industries with head-to-head competition interconnection protocols are the main required tool. As in the case of mobile phone companies the built-out of the network may be left to the various parties as they have an incentive to serve all customers that are willing to pay a price that covers the cost of service. No master plan is needed. However, in this particular case a scheme to allocate scarce radio spectrum may be needed.

Electricity systems typically require more extensive rule-making. The transmission network will need to be built-out in line with a master plan as even nodal pricing by itself does not fully provide the right investment signals. Interconnection rules and access prices shape incentives for siting new plants, the major system expense. Extra complexity arises when intermittent distributed sources of power are envisaged such as sale of electricity from private household generation to the grid or possibly, in the future, sale of electricity generated by cars during non-driving hours. This requires standards and pricing rules for access to the grid.

Water systems are often limited to a city or small area. Yet, many large cities may have multiple interconnected water providers. A classic case is the water system of Paris with one concessionaire operating on the left side of the Seine and the other on the right side. More recently such a split city system was introduced in Manila about a decade ago. Having multiple providers may provide a measure of benchmark competition. Interconnection between the systems is regulated, for example, via a concession contract. System development may be possible via master plans for each concession area or may require an overall plan that coordinates to some degree the built-out of systems with multiple players.

Finally, there are infrastructure sectors where multiple providers may not just run different independent networks, but where such providers are just responsible for a piece of the network that cannot at all stand on its own. Examples are toll road operators for selected roads in a network of highways such as in France or railway track operators for part of a system as in the

United States of America. In this case, system development requires a broader scheme such as a master plan for roads that precedes the decision to award a part of the system to a separate service provider. But there are also natural gas pipeline companies that operate just a single pipeline that is part of a larger network. To some degree entry into this business can be left to market forces, if there are nodal prices set by market forces in a larger gas system. But typically some level of overall system development planning is still required.

When governments want to expand access to services to people who cannot afford cost-covering prices, some level of subsidies is needed. Service providers can then respond to the enhanced purchasing power of the subsidized consumers. Where master plans are needed, these then specify also which areas with poor people are to be connected. Setting the level of subsidy does, of course, require knowledge of expansion and operating costs. Establishing the subsidy is thus a challenge equivalent to price regulation at least for the subsidized consumers.

System development in systems with multiple service providers is complex. At the same time even, if a single company is in charge of a system, the internal units of that company need to be managed and incentivized in ways similar to that of separate companies. Moreover, large companies can become states within the state and may be harder to regulate than multiple companies. At the same time both water and electricity systems also show that multiple providers may be an obstacle to system development, if interconnection cannot effectively be imposed by regulation. Historically, particularly municipality owned service providers have tried to guard independence and resist regulatory strictures. Witness the history of the British electricity system or the water system of Mexico City.

Fundamentally, the hand of regulators is strengthened for purposes of system development planning and ongoing regulation, if a possibility exists to change an incumbent provider in any part of the system. In markets with free entry this is an in-built feature. In natural monopoly segments of infrastructure systems, where head-to-head competition is infeasible, this provides the ultimate rationale for concession-type ownership schemes that allow the government to switch providers under certain circumstances (see section 3).

Annex II:

Checklist and hierarchy of basic design decisions

The first level of decision-making: Choice of Market Structure

- Is head head-to-head competition feasible?
- Is frequent re-bidding of the franchise based on the lowest price feasible?
- Should free entry into a natural monopoly business be allowed without price regulation?
- Should natural monopoly business be a regulated franchise?
- Should the natural monopoly franchise be legally protected against entry?

The second level of decision-making: Choice of regulatory framework

- What pricing rule for the monopoly?
- What legal and contractual framework to embed the rules in?
- What organizational and procedural arrangements should govern the exercise of the regulatory function?

The third level of decision-making: Choice of ownership

- Should some form of private participation be sought?
- For which function of the business should private participation be sought?

The fourth level of decision-making: Finance

- Should some form of private finance be used or sovereign finance?
- For which part of the business should private or public finance be used?
- How should the financial transaction be structured?

The fifth level of decision-making: Subsidies

- Should subsidies be used to expand access to infrastructure?
- Who should be targeted and at what cost?
- How should the subsidy be funded – from general or special tax revenues or some form of cross-subsidy?
- Should the subsidy be performance-based?

Diagnostic approach

A diagnostic of infrastructure is meant to identify problems in the provision of services and to help formulate policy responses to remedy them. Diagnostics by their nature compare “what is” to what “could be or should be”. “What is” is thus benchmarked against what could or should be.

Essentially there are three ways of benchmarking the state of infrastructure in a particular jurisdiction – benchmarking performance against the situation in other places or against chosen standards. Alternatively one can benchmark against what we know about best practice in policy-making.

Basic performance benchmarking

The first two types of benchmarking assess system performance, the latter one benchmarks policy. Basic performance benchmarking can be performed by using relatively simple indicators that are widely available across countries. Three types of indicators may be considered:

- Indicators of access to infrastructure services and/or quantities of services provided
- Indicators of quality of service, and
- Indicators of productivity or efficiency of service provision

Indicators of access vary among sectors. They might directly measure access as in the case of water or electricity where data exist covering the share of the population in certain areas that has access to service. In other cases one may use indicators such as the number of phone lines or cellular subscriptions per person or the length of roads per inhabitant or in relation to the size of territory.

Indicators of quality may be available for sectors such as water and electricity. For example, data may exist on the reliability of service provision such as the number of hours per day that water is available or survey data may provide an estimate of the extent of standby generation for power supply.

Finally, simple productivity and efficiency indicators may be used. This includes data on electricity transmission losses or unaccounted for water. Indicators on the unit cost of service provision, such as “cost per cubic meter of water” are useful, yet already harder to obtain. Basic productivity indicators include the number of staff employed by service providers per customers served.

Collecting such basic sets of indicators for a sector and comparing it to countries at similar levels of income provides a basic first cut at system performance. One can thus identify whether major problems exist in a specific country and sector or whether, broadly, performance is adequate or relatively good.

Linking performance benchmarking and policy analysis

Basic or more elaborate benchmarking of performance may be complemented by exploration of policy options. Such options could also be benchmarked against a view of what constitutes good practice based on currently available evidence. In the following an approach to diagnosing policy is set out that

complements performance benchmarking. To begin with the link between performance benchmarking and policy analysis is discussed.

First, consider benchmarking performance to that in other countries, cities, regions etc. One may find that a country lags in performance compared to others. But finding that infrastructure in Sierra Leone has deficiencies compared to that in Singapore may not provide much help for formulating policy responses. Sierra Leone is different from Singapore in respects. This makes comparisons of limited relevance for policy purposes. Hence one may benchmark against countries that are somehow similar, what some call at a similar stage of development. This could give a better appreciation of what may be achievable in Sierra Leone in the next stage.

Defining what is similar is a tricky business. Every place differs in many dimensions from another and figuring out what dimensions matter for designing policy responses is hard. The most detailed benchmarking exercises that have been carried out in infrastructure are found within countries, for example, water company performance in England and Wales or electricity distribution in Chile. In no case has it been possible fully to determine the relative performance of different utilities. For every data point that suggests one is performing better than the other another difference in initial conditions could explain the difference. If one wants to push precision, one can thus often argue: “yes, our situation is worse, than in some other place, but that is due to constraints on our place that we cannot change. It is not due to infrastructure policy or company performance”. Still benchmarking against other jurisdictions may provide a sense of the things that are potentially deficient in a particular infrastructure sector.

If one wants to move from benchmarking performance to policy recommendations, one needs to move from factual comparisons to a view about what “could or should” be possible in a particular place. That brings in benchmarking performance against particular standards. The standards need to be realistic. To some degree, a feeling for what is realistic can be developed from cross-country comparisons or comparisons among other jurisdictions, such as cities. It is, for example, common to see how much different countries invest in infrastructure as a share of GDP and to recommend a “norm” of how much should be invested. The number “7 percent of GDP” currently enjoys some popularity. Or one may call for service standards that require continuous service 24 hours a day, 7 days a week.

In all these cases, the standards are somewhat arbitrary and it is not clear whether they will lead to the best possible use of resources. Fundamentally, such standards do not result from a mechanism that reveals whether the benefits of implementing them exceed the costs. Also it is not clear whether a feasible policy response exists to make it happen in a particular place. It may be regrettable that service provision is not great, but if nothing can be done, one needs to accept it.

Unless one has a view that there is, indeed, a suitable policy and management response nothing follows from setting a standard. To use an analogy, an old person may run more slowly than a younger one, but that may not be due to insufficient effort of the old person, but just due to age. Only when we can argue that the old person could do better by exercising more, eating better, or taking appropriate medicine does the benchmarking become relevant for what to do. Not only that, but the standard to be achieved

by the old person can be left to her own decision by confronting her with the costs she would have to incur to achieve improvements. It may thus be possible to design a “policy” that helps reveal the standard preferred by individuals.

Implicit in all benchmarking exercises is thus a view about the policy responses that are feasible and their effectiveness. This brings us to the third way of benchmarking. By setting out the basic policy options available to a country and comparing them with what has been done so far, one can identify a potential “policy gap” that may be helpful in designing better policy. In this type of benchmarking the view about policy options that may be relevant is made explicit. It is also possible to assess mechanism for revealing demand rather than using a priori views about what level of service provision is appropriate.

This paper has laid out a framework that identifies the basic policy options for infrastructure. The following broad framework of questions may be helpful in structuring a diagnostic of infrastructure policy in a particular country and sector.

Determination of demand:

What mechanisms exist to ensure that an efficient level of demand for infrastructure services is revealed?

- Are user fees set at full-cost covering levels (incl. the cost of capital)?
- If not, is credible cost benefit analysis used routinely?
- If neither is the case, how is demand derived? What reason is there to believe that the method of determining demand is welfare-enhancing? What are the risks that uneconomic demand is stimulated?

Market structure regulation:

Can some form of competition be tapped to enhance efficiency of provision and/or access to services?

- Is there scope for head-to-head competition in the sector (competition “in-the-market”)?
- Is there scope for auctioning off franchises repeatedly (competition “for-the-market”)?
- If real competition is not feasible or politically not chosen, should there be free entry into the sector in question? What could free entry achieve that monopoly provision might not? Does the incumbent provider of monopoly services have a good track record or not? Could free entry allow greater variety of service offerings? Could free entry allow greater access? Should free entry be considered for regions of the country where access is still limited or inexistent? Should free entry also be allowed within existing service territories?
- Should monopoly providers be regulated? Should prices be regulated? Should quality be regulated? Does the existing system of regulation, for example, a ministerial office providing price and/or quality regulation have a good track record? What would be the downside of

limiting regulation? Could it be that the benefits of not regulating, for example greater access outweigh the costs, for example, higher prices?

Conduct regulation:

How to establish the credibility of regulation so that investment comes forth while preserving incentives for efficiency as best as possible

- What pricing rules are sensible? Should there be an emphasis on pricing that promotes credibility or on pricing that promotes efficiency of provision, e.g. rate-of-return regulation vs. price cap? Should there be emphasis on pricing that promotes system expansion or pricing that incentivizes greater efficiency in an existing system?
- Should regulation of quality emphasize uniform standards or allow provision of differentiated services? Should rules aim at achieving high technical standards or at providing more basic services?
- In what way should the rules be anchored? Should they be embodied, for example, in laws, statutes, contracts, licenses, decrees, administrative circulars etc.?
- Who should make and/or adjust the rules? What role for the legislative branch, what role for the executive, what role for separate regulatory agencies?
- How can regulatory offices be insulated from undue political influence, from capture by interest groups and still be held accountable? Issues arising cover remit of regulators, appointment of regulators, payment, funding of the payment, liability etc.
- How should regulatory processes be organized (Rule-making, monitoring of rules, enforcement)? What consultative processes should be used? How will decisions be taken?

Ownership choices

What mix of public and/or private ownership arrangements should be aimed at?

- Is there some degree of effective competition that may make reliance on private owners, who have their own money on the line, desirable?
- Is it conceivable that multiple public enterprises could compete effectively? Could they truly exit the market in case of underperformance?
- Should one consider foreign public enterprises like private companies, because the local taxpayer is not exposed to losses or because technical capacity is not available at home?
- If market structure does not allow significant competition, should one split ownership rights, for example, by separating the right to conduct commercial operations from the right to invest and own the fixed assets? Would this lead to significant competition for the right to operate commercially? Would the benefits from such competition outweigh the potential co-ordination issues at the interface between investment and operations?
- If market structure does not allow significant competition, is there a mechanism to deal with performance failures of the monopoly provider? Is there a mechanism for terminating the right to provide service for fault and/or without fault? Is bankruptcy possible? How can assets be

transferred to new owners? Can creditors attach rights and pass them on to new service providers?

- If there is a possibility of termination without fault, there is a de facto concession-type arrangement. What rules should there be for termination so as not to create risks for concessionaires that raise risks and thus the cost of capital unnecessarily? Can this be dealt with through flexible concession duration, for example, under least-present value of revenue concessions and/or through appropriate compensation schemes for termination of ownership?

Finance:

- Where real competition exists, how can one ensure that de jure or de facto taxpayers backing does not undermine market discipline?
- Generally, how can one ensure that reliance on user fees is credible and taxpayers are not exposed in some form to the risk of failure?
- If taxpayer support is needed in some form, is the government credit constrained or not?
- If government is credit-constrained, how can one make finance flow to infrastructure?
 - o Can privatization help in some form by dedicating cash flows from infrastructure services to a specific infrastructure venture rather than letting revenues pass through fiscal accounts?
 - o Are some type of guarantees of government obligations necessary? Should such guarantees be given or is the government not likely to honor the guarantee?
- How does government account for exposure to infrastructure ventures? Are all obligations transparently accounted for? Are “off-balance sheet” exposures possible? In particular, are future obligations (fee payments, guarantees etc.) transparently accounted for, including their present value?
- Are local banks capable of financing infrastructure?
- Do local capital markets exist that allow refinancing of infrastructure after construction? Can debt of completed infrastructure ventures be securitized?
- To the extent that local financial markets are not capable of providing finance, does it make sense to borrow from abroad? What types of borrowing make sense given exposure to exchange rate, convertibility and transfer risk? Given the risks, would it be sensible to redo cost-benefit calculations with realistic assumptions about risks? Would these change the choice of project, for example from one or a few large-scale projects to a series of small ventures that can be handled financially more easily?

Access and subsidies

- What is willingness to pay for services among different population groups?

- When pricing according to willingness to pay, how far can access be expanded, taking also into account options to offer services of differentiated quality and exploiting possibilities for price discrimination?
- If one wants to expand access beyond what can be achieved relying in some form on willingness to pay, what level of access is desirable? What are the costs and benefits of different levels of access?
- What level of subsidy can be sustained? How can it be funded?
- How should subsidies be designed? Should they be focused on expanding access? Should they support existing customers by reducing their payment burden? What subsidy schedules should be used, e.g. lifeline rates.
- Should subsidies be performance-based?

BOX 5. Assessing the state of infrastructure and policy implications – The case of Vietnam

As an example of basic issues arising in assessing policy consider the case of Vietnam. In the early 1990s only some 14 percent of the population had access to the electricity grid. Today almost everyone in the country is connected with access reaching 97 percent, more than, for example, in Indonesia. Quality of service remains an issue. Outages occur regularly. Their duration is longer than in other comparable countries in East Asia, their frequency a little less. Overall, the cost imposed on the economy is similar to that of other low and lower middle income countries in the region. In sum, impressive progress has been made in a fairly short period of time, although problems remain.

What was the policy that drove this performance? In 1995 Vietnam created a public enterprise, EVN, to manage the electricity system. Prices were kept well below cost. Fiscal transfers as well as other revenues of EVN funded the system expansion. Prices were actually more heavily subsidized than, for example, in Indonesia.

What does this imply for policy direction? Is it good to rely on state-owned firms and to charge very low prices? How does it relate to the default assumptions outlined in this paper, which tend to favor cost-covering prices and commercially oriented enterprises?

Intriguingly, the current government in Vietnam is now attempting to raise prices, to attract private generation providers and private finance and is also considering the merits of some level of competition among generators. Overall, it appears that the foundation of EVN was a step towards a more professional and commercial approach of managing electricity provision. Low prices could be maintained because fiscal resources were made available. Also, EVN diversified

into other profitable businesses including telecommunications, which allowed the company to remain viable.

Yet, the costs of the approach have also become apparent. First of all, it is not clear whether it might not have been better to go for better quality rather than universal access. For example, providing businesses with reliable electricity might have provided more benefits than having everyone obtain low quality service. Second, low prices lead EVN to focus on profitable ancillary business, which risks diverting attention and slow further improvements. Fiscal strains also provide government with an interest to seek alternative options such as private finance for private generators. This in turn requires cost covering prices, if continued dependence on fiscal support is to be phased out.

Overall, Vietnam has taken selected steps towards the policy “defaults” laid out in this paper. As is typical partial reforms may go a certain way to improve performance. Yet, as incentives under the past policy have played out, it is becoming apparent that further steps in the direction of the default policy make sense.

Annex IV:

Illustrative list of structural options for different sectors

A. *Where is head-to-head competition feasible in principle?*

Electricity:

- In generation and supply (trading) when the system is large enough to allow at least four competitors to survive in these sub-markets market.

Natural gas:

- Among gas production units
- Among non-pipeline based gas transport carriers, such as LNG carriers
- In the pipeline system, where substitute fuels (e.g. fuel oil) provide adequate competition
- In large pipeline systems with nodal pricing some level of competition in building new pipelines may be feasible

Transport:

- In road transport systems among cars, buses and trucks
- In freight rail systems, where there is effective intermodal competition from trucking
- Among ports and airports that are not far from each other
- Within a large port among different container terminals

Water and waste management:

- Among water vendors using bottles, buckets or other transportable containers
- Conceptually – as in power and natural gas – there could be competition among water supply sources in large water pipeline systems, but in practice not yet
- Among landfill providers
- Among scavengers

B. *Where is repeated bidding for monopoly franchises feasible? (Among services that do not require franchise-specific assets)*

- Contracts for the operation and management of monopoly franchises
- Bus services
- Garbage collection services

C. *All infrastructure sectors can be run as regulated or unregulated monopoly franchises with or without legal protection*

Annex V:

Basic options for Public-Private Partnerships (PPP)

Allocation of risk to private sector

Type of ownership arrangement

None

State-owned enterprise

Service delivery for state-owned firm

Service contract

Management service for a franchise

Management contract

Commercial operations of a franchise

Lease, affermage

(incl. risk of non-payment)

Commercial operations and investment

Concession, privatization²⁵

²⁵ There is no significant difference between a full concession and privatization of a monopoly franchise. Take the example of French water concessions vs. English water privatization. Can the English owner decide to turn off the taps? No. Can she dig up the pipelines and take them elsewhere? No. Can she set any price she wants? No. Can the privatization be terminated for fault? Yes. Can the privatization be terminated without fault? Yes. These are the principle features of a concession contract. Details may vary, but the basics are no different.

Bibliography

- Andres, L.A. et al. (2008) "The Impact of Private Sector Participation in Infrastructure", PPIAF, Washington D.C.
- Arrow K. and R. Lind (1970) "Uncertainty and Public Investment Decisions" in *American Economic Review* 60
- Brook P. and Irwin T.C. (2003) "Infrastructure for Poor People" World Bank, Washington D.C.
- Easterly W. (2001) "The Elusive Quest for Growth" MIT Press
- Engel E. et al. (2001) "Least-Present-Value-of-Revenue Auctions and Highway Franchising" in *Journal of Political Economy* 109(5)
- Galal A. et al. (1995), "Welfare Consequences of Selling Public enterprises", World Bank, Washington D.C.,
- Gassner K. et al. (2008) "Does the Private Sector Deliver on its Promises? Evidence from a Global Study in Water and Electricity", PPIAF, Washington D.C.
- Glaister S. (2004) "British Rail Privatization: Competition destroyed by Politics" CRI Occasional Paper No. 23, Center for the Study of Regulated Industries, Bath
- Gomez-Ibanez J. A. (2003) "Regulating Infrastructure: Monopoly, Contracts and Discretion" Harvard University Press
- Guasch L. (2004) "Granting and Renegotiating Infrastructure Concessions" World Bank, Washington D.C.,
- Irwin T. and T. Mokdad (2010) "Managing Contingent Liabilities in Public Private Partnerships", PPIAF, Washington D.C.
- Kariuki M. and J. Schwartz (2005) "Small-scale Private Service Providers of Water and Electricity: A Review of Incidence, Structure, Pricing and Operating Characteristics" World Bank Policy Research Working Paper No. 3727, Washington
- Kerf M. et al. (1998) "Concessions for Infrastructure" World Bank Technical Paper No. 389, Washington D.C.
- Kessides, I. (2004) "Reforming Infrastructure: Privatization, Regulation and Competition", World Bank, Washington D.C.
- Kirkpatrick D.P. and Y. Zhang (2006) "State versus Private Provision of Water Services in Africa: An Empirical Analysis", in *World Bank Economic Review*, Vol. 20 No.1
- Klein M. et al. (1996) "Transaction Costs in Private Infrastructure Projects: Are They Too High?" in *Public Policy for the Private Sector Note no. 95*, World Bank, Washington D.C.

Klein M. (1997) "The Risk Premium for Evaluating Public Projects" in *Oxford Review of Economic Policy* 13(4)

Klein M. (1998) "Network Industries" in Helm D. and T. Jenkinson "Competition in Regulated Industries", Oxford University Press

Klein M. and Hadjimichael B. (2003) "The Private Sector in Development: Entrepreneurship, Regulation and Competitive Disciplines", World Bank, Washington D.C.

Komives K. et al. (2005) "Water, Electricity and the Poor", World Bank, Washington D.C.

Laffont J.J. and J. Tirole (1993) "A Theory of Incentives in Procurement and Regulation" MIT Press

Li W. and Xu L.C. (2004) "The Impact of Privatization and Competition in the Telecommunications Sector around the World" in *Journal of Law and Economics*, August

Meggison W. and J. Netter (2001) "From State to Market: A Survey of Empirical Studies on Privatization", in *Journal of Economic Literature*, June

Nellis J. (2011) "The International Experience with Privatization: Its Rapid Rise, Partial Fall and Uncertain Future" Washington D.C. mimeo

Nenova T. and T. Harford (2004) "Anarchy and Invention" in *Public Policy for the Private Sector*, World Bank, Washington, November

Newbery D. (1999) "Privatization, Restructuring, and Regulation of Network Utilities" MIT Press, Cambridge

Pollit M.G. and A.S.J. Smith (2002) "The Restructuring and Privatization of British Rail: Was it Really that Bad?" *Fiscal Studies*, Vol. 23, No 4.

Smith A. (1776) "The Wealth of Nations" University of Chicago Press 1976 edition

Train K. (1991) "Optimal Regulation: The Economic Theory of Natural Monopoly" MIT Press

Winston C. (1993) "Economic Deregulation: Days of Reckoning for Micro-economists" in *Journal of Economic Literature* 31(3)

World Bank (1994) "World Development Report: Infrastructure for Development" Washington D.C.

World Bank (2004) "World Development Report: Making Services Work for Poor People" Washington D.C.

World Bank (2005) "Electricity for All: Options for Increasing Access in Indonesia" Washington D.C.

Zhang Y. et al. (2008) "Electricity Sector Reform in Developing Countries: an Econometric Assessment of the Effects of Privatization, Competition and Regulation" in *Journal of Regulatory Economics*, April