

Competition in Public Utilities in Developing Countries

Paulina Beato
Jean-Jacques Laffont

Inter-American Developing Bank

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Paulina Beato is Principal Economist in the Infrastructure and Financial Markets Division of the Sustainable Development Department. Jean-Jacques Laffont is Professor of Economics at the University of Toulouse and Director of the Institut d'Economie Industrielle.

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Foreword

During the last two decades, Latin American countries have brought about important reforms in infrastructure services, encompassing changes both in ownership patterns and in operating terms. Regulatory frameworks have also evolved from monopoly and public ownership settings lacking specific regulations, towards scenarios where private participation prevails, with competition and regulation playing complementary roles. However, even though competition is a pivotal feature to all public services reform processes, a high degree of vertical and horizontal concentration pervades within the industrial structure of many of the region's countries. Furthermore, mergers and acquisitions taking place in the context of an increasingly global economy, without the appropriate legislation geared at promoting competition and restraining market control, have often led to reduced levels of competition for the market or in the market.

The Interamerican Development Bank has actively promoted infrastructure reform development in Latin America. The Bank has also financed private projects aimed at fostering the implementation of reforms in the power, gas, water, and transport sectors. The reforms have succeeded in fostering private participation. Because of the reforms, Latin American countries were able to attract private participation to infrastructure sectors like telecommunications, transportation, energy, and potable water and sewerage. Private participation in infrastructure has reduced public deficits and introduced new technologies. In addition of efficiency improvements, private sector has extended infrastructure services to more consumers.

These reforms seem less successful in promoting effective competition in infrastructure sectors, which is the other building block of the reforms. Indicators showing weak competition in the region's infrastructure sectors are found in most countries. In this context the Infrastructure and Financial Market Division of the Interamerican Development Bank is developing a program, *Competition Policy in Infrastructure Sectors*, consisting in identifying competition problem in infrastructure sectors and the legal and structural reasons that may provoke them. This program also includes the analysis and discussion of competition regulations appropriate to promote competition in infrastructure services in developing countries

This article, *Competition in Infrastructures for Developing Countries*, is part of the set of publications included in this program. This paper summarizes the desirable departures from the practices of developed countries that are called for the specificities in less developed essentially on the basis of normative economic theory. The paper provides a useful framework for those who have the difficult task of advising these countries in the implementation of more efficient ways to provide public services. Nevertheless, as the paper points out that more empirical work is needed to characterize more precisely the specific features of less developed countries that are relevant for regulatory economics. Such a work should naturally lead to distinguish various stages of development and to obtain a classification of countries calling for differentiated policies.

Pietro Masci
Chief
Infrastructure and Financial Markets Division

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1. Introduction

This paper focuses on public utilities (telecommunications, electricity, gas, water, transportation (roads, railways, buses, ports, airports,...) and postal service), which are sometimes referred to as *economic infrastructures*. It does not concern itself with the so-called *social infrastructures* such as education and health, or with the *financial infrastructures*. There is little debate today regarding the fact that, when possible, public utilities should be privatized (although several African countries did not succeed in doing so). As a result, this paper will not cover issues of privatization. It will, instead, discuss the specific questions surrounding the regulation and liberalization of public utilities in developing countries. To that end, this section of the report recaps the characteristics of developing countries that have a bearing on the analysis of regulation and competition policy.

An essential concept in this discussion is the marginal cost of public funds, that is, the social cost of raising one unit of funds. This cost includes a deadweight loss¹ because governments raise revenues by means of distortionary taxes. It is estimated that this deadweight loss amounts to 0.3 in developed countries, meaning that it costs citizens 1.3 units of account every time that the government raises 1 unit. The inefficiency of tax systems in developing countries, coupled with the corruption that is sometimes also present, makes it extremely difficult for governments to invest in infrastructures and affects the cost of all types of public interventions, particularly, regulation and competition policy. According to World Bank data, the deadweight loss in developing countries is well beyond 1. It has been estimated at 1.2 in Malaysia and 2.5 in The

Philippines, while in Thailand it ranges between 1.2 and 1.5 (Jones, Tandon and Vogelsang, 1990; Mookherjee, 1998). In developing our analysis we take the high cost of public funds as a given because, although tax reforms are necessary in many developing countries, it is unlikely that they will be in place quickly owing to the many financial, human and political variables involved.

An essential instrument of regulatory and competition agencies is the ability to audit costs. Yet, developing countries are hampered by a lack of well-developed accounting and auditing systems (Trebilcock, 1996). This is due to the lack of proper training programs; to the political and social difficulties that hamper the payment of incentive salaries to auditors to reward effort and discourage corruption; to the lack of up-to-date technology such as computerized systems (which makes it harder to discover cost padding and evaluate real costs); and to the inability to impose high penalties in cases of documented wrongdoing (because of the strong limited liability constraints of most economic agents).

Many developing countries also suffer from widespread corruption due, in particular, to the low internal costs of side transfers. When two parties (such as a firm and an auditor or a bidder and the auction organizer) arrange a private deal, they must take into account the costs of being discovered and the need to use indirect compensation (which is less efficient than direct compensation). The cost of these side transfers is expected to be lower in developed countries because they are more difficult to identify and, in addition, social norms may place a positive value on some types of side transfers (for example, when they take place within families, villages or ethnic groups). Accordingly, it is more difficult to fight corruption (Tirole, 1992).

¹ The deadweight loss depends on the type of tax used because the tax systems are not usually optimized.

Inefficient credit markets and the sheer lack of wealth make limited liability constraints more binding in developing countries. It is important to stress this point because many of the problems in regulation and competition policy result from difficulties in borrowing and attracting foreign capital. It is also worth highlighting the complementarity of general competition policy and good banking sector regulation. When the banking sector is inefficient and makes borrowing costly or impossible, an effective competition policy may destroy the rents that allow firms to invest, or may create instability.²

Other developing country characteristics that hamper public utility regulation concern the government. In particular, two characteristics of developed countries that are often missing in developing countries are constitutional control of the government and some degree of ability to enter into long-term contracts. The lack of the checks and balances typical of well-functioning democracies (supreme courts, government auditing bodies, separation of powers, independent media³) makes the developing country governments an easier prey to interest groups and patronage. The lack of political democracy and well-functioning political institutions increases the uncertainty of future regulations and makes it difficult for the government and the regulatory institutions to make credible commitments to long-run policies. Consequently, the economic policies of developing countries are even more sensitive to ratchet effects and renegotiations.

Another shortcoming of developing economies is the weakness of the rule of law. Poor enforcement of laws and contracts biases contracting toward self-enforcing contracts or leads to renegotiations.

Finally, it is essential to stress that the liberalization and deregulation of public infrastructures in developing countries often fails to attract the level of foreign capital that is necessary.

These features will be kept in mind throughout the discussion that follows, and when necessary specific advice for dealing with these difficulties in regulating and promoting competition in public utilities will be presented.

Section 2 discusses the structuring of regulatory agencies that favor competition, and the trade-offs involved in choosing whether or not to engage in the vertical disintegration of incumbent monopolies between the competitive segments and the natural monopoly ones. Section 3 presents the regulatory rules required by the monopoly segments in developing countries. The crucial issue of the management of the interface between the monopoly segments and the competitive segments is addressed in Section 4 where access-pricing rules adapted to developing nations are discussed in greater detail. Section 5 is devoted to competition policy *per se* for the segments opened to competition. Concluding comments are offered in Section 6.

² Mishkin (1997) concludes that "developing countries may need to move slowly in financial liberalization in order to keep a lending boom from getting out of hand".

³ See Besley and Burgess (2001) for an empirical study of government responsiveness to media activity.

2. Structural Issues

THE STRUCTURE OF REGULATORY AGENCIES

A first consideration in structuring the government entity that will have responsibility for regulation and competition policy is whether these functions should be the purview of one integrated agency or separated ones. In this regard, recent experience in Australia and New Zealand is enlightening.

New Zealand employed a very novel approach to regulation, relying only on general competition laws enforced by the courts and by an industry-wide competition authority. This approach was first used to regulate telecommunications and then power. The notion of *self-regulation* by industry was also introduced. In this case, industry participants form councils to negotiate the main rules and access conditions.

Although New Zealand's experiment was not an immediate failure, the government recognized, after some years, that there was still a need for regulatory control of industries that are not competitive enough. Indeed, this proved necessary even in telecommunications, which is the most competitive industry of the ones we are considering here. The concern is that light control of the industry is not sufficient to contain abuse of dominant position. The number of cases brought before the courts show that rapid technological change and the technology intensive nature of the industry make it difficult to find a firm guilty of abuse of dominant position. Moreover, the procedures involved make for very long delays. As a result, relying solely on competition laws has proved inefficient even when these laws are well developed and enforced. On the basis of this experience, therefore, we can conclude

that eschewing regulation is not the right option.

Integrating general competition policy and regulation into a single agency is only possible if the regulatory agency is a multi-industry one as in Australia. Australian regulation is organized around a federal multisectoral agency (the Australian Competition and Consumer Commission, ACCC), specialized agencies, and regional regulation. The ACCC is composed of sectoral and functional bureaus and coordination entities. The Commission deals with product safety, consumer protection, access, mergers and restrictive trade practices in all the sectors under study in this report.

The ACCC was created in 1995 following the recommendations of the Himler Report. It has taken over a non-negligible part of the duties of specialized regulators by acquiring responsibility for promoting competition in a larger sense. For example, the regulatory body responsible for telecommunications was closed after the creation of the ACCC. The Utility Regulators Forum, created in 1997, is responsible for coordinating regulatory activities within the ACCC. The Australian case involves integration *at the federal level* of regulation and competition, even if regional agencies are also used. This system can be compared to the one prevailing in the United States where multisectoral ruling takes place at the state level, specialized regulation is the responsibility of the federal government, and competition policy is dealt with separately.

Integrated regulatory agencies are an attractive option for developing countries because they face a significant shortfall in adequately trained personnel. This is especially the case for the telecommunications,

electricity, gas, water and transportation industries. While there are substantial economies of scope between the regulatory institutions of those industries, they seem much less important between regulation and competition policy. To avoid creating a too powerful institution, we would generally favor a separate competition agency and, except for very large countries, integrated regulatory agencies at the federal level. The only exception might be water, which could remain at the local level. Technological intensity requires federal regulation to reduce costs, but accountability requires more decentralized institutions.

Good advice on this structural issue must take into account political constraints, initial conditions and industry specifics. The variety of solutions implemented in developed countries and the experience of various Latin American countries (Argentina, Chile, Peru, Brazil, Bolivia and others) suggest that the trade-offs are complex. They involve balancing differentiation versus coordination; creative versus destructive competition between regulators (see Laffont and Pouyet, 2000); better enforcement by local authorities versus better control by the government; local corruption versus federal corruption (see Bardhan and Mookherjee, 1999); industry specific

expertise versus sharing resources; and diversifying the risks of institutional failures versus coordination (Aubert and Laffont, 2000; Smith, 2000).

THE STRUCTURE OF THE INDUSTRY

The industries under consideration were formerly public (or private) natural monopolies providing public services such as telecommunications, electricity, gas or transportation. Segments of these industries are now viewed as potentially competitive. Some examples are long distance telecommunications service and electricity generation. These are, therefore, the segments opened to competition. Other segments continue to be considered natural monopolies. These include, for example, the electricity transmission grid, railway tracks, and the local loop in telecommunications. These industry segments remain regulated and may eventually face new forms of regulation (see Section 3).

Three types of market structures can be envisioned for these industries: (1) vertical disintegration, (2) vertical integration and (3) competition in infrastructures. Under *vertical disintegration* the firm controlling the bottleneck (the natural monopoly segment) is not allowed to compete in the

Box 1

A Compromise between Coordination and Specialization: Bolivia

Bolivia's recently established regulatory system constitutes a balanced compromise between a multisectoral agency and specialized regulators. It is composed of sector-specific branches that are under the supervision of a coordination entity. The structure is very similar to that of a multisectoral agency with specialized bureaus; yet, it allows more independence to the branches. This, in turn, makes it more acceptable to the ministries, which might be reluctant to turn their regulatory power over to a multisectoral agency.

Such an organization may help reduce the threat of capture of regulators by the industry but may not insulate the agency from political interference in view of its strategic importance.

Box 2

Market Structure of Telecommunications Infrastructure Providers

Zambia aimed at a very competitive industry with two fixed link telephony providers and three mobiles, but was unable to attract any investor. Ghana issued two licenses for fixed link telephony but the weakness of regulation did not prevent foreclosure behavior by the incumbent monopolist so that the second operator is not operational. Côte d'Ivoire was criticized for granting a seven years monopoly for fixed link telephony, but the network is now expanding as scheduled.

The telecommunications sector in Peru was privatized in 1994 and a seven-year monopoly in fixed phone services was granted to force large investments that increase coverage and penetration and allow for a smooth restructuring of tariffs. In 1998 the monopoly (Telefonica) and Peruvian authorities renegotiated the contract and opened all services to competition.

services using the bottleneck as an input. For example, the local telephone company owning the local loop is not allowed to compete in long distance service using the local loop to access consumers. In the case of *vertical integration*, the firm controlling the bottleneck becomes one more competitor among many service providers using the bottleneck as an input. Finally, in the case of *competition in infrastructures*, competition then takes place between vertically integrated firms, each of which controls a restricted access point and provides services.

The comparison between the first two cases raises the issue of the economies of scope that vertical integration makes possible, and the problems of favoritism it raises. The bias in developing countries should be toward vertical disintegration because the economies of scope are likely to be independent of the characteristics of these countries (at least for given technologies), while favoritism is more difficult to counter.⁴ Cases 2 and 3 rest on a

⁴ This should be balanced with another consideration; namely, the importance of transaction costs. This will be higher in case 1 due to the lack of enforceability of contracts and the lack of commitment, which produces constant renegotiations. See

comparison of the fixed costs associated with competition in the provision of the "bottleneck" (like local telephony) and the gains one may expect from this competition (Auriol and Laffont, 1992). The comparison is difficult for developing countries where the high cost of public funds makes more expensive both the duplication of fixed costs and the information rents resulting from a monopolistic provision of the bottleneck.

These comparisons are further complicated by the dynamics of the industry, which may be moving towards case 3, as in telecommunications. Then, vertical disintegration may in fact slow down the emergence of competition among vertically integrated firms providing both local and long distance telephony. Recommending vertical disintegration may then be particularly inappropriate. However, for railways,⁵ gas or electricity, vertical disinte-

also Ordovery et al. (1994). Another consideration in small countries and some industries such as electricity, is that only a vertical structure provides a critical level of business to attract the interest of foreign investors.

⁵ Except maybe where competition by roads or (for large countries) competition between vertically

gration of the track, the pipelines or the electric transmission grid from transportation or the generation can be recommended if competition in services is introduced.

In all these cases there is a choice between a single regulated entity that owns the tracks, the pipelines, or the grid, or shared ownership of the bottleneck by users who agree on rules for using it. The comparison here is between the inefficiency of regulation and the free-rider problems of joint ownership. In a country where regulation is easily captured one may favor the second alternative, despite the lack of consumer representation that it entails.

A particular problem for the gas industry is the market power of producers, especially when there are foreign producers involved. The bargaining power of consumers with respect to producers may be enhanced by the existence of a vertically integrated network operator who also owns gas fields. This argument is used in Europe with respect to the supply by Algeria, Russia and Norway, and also in Argentina where YPF (recently acquired by Repsol) sells more than 60 percent of the gas produced.⁶

More generally, there is a question about the affordable competitiveness of the market structure, given that developing countries also need to attract foreign capital (see Box 2).

integrated firms interconnected with reciprocal access rules is possible.

⁶ Since 1993, prices at the wellhead have increased by about 17 percent in real terms. Enargas is considering presenting the case before the Competition Commission.

3. Regulation and Development

The regulation of natural monopolies requires finding a balance between efficiency and the cost of the information rents. High-powered incentive schemes (such as price caps) that induce cost minimizing behavior yield large rents to the most efficient firms, while low-powered incentive schemes (such as cost of service regulation) control those rents but create weak incentives for minimizing costs.

THE HIGH COST OF PUBLIC FUNDS

As stressed above, a major characteristic of developing countries is the high cost of public funds. It is easy to see that this high cost calls for higher prices of the commodities produced by the natural monopoly and for lower-powered incentive schemes (high shares of cost reimbursement). Before presenting the intuitive reasoning for these results, it is important to emphasize that we are assuming perfect observability of cost and full commitment of the regulator.

Intuitively, we know that higher costs of public funds mean a higher cost of giving up rents and also a higher inefficiency cost. However, the relative cost of rents increases faster because when an additional rent is given up to a particular firm to support an efficiency improvement, the same incentive must also be provided to all the more efficient firms. The optimal regulation sacrifices some efficiency in order to decrease such rents. Thus, this is an argument in favor of cost-plus schemes relative to fixed-price schemes or, in the language of regulatory theory, rate of return regulation versus price caps.

A higher cost of funds also means that it is more valuable to price above marginal

cost, i.e., to use public utilities prices to finance fixed costs and the government's budget. In particular, it is a mistake to advocate marginal cost pricing for public utilities in developing countries.

The implied difference in pricing between developed and developing countries can be substantial, since a move from a cost of funds of 0.3 to 1 translates into a relative deviation from marginal cost that is double in the second case. Since effort levels also decrease as cost reimbursement rules are tilted toward cost-plus schemes, marginal costs are higher and, therefore, prices should be even higher in developing countries. We illustrate this point in Box 3.

MONITORING

The impact of monitoring on the power of incentives is quite different depending on the type of monitoring.

Monitoring of *effort* generally enables the regulator to reduce the information rents and calls for higher-powered incentive schemes. A less-efficient monitoring technology will call for relatively less-powerful incentive schemes. Indeed, low incentives and monitoring are substitute instruments to extract the firm's rent. A decrease in the use of one instrument makes the other instrument more attractive. As a result, an increase in the cost of public funds induces low incentives both directly and indirectly (as explained above) through a decrease of the more costly monitoring.

Box 3
The Rent Extraction-Efficiency Trade-Off.

Suppose there are three units of production with costs $b_1 < b_2 < b_3$ at the zero effort level induced by cost plus regulation. As costs are fully reimbursed, no rent is given up to the firm and the consumers' bill is $b_1 + b_2 + b_3$ or the gray area in Figure 1.

Price cap regulation induces in each unit of production an effort e^* that decreases monetary cost by e^* at a disutility cost $y(e^*)$ for the firm. Total costs are then $\tilde{b}_1 = b_1 - e^* + y(e^*)$, $\tilde{b}_2 = b_2 - e^* + y(e^*)$, $\tilde{b}_3 = b_3 - e^* + y(e^*)$. Production of the less efficient unit calls for a price of \tilde{b}_3 , hence a bill for consumers of $3\tilde{b}_3$ (dotted area in Figure 1)

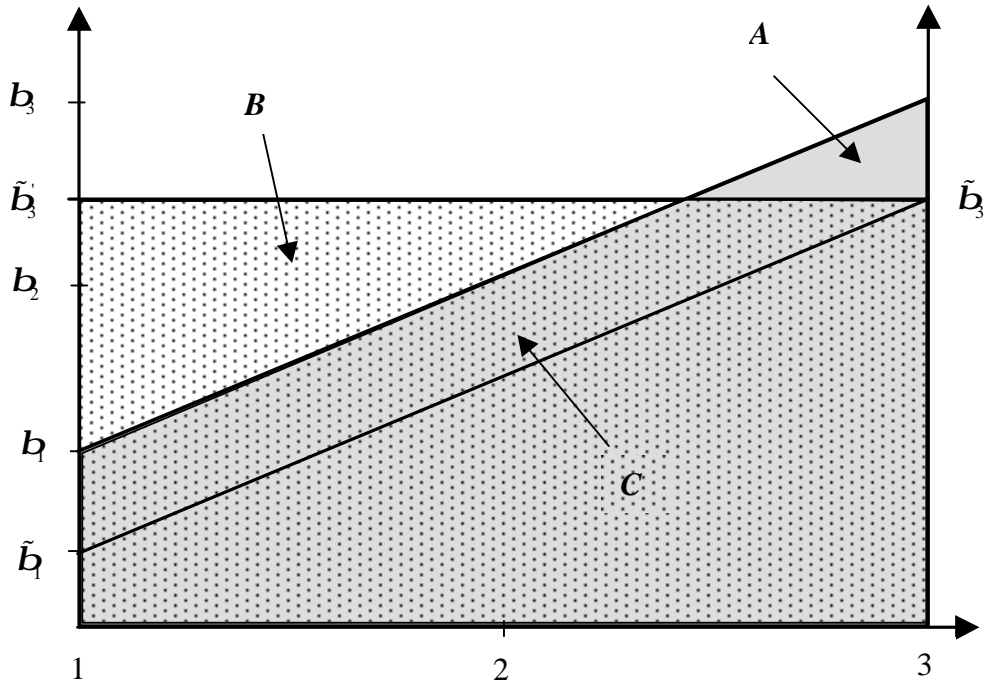


Figure 1

If the firm's rent is not taken into account, the comparison between cost plus and price cap regulations reduces to the difference of consumers' bills,⁷ i.e., the difference between the triangles A and B . If $A > B$ (resp. $A < B$), price cap (resp. cost plus) dominates.

However, if the firm's rent (triangle \tilde{b} \tilde{b}' \tilde{b}_3 or C in Figure 1) enters the regulator's objective function with a weight \mathbf{a} , price cap dominates if $B - A < \mathbf{a}C$, i.e., if the consumers' bill differential is less than the social valuation of the firm's rent.

If the regulator does not care about giving up a rent to the firm ($\mathbf{a} = 1$), price cap always dominates (since $C > B$). However, when giving up a rent is socially costly, cost plus regulation may dominate.

In industries where transfers of public money are possible (railways, buses...), the cost of giving up a rent to the firm increases with the cost of public funds.⁸ Accordingly, in developing countries with a high cost of public funds, the trade-off is tilted towards cost-plus regulation. In industries where transfers are not allowed (telecommunications, energy) the social weight attributed to the firm's profit does not bear any direct relationship with the cost of public funds and the optimal trade-off between rent extraction and efficiency is not affected necessarily by the cost of public funds.⁹

If differences of cost across units are larger (i.e. asymmetric information is more serious) as it is likely in developing countries, for example if the cost spread increases with a constant mean, it increases $B - A$ in Figure 1 and favors cost plus. However, taking into account C weakens this effect (see Figure 2 where we draw A, B before (dotted triangles) and after (gray triangles) the increase in the cost spread).

If the differences of costs are higher in an industry than in another, for example higher in telecommunications than in power transmission, price cap is relatively favored in power transmission.

⁷ For simplicity, we assume that the indivisibility is such that under both regulations all three units are operated.

⁸ Since each unit of account taken from the firm allows a decrease of the deadweight loss of the tax needed to raise one unit of account (see Laffont and Tirole, 1993).

¹⁰ However, the higher the prices the more disconnections to the service are likely, and this may call for social funds to balance this negative effect.

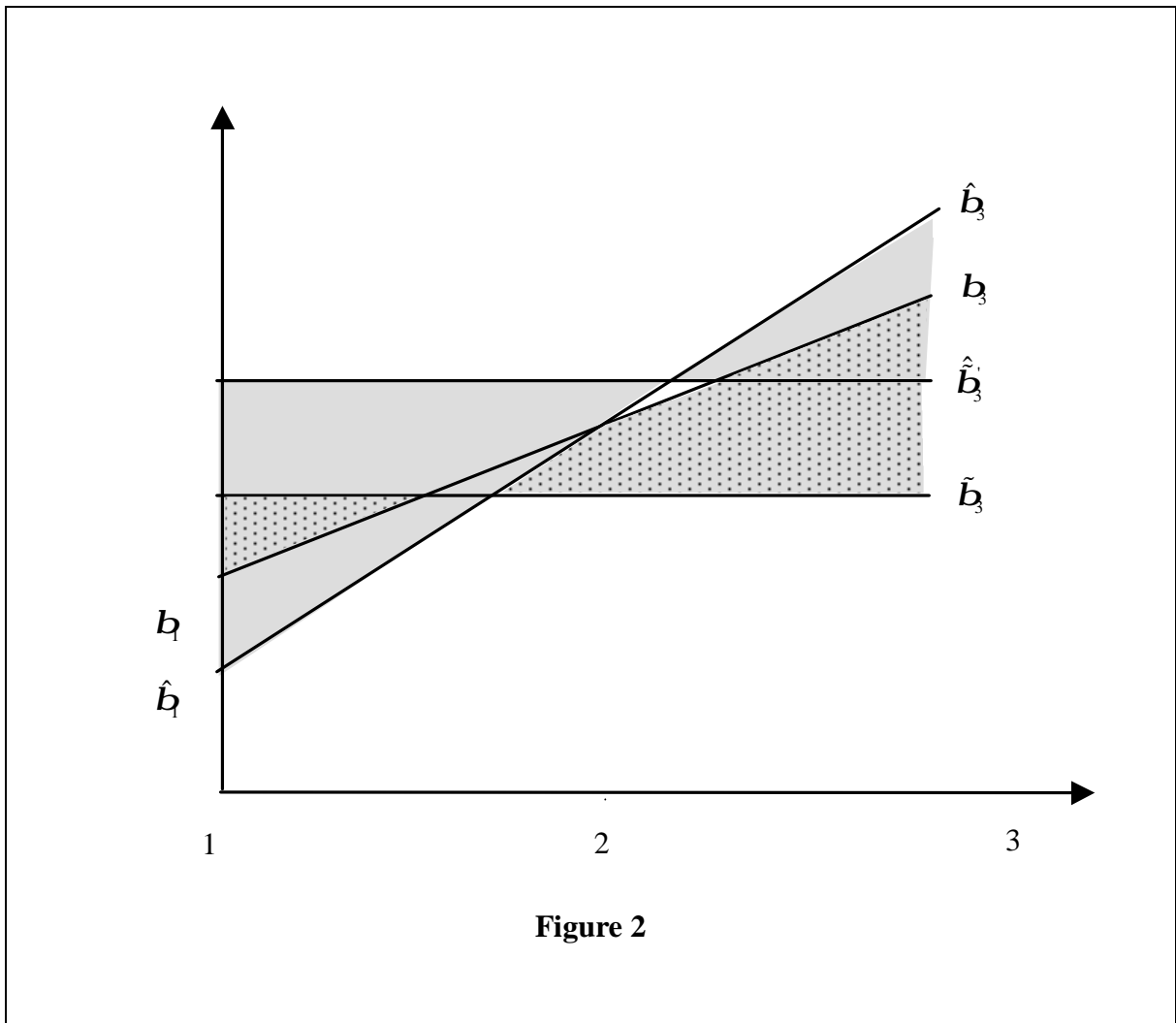


Figure 2

We have emphasized so far the strong assumption of perfect observability of costs. In practice, however, costs are not perfectly observable and one must also take into account the possibility of cost padding, i.e., the many ways in which a firm can divert money. Cost can now be increased by undue charges, which benefit the management and the workers. The analysis (Laffont and Tirole 1993) shows that the imperfect auditing of cost padding calls for a shift towards higher-power incentive schemes. In the extreme, if auditing did not exist, only fixed-price contracts would be possible. Indeed, they would be the only ones preventing unlimited cost padding by making firms residual claimants of their costs. It is therefore very obvious that weak auditing technology, as

can be expected in developing countries, will result in an even higher desire to shift toward fixed-price mechanisms. This effect is reinforced by the savings in auditing costs resulting from fixed-price mechanisms in countries with a high cost of public funds.

The impact of the lack of auditing cannot be overemphasized. It is a crucial point, which conflicts with the findings of the previous paragraphs, but easily dominates the other effects. In the absence of reasonable accounting, price cap regulation is the only way out. It is only through price cap reviews that some cost elements can be brought in, leading to some cost-plus shift through the ratchet effect (see below).

Making cost information public may be a way for the regulator to improve the quality of accounting by fostering more truthful disclosure of information by the firm, establishing its credibility for honest behavior.

HIERARCHICAL REGULATION AND CORRUPTION

The next point to consider is the need to devolve regulation to the regulatory agencies or ministries. A main role of these institutions is to partially bridge the informational gap between public decisionmakers and the regulated firm. This gives rise to another issue, the possible capture of the regulatory agency by the firm. Such collusion will occur with greater probability if the stakes of collusion are high, if the cost of side transfers between the firm and the regulator are low, and if no incentive mechanism is in place for the regulators.

The stake of collusion amounts to the information rent that an efficient firm obtains when the regulator hides the fact that it is efficient. From our previous analysis, it is increasing with the level of effort chosen by the less-efficient firm (since it is equivalent to the gain obtained by an efficient firm when it mimics an inefficient one). The maximum bribe that a firm will be willing to offer to the agency is this stake. However, it should be discounted by the price of internal transfers, which includes the cost of being discovered as well as the need to use often-indirect transfers that are less efficient than monetary transfers. Capture is avoided if the agency is paid an amount larger than the discounted value of the stake of collusion when it reveals the firm is efficient (we will call this constraint the collusion-proof constraint).

In the simplest cases, the regulatory response to the fear of capture is to satisfy the collusion-proof constraint at the lowest possible cost. This includes shifting opti-

mal regulation toward cost-plus schemes to decrease the stake of collusion, and improving monitoring to increase the cost of side transfers (see Box 4).

Three features of developing countries call for even higher shifts toward cost-plus mechanisms. First, we can expect a lower cost of internal transfers because of less stringent monitoring of illegal activities. Second, incentive payments to the agency are more costly because of the higher cost of public funds. Third, it may be politically more difficult to create such strong incentive payments.

So far we have dealt with a case where the optimal regulatory response entails no corruption. If we extend the framework to a case where, for example, regulators are more or less susceptible to being corrupted (some requiring low bribes, others requiring higher bribes), it may be optimal to let some corruption occur if the proportion of regulators requiring low bribes is small enough. Creating incentive payments that suppress the corruption of this type of regulators would be too costly, because the high payments required to fight corruption would have to be incurred even for the other type of regulators (for whom it is not necessary). Then, the same features of developing countries, which militate in favor of low-powered incentive schemes (high cost of public funds, poor auditing technologies), suggest that it is optimal to let more corruption happen at equilibrium.¹⁰

Therefore, the effect of corruption appears complex. If we consider corruption of cost auditing it calls for higher power incentives, but if we consider corruption in information reporting, lower powered incentives are required.

¹⁰ See also Laffont and Meleu (2000) for an analysis of how the separation of regulatory powers may help fight corruption.

Box 4:
Regulatory Response to Capture

Suppose, in a procurement problem, that the regulator hides with probability r the fact that the firm has an efficiency parameter \underline{b} when this parameter can be either \underline{b} or $\bar{b} > \underline{b}$ with $\Delta b = \bar{b} - \underline{b}$.

If the government offers a price cap regulation $p = \bar{b} - e^*$ corresponding to the cost of an inefficient firm exerting the cost decreasing efficient effort level e^* , the rent of the \underline{b} -firm is $p - (\underline{b} - e^*) = \Delta b$ with an expected social cost (with respect to first-best regulation) of $rln\Delta b$ if l is the deadweight loss of social funds and n the probability that the firm is efficient.

Suppose instead the regulator offers a cost plus scheme. Then cost is \underline{b} (resp. \bar{b}) for an efficient (resp. inefficient) firm, since effort is zero in both cases. Then, the social cost of this regulation (with respect to first-best regulation) is $(1+I)e^*$. No corruption occurs in this type of regulation.

The move to low powered incentives is better than corrupted high-powered regulation if $(1+I)e^* < rln\Delta b$ or $e^* < rn\Delta b$ if we do not include the firm's profit in the social welfare function.

The higher the level r of corruption, the more likely it is worth moving to the cost plus scheme which is a low powered incentive scheme which destroys the stake of corruption. However, note that we assumed here that the auditing of cost itself was not corrupted.

COMMITMENT

Let us consider now the important issue of commitment, more specifically, the fact that governments in developing countries have even less credibility to commit to long-run regulatory rules than those in developed countries.

A lack of commitment puts the ratchet effect into motion. Faced with incentives in the first periods, firms fear that taking advantage today of these incentives (efficient firms make more money by having low costs) will lead to more demanding incentive schemes in the future. The way to commit credibly to not expropriate rents in the future is to learn nothing today

about the firms' efficiency. Instead of offering, as in the static case, a menu of contracts with variable sharing of overruns, which induces self-selection, the extreme attitude is to offer a single contract which induces under-effort of the good type and higher-than-first-best effort of the bad type. The inefficiency created by the lack of commitment is an inappropriate provision of effort levels over the various periods, which has no simple interpretation in terms of the power of incentive schemes. In the case of linear schemes it can be shown (Freixas et al. 1985) that the ratchet effect pushes toward high-powered schemes that create higher rents in the first period to induce the revelation of types. More generally, the less

commitment ability there is, the less the

are regularly renegotiated while a com-

Box 5
Enforcement Failures in Telecommunications.

In Ghana, the incumbent monopoly for fixed telephony, which was not allowed to enter the mobile business eventually did enter the market and used all kinds of tactics to delay interconnection.

In Tanzania, the regulator attempted to enforce regional mobile licenses. However, the dominant operator, Mobitel, argued that its license was national and launched service in an area where the regulator tried to shut down the operator. After a crisis involving the Court and the country's President all cellular licenses were declared national in scope.

In Côte d'Ivoire, the incumbent monopolist priced access for competing public phones in a way that foreclosed entry. The regulator intervened in 1998 to set a minimum price for the incumbent's prices at its own call boxes to allow entry. However, until recently the incumbent refused to adjust its prices.

regulator should try to separate types and the more so if the cost of public funds is high.

The lack of ability of regulators to commit can be mitigated by the repetition of their relationship with the firms and the building of the regulators' reputation of not expropriating the rents derived from future efficiency improvements.¹¹ It can be expected that this substitute to commitment of institutions will be less easy to achieve in developing countries.

No general analysis exists of how easy commitment is, depending on the type of regulatory regime. Regulatory institutions must be particularly scrutinized in developing countries for their ability to provide long-run incentives through their power of commitment, since a major goal is to attract foreign investment. For example, price capping has been pushed in the Western world as a way to provide high-powered incentives. However, price caps

mitment to a fair rate of return *might* be less prone to costly renegotiations (Greenwald 1984).¹²

WEAKNESS OF THE RULE OF LAW

Enforcement of regulatory rules is poor in developing countries (see Box 5) for two reasons. First, enforcement is costly, and optimal enforcement decreases with the cost of public funds. Second, the principal agent paradigm with full bargaining power attributed to the regulator does not fit the reality of developing nations. Note however that weakness in the bargaining position at the renegotiation stage calls for increased investment in enforcement. Finally, corruption of the enforcement mechanism itself or of the regulatory mechanism calls for less enforcement. Thus, the weakness of the rule of law in developing countries is not only due to poor human resources, it is also part of an optimal regulatory response (see Laffont, 2001).

¹¹ See Gilbert and Newbery (1988) for a model of infinitely repeated contracting in which some collusive equilibria do not exhibit the trading inefficiencies associated with shorter horizons.

¹² However, one can also commit to a fair renegotiation of price caps.

FINANCIAL CONSTRAINTS

Financial constraints compound the difficulties of asymmetric information for regulation in many circumstances. The basic intuition can be stated in simple moral hazard control problems with risk neutrality. Moral hazard in a delegated activity can be controlled without giving up a rent to the agent if penalties are possible even when the observation of the performance is noisy. However, if such penalties are not possible because of limited liability constraints, only rewards for good performance can induce appropriate effort levels, i.e., information rents must be given up.

The greater the financial constraints the greater those rents. Both the strength of financial constraints and the high cost of public funds favor a shift toward less powerful incentive schemes in developing countries. The irony of the situation is that, even though these countries should make more effort to emerge from underdevelopment, inducing effort is much more difficult in developing countries.

SUMMING UP

This section has detailed the many arguments that favor a move toward less powerful incentive schemes (and, therefore, a move toward less efficiency) in developing countries.

However, the use of performance evaluation to improve the fundamental trade-offs between efficiency and rent extraction

presumes a perfect, or at least unbiased, auditing of that performance. The main argument against such advice is the cost padding effect and the corruption of the cost audits which, on the contrary, favor fixed-price mechanisms that save all the auditing costs.

Thus, we may distinguish three stages of development concerning regulation. In the first stage, the auditing mechanisms are so poor that powerful incentive schemes should be advocated. They promote short-run efficiency in activities that are immune to ratchet effects, but they strongly favor ex post inequality (since the efficient types make more money than the inefficient ones), they encourage some types of corruption of regulatory and political institutions, and they are costly for the rest of the economy because they create a money drain toward the regulated monopolies. This first stage should be used to develop a good auditing system. Once it is in place, one can move rather discontinuously to stage two of development by promoting less powerful incentive schemes for the reasons explained above. Then, as development continues, the optimal solution is to slowly move toward more powerful incentive schemes in stage three. The quality of regulation in each of these stages depends critically on the ability of the government to commit credibly to the implementation of the schemes.

4. Promoting Competition by Pricing Access

Let us again distinguish between the three market structures considered in Section 2 to discuss appropriate access pricing rules in developing countries.

VERTICAL DISINTEGRATION

Consider the simplest case where the final services are produced by competitive industries at constant marginal costs. Ramsey pricing tells us that the access price markup over the marginal cost of access for a given good relative to the access price for this good should be inversely proportional to its demand price elasticity. Such a pricing scheme can be decentralized; price caps can be applied to the regulated firm in charge of the infrastructure, relying in this way on the firm's demand information. Of course, that information is the province of the users of the infrastructure. The utility can infer this demand information from the demand for access as long as the users report truthfully the type of final good for which they use the infrastructure.

It may be difficult to promote such truthful reporting in developing countries when inspection systems are easily corrupted. Moreover, price discrimination resulting from sophisticated Ramsey pricing may be manipulated by interest groups (see Laffont-Tirole, 1993, Chapter 11). Consequently, in the case of developing countries Ramsey pricing should be based on broad categories of usage that do not raise complex inspection issues and should be decentralized by price caps.

Another concern in developing countries is the market power of users of the infrastructure. However, the regulation should not attempt to undo, via access pricing policy, the monopoly power of the users of

the infrastructure. Indeed, such a policy requires a lot of knowledge from the regulator and raises issues of favoritism. In the absence of long-term contracts, there is a potential for expropriation of some large users' investments, which is quite negative for attracting foreign capital. In this case, other policies should be used to foster the competitive use of the infrastructure (see Section 5).

The discretion surrounding the determination of price elasticities and raising the problem of capture is transferred to the choice of weights when using price caps. A nondiscretionary method for choosing weights in the price cap, such as last year's quantities (plus an exogenous change in the level) should be selected in developing countries.

ONE WAY ACCESS WITH VERTICAL INTEGRATION

We consider now the case of a vertically integrated utility that provides access to the infrastructure and also sells a service using the infrastructure (the incumbent), and discuss two sub-cases.

Suppose first that the competitive users of the infrastructure provide an imperfect substitute to the service provided by the incumbent (mobile phones versus fixed link telephony with a lot of unsatisfied demand). In this case, regulation of access should be treated just like regulation of an end-user service, because the incumbent will be willing to provide access that increases its business with little effect on its own service market. For example, global price caps including final goods as well as access goods can be used. (See Laffont-Tirole (2000), Chapter 6.)

The situation is more difficult when competitive users offer services that are very close substitutes of the services provided by the incumbent. Then, the Ramsey rule tells us that the access price should be high enough to avoid inefficient business stealing and to balance the budget of the incumbent. One is tempted to favor a generous (for the incumbent) access-pricing rule, such as efficient component pricing, to avoid foreclosure and to focus regulatory resources on implementing quick and high quality interconnection. Alternatively, one can use a global price cap supplemented by maximum prices determined with the efficient component-pricing rule. It should be recognized that it is a very difficult case requiring a lot of regulatory expertise, making it difficult to implement good solutions in developing countries. Indeed, examples from Colombia, Ghana, China and elsewhere show that incumbents in the telecommunications industry are using various strategies to avoid competition (foreclosure, delays, raising rival's cost...).

TWO WAY ACCESS FOR COMPETITION IN INFRASTRUCTURES

When there is competition in infrastructures, as is the case of telecommunications, in particular, final prices are usually deregulated but the regulation of access prices remains an issue. For example, in the Internet, the bill-and-keep doctrine amounts to a zero access charge, something that is currently being debated (see Laffont et al., 2001).

According to the literature, access prices in telecommunications should be regulated because firms (at least for symmetric network) can use access charges to collude against consumers (high access charges induce high final prices) and to block entry (see Armstrong, 1998 and Laffont et al, 1998a and 1998b). One possible solution is to impose the bill-and-keep doctrine because of its simplicity and because it encourages competition in final prices.

Box 6 Colombia

A Constitutional amendment prohibits monopolies in Colombia, even public ones. Several regional public companies offer local telephony (Bogota Telecom Company: 25 %, Medellin: 10 %, Cali: 7 %), and there are four mobile companies.

There appears to be no problem in setting interconnection charges for mobile and long distance service. The services are sufficiently complementary so that both operators gain from quick interconnection. However, concern remains regarding high access charges.

But, when the Telecom and Medellin companies entered the local market in Bogota, Bogota Telecom refused them access. As a result, there are now three fixed-link companies in Bogota that are not fully interconnected. Indeed, access charges are not included in the price cap on final prices or determined by historical costs according to the fully distributed method. Since Bogota Telecom makes no money on access, it has all the incentives to engage in exclusionary behavior.

A more difficult situation occurs when networks are asymmetric in size or traffic. In particular, it is important to ensure that network competition does not interfere with network development.

The regulator may mandate negotiations for interconnection under the threat of arbitration by an international body. It is unlikely that he will often have the infor-

mation to choose access prices itself. This is an area where it is particularly clear that it is not enough to declare that competition is possible or even to sell licenses for competition to really take place. The inability to ensure fair competition may even delay competition and lead to implementation of the alternative option, that is, of regulating the monopolist with a strict program for developing the network.

5. Competition Policy

We have argued that competition policy is not appropriate to deal with the complex and rapidly evolving technical issues concerning the interface between the competitive and noncompetitive segments of infrastructure industries. It remains to be seen what kind of competition policy is appropriate for the potentially competitive segments.

Three ingredients are needed for competition. First, there must be enough firms or potential entrants into an industry. Second, those firms must not enter into collusive side-contracts. Furthermore, if a firm has developed a dominant position through innovation it should not abuse this position.

It should first be stressed that, in most developing countries, the major problem is the dearth of participants, particularly in infrastructures where investments are usually sunk for long periods. As a result, the major problem is how to attract local or foreign capital to those industries, that is, how to create the conditions that make investment attractive. The work required to favor entry is not the usual task of a competition agency. Unfortunately, it concerns most of the characteristics of developing countries that were discussed earlier and which cannot be easily resolved: inefficient financial sectors, lack of credibility of institutions, lack of enforcement of laws, inefficient transportation and communications, lack of information available to consumers, etc., what Carlin and Seabright (2000) refer to as "competitive infrastructure."

This is particularly the case in infrastructures where technologies favor high concentration and international trade cannot be relied upon to create competitive pressures. The difficult question is: which rate of return will attract the optimal level of

investment? If this optimal rate were known, competition policy should ensure this rate and no more. Probably, this can be achieved more easily through concession contracts with regulated prices than with competition in infrastructures.

More traditional competition policy can be relied upon in the case of the competitive use of infrastructure. As observed by Rey (1997), collusion is facilitated by entry barriers, market concentration and capacity constraints, and these factors are more likely to be present in developing countries. As already observed, the transaction costs of collusion are also likely to be lower in developing countries. Similarly, predatory strategies may be particularly dangerous in countries where credit markets are weak. Rey (1997) argues also that the high entry barriers often found in developing countries give more force to the market foreclosure argument when discussing the essential facility doctrine. He also recommends a more cautious attitude toward vertical restraints.

Competition policy during the liberalization process should apply to the competitive segments of the deregulated industry; namely, generation in electricity, long distance service in telecommunication, and operating services in transportation. This is particularly important in developing countries where attracting capital for infrastructure investment generally requires giving sizeable market shares to investing firms.

In particular, merger and acquisition rules in developing countries must be designed with an emphasis on simplicity, nondiscretion, and adaptability to rapidly changing market structures. One possibility is to establish explicit market share constraints (foregoing efficiency arguments), which are revised periodically.

Some industries may need more innovative combinations of regulation and competition. For example, under normal conditions, the electricity industry may be appropriately competitive and need only the oversight of competition authorities. However, when capacity constraints are binding, either under conditions of peak demand or because of supply shocks, generation firms may enjoy such power in local markets that price regulation becomes necessary.

More generally, the difficulty in attracting capital generates market structures that are imperfectly competitive and calls for a more intrusive regulation of behavior than classical competition policy. It also creates conflicts between privatization committees or regulatory institutions, which are well aware of the constraints on competition imposed by the need to attract capital, and the competition authorities, which *ex post* tend to breach the explicit or implicit agreements that restrict competition.

In any case, it should be clear that US-style competition policy (with its armada of lawyers and economists) is neither affordable nor achievable in developing countries. Designing simple and transparent rules for developing countries, particularly to prevent horizontal collusion and abuse of dominant position, remains a worthy task. Nevertheless, the benefits that can be expected from competition policy are quite small in the foreseeable future for several reasons.

The lack of adequately trained staff is particularly acute. The complexities and ambiguities of the economic analysis of such questions as predatory behavior and vertical restraints make this a particularly vexing problem. As a result, emerging industries will be necessarily highly monopolistic and interest groups will have considerable potential for interference.

Yet, competition agencies should be developed. Their first major goal is to play an educational role by advocating the social benefits of fair competition and concentrating on specific goals. For example, competition is weak in developing countries because transactions are localized as a result of poor communications systems and inefficient trading organizations. Focusing attention on these areas should be particularly fruitful.

Finally, in pushing for competition in infrastructures it must be remembered that a major goal is to achieve greater population coverage in access to basic public services. When properly¹³ used, monopoly provision, which allows cross-subsidies, is a powerful redistributive instrument. Competition makes redistribution via prices more difficult, and there are not always easy substitutes in countries with very inefficient and often corrupt tax systems (see Beato, 2000; Laffont and N'Gbo, 2000). Then, it may be easier to achieve universal service obligations within a concession contract than through oligopolistic competition

¹³ In addition to favoritism and rent-seeking, cross-subsidies may induce inefficient bypass and create poor incentives for service quality provision and proper coverage of underpriced consumers.

6. Conclusion

This paper has highlighted the departures from developed countries' practices that are required in developing countries on the basis of normative economic theory. However, a number of caveats must be borne in mind.

First, more empirical work is needed to more precisely describe the specific features of developing countries that are relevant for regulatory economics. Such work should naturally lead to distinguishing various stages of development and to obtaining a classification of countries requiring differentiated policies.

Second, even though we have mentioned some characteristics of governments, a broader political economy of reform, taking into account specific historical and political situations is necessary.

Third, liberalization, competition and regulatory policies are very recent developments, especially in the very poor countries. The empirical evidence is limited and not of easy access. Moreover, it is never in a form that would allow rigorous econometric tests. Case studies and theory are the only available tools that can be used under these circumstances, but this should be done with a lot of caution, in particular because the economic theory relevant for developing countries is so far only sketchy.

Nevertheless, we hope that this paper provides a useful framework for those who have the difficult task of advising developing country authorities on more efficient ways of providing public services.

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