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The Regulatory and Institutional Dimension of Infrastructure Services

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1. Introduction and scope of paper

1. This introductory chapter consists of a short historical overview to provide a context within which the paper discusses the purpose and framework of infrastructure regulatory industries ("utilities") such as telecommunications, electricity, natural gas, water and sewerage, postal services railways and other transport industries.[1]

1.1 Historical context[2]

2. Since 1980, there has been an enormous change in the methods of operation of infrastructure industries. For most of the twentieth century, in Europe, in Australasia and in most developing countries, infrastructure industries were publicly owned. They typically operated as full vertical and horizontal monopolies within their defined national, provincial, regional or local area. In Western Europe and some other countries, from the 1950s, these industries were operated on an increasingly commercial basis, but subsidies and cross-subsidies were widespread and much if not all investment was financed from revenues and government tax revenue rather than from private sector lending. Among developing countries, with few exceptions, public ownership was the norm and commercialization was very limited indeed.

3. Since 1980, commercialization of the operations of these industries and private finance of their investment have become much more prevalent across the world. This is true not only of Western Europe and Australasia, but also of the countries of Central and Eastern Europe and the Former Soviet Union, in Latin America, in China and other Asian countries and increasingly in Africa. Sometimes this process has been via full privatization (particularly in telecoms) but, in many countries, the State (or regional/local Government) has retained partial ownership or has kept ultimate ownership (via the use of national or local concession contracts). This latter pattern has been relatively common in electricity and natural gas distribution and even more so in water and sewerage.

4. These post-1980 developments are not, however, something new. When infrastructure industries emerged in the nineteenth century (the railways and later town gas and electricity), they and their networks were usually developed by private sector operators, frequently operating under something like a 20–25 year concession contract. This was true of both United Kingdom and French railways – as well as electricity and town gas – and this model persisted until 1939 in these countries and others before giving way to nationalization after 1945. The United States was the major exception to this pattern where private provision persisted without a break from the nineteenth century through to the twenty-first but, notably, including commercialized municipally-owned companies and some critical public facilities such as the huge 1930s hydroelectric dams.

5. The divergence between North America and other countries arose for a number of reasons. However, one of the most important was that the United States in particular successfully evolved a set of *economic regulatory institutions* that (a) protected consumers against monopoly abuse by the infrastructure companies and kept costs and prices aligned; and (b) protected investors, providing them with a secure platform on the basis of which they could roll out services across the country and earn a sufficient and secure enough rate of return to support private bond and equity finance. The United Kingdom, France and other countries failed to create institutions before 1914 that were strong enough to do this – particularly to provide

[1] Utilities (or public utilities) are conventionally defined as electricity, natural gas, water and sewage, sometimes also including telecommunications, transport and postal services. This list is the same as that for infrastructure industries. In this paper, I treat the terms utilities and infrastructure industries as synonymous.

[2] There are many histories of the development of infrastructure industries and their regulation. This account draws heavily on Stern (2003).

regulatory institutions that would be sufficiently robust in the circumstances of the major economic crises and dislocations during and after the two world wars.

6. In developing countries, the development of infrastructure industries was very modest until after 1945. After 1945, the State-owned monopoly model became the norm. This was the case more particularly in Asian and African countries, including because this model was common in both the United Kingdom and France, with whom the newly independent States retained strong economic ties and aid relationships. In addition, more or less explicitly socialist planning models provided the dominant development method from the 1940s into the 1960s and 1970s.

7. The new wave of commercialization and privatization of infrastructure industries in the 1980s started in Australia, Chile and other countries as well as in the United Kingdom. It began in telecoms – where it has been most successful – but has since been extended relatively successfully to electricity and natural gas. This process has almost always been accompanied by the development of new regulatory institutions to protect both consumers and investors. Most often, as in the United Kingdom, this has been via independent sector-specific regulatory agencies. These are now mandatory for European Union member States in telecoms as well as for electricity and natural gas. In other countries, it has been through specialist chambers in competition agencies – as in Australia and Germany, although both of these have now set up separate regulatory agencies, as has New Zealand, which was the one early infrastructure reformer to try to do without explicit sectoral regulators for telecoms and energy. New Zealand initially opted for an economy-wide competition law rather than sector-specific regulators. This approach was not necessarily a success. For example, by the late 1990s, there was widespread dissatisfaction with the light-handed approach to telecommunications regulation, due to lengthy disputes, and uncertainty over interconnection prices. New Zealand has since introduced a number of sector regulators.

8. This reform pattern has spread rapidly from the late 1980s to developing countries so that, since 1995, almost all United Nations member States have some kind of regulatory agency for telecoms and most also have one for electricity/energy. This is closely associated with the much increased role of private finance of infrastructure, which has been the most powerful force for regulatory reform. Even though (apart from telecoms) privatization of infrastructure industries or facilities has become less important than it was 10 years ago (possibly because the most obvious reforms have been undertaken now), private finance of infrastructure industry investment has remained important, not least because Governments around the world have found more urgent calls on scarce tax revenues than infrastructure industry investment. Private finance also plays a role via concessions and private–public partnerships (PPPs) and that has meant a continued, indeed growing, role for economic regulatory agencies.

9. Regulatory agencies exist in some countries for railways, water and postal services, but in far fewer countries. This is, to a considerable extent, because the commercialization and liberalization process has been more difficult in these industries and, in many developed countries, restructuring on these lines has been slow. Hence, even among European Union member States, public ownership remains widespread and, more importantly, private finance of investment is much less prevalent. In addition, for various reasons, both direct subsidies and cross-subsidies still play an important role in these industries in virtually all countries. This is even more the case in developing countries.

10. The performance of the new commercialized model for infrastructure industries and of the new regulatory agencies has been relatively good in developed countries such as European Union (EU) countries (including the new Central European member States) and in Australia. However, it has been much more mixed in developing countries, particularly for the energy sector. This is true for middle-

income developing countries as well as for low-income countries. There have been many successes but also some moderate and some serious failures.

11. One major lesson learned over the last 20 years is that infrastructure regulatory institutions – like other economic institutions – must be carefully tailored to the needs and capacities of the countries in which they are intended to operate.[3] Hence, it makes little or no sense to expect a United States or United Kingdom regulatory model to be readily transferable to a small, low-income African country, nor does it make sense to transfer a regulatory model that depends heavily on within-country commercial courts to a post-conflict country or one with poor quality legal institutions. The design of appropriate institutions for developing countries with capacity and/or other limitations on regulatory institutional design will be a major theme in what follows in the rest of this paper.

1.2 Scope of the paper

12. This paper is intended to provide general guidance to assist developing and transition economies in identifying and establishing regulatory institutional frameworks (RIFs), which will contribute to supporting their domestic services capacity and efficiency, competitiveness and export capacity, and help ensure the provision of essential services.

13. To meet this objective, chapter 2 of the paper discusses issues such as the key features of infrastructure industries and why regulation is needed. It also discusses the appropriate role of regulation as commercialization, liberalization and unbundling are taken further.

14. Chapter 2 covers the role of regulation in State-owned infrastructure companies as well as in mixed-ownership and privately-owned companies, but, it will focus only on the economic regulation of essentially commercialized enterprises. These are defined as enterprises "with significant amounts of private involvement (or at least private financing of investment) in some or all elements."[4] Consequently, the discussion in chapter 2 – and in this paper as a whole – excludes discussion of RIFs for unincorporated State-owned enterprise operating under the control of a line ministry or similar. They are excluded because separate/independent economic regulation is irrelevant in these circumstances, since the determination of prices, quality standards and investment (i.e. the core issues covered by economic regulation) are effectively handled via bilateral discussions between the infrastructure company and the relevant government entity (e.g. line ministry, presidential office or party secretariat).

15. Chapter 3 covers the role of RIFs and regulatory agencies. This includes discussions of the objectives and functions of regulation as well as an introduction to the key issues of regulatory substance. It sets out what can usefully be said in general terms concerning the core substance of infrastructure regulation which, of course, varies considerably, between infrastructure industry and country. The main focus is on how regulation can best be used to increase the efficiency of the infrastructure service suppliers and the volume (and efficiency) of investment.

16. Chapter 4 discusses regulatory governance. This section includes material on what makes for good governance and discussion of the relevant criteria for the evaluation of regulatory governance. It also covers examples of good and bad regulatory governance and evidence on the impact of good and bad regulatory

[3] See the writings of Dani Rodrik and, in particular, Rodrik (2004) for a very well-focused discussion of the balance between generic purposes and local country features in the design of economic institutions. This paper adopts that general perspective.
[4] Brown et al. (2006): 90 and discussion following. For a good general discussion of State ownership, utility reform and regulation, see Gomez–Ibanez (2007) who also analyses the reasons for the relative failure of State-owned enterprises reform in developing countries from the 1960s onwards.

governance on infrastructure industry performance. This chapter also covers resource availability for regulatory agencies, particularly the availability of scarce specialist human resources.

17. Chapter 5 covers the main types of regulatory entity. The discussion includes material on appropriate intermediate and transitional regulatory arrangements for countries with weaker legal and other institutions.

18. Chapter 6 makes some short concluding comments and also makes some suggestions as to further work in this area.

19. The discussion in the rest of the paper focuses very heavily on telecommunications and energy (electricity and natural gas). This is because (a) the bulk of the available discussion and evidence on regulatory design and effectiveness concerns these industries; and (b) because these industries produce outputs that are traded internationally. Telecom services are included in the General Agreement on Trade and Services (GATS) and both electricity and natural gas are widely traded. In consequence, regulation and energy prices for industry are international trade issues that have generated controversy within the World Trade Organization (WTO) (e.g. in the discussions over Russian Federation entry to WTO). The same is not true for railways or water – where, in any event, there are few regulators – so there will be little explicit discussion of these industries in what follows. However, it is worth noting that there have been several major legal cases concerning governmental regulatory obligations over foreign investment in water. These have arisen from disputes over bilateral investment treaty (BIT) agreements brought before the International Centre for the Settlement of Investment Disputes (ICSID). Examples include cases involving the water industries of Bolivia and the United Republic of Tanzanian.

20. Airports and ports (and sometimes roads) are usually considered as infrastructure elements. However, they are primarily infrastructure “facilities” rather than infrastructure “industries”. In addition, there are very few explicit RIFs for them and their “regulatory” organization raises very different issues since not only do they compete with one another, but there is no explicit physical monopoly network element, as there is for the utilities discussed above. However, the discussion of regulatory institutions and governance in chapter 4 should be relevant for all regulatory entities, including concession contract monitoring and enforcement agencies, and similar institutions that are often important for overseeing airports, ports and toll roads.

2. Infrastructure industries and the need for economic regulation

21. The main infrastructure industries are:

- Electricity;
- Natural gas;
- Telecommunications;
- Railways;
- Water and sewerage; and
- Postal services.

22. These industries all share one common feature: they all supply their services via a physical network.[5] Electricity wires, gas pipelines, railway tracks, water and sewerage pipe systems provide national and/or local monopoly facilities that are

[5] Note that oil and oil products are not in this list, since they can be transported in a number of ways and are not in any way dependent on a monopoly pipeline network. Postal services, like telecoms, do not have a unique *central* network, but in practice postal service-delivered letters and small parcels do have a customer-end local delivery monopoly.

essential for linking producers with consumers. Historically, this was also true for telecoms and postal services. For postal services and – to a lesser extent – fixed-line telecoms, this is still very largely true, but the monopoly element is on the local delivery into the factory/office/dwelling rather than higher up the supply chain (the "local loop").

23. The dependence of these industries on a natural monopoly network means that consumers are potentially subject to monopoly exploitation. Hence, the need for economic regulation – at least of the monopoly network element, if not the whole industry. This applies to all the industries above other than telecoms.

24. For telecoms, we are now seeing increased network competition within fixed-line services, as well as fixed-line competition with mobile and fixed radio telephony and substantial competition within mobile and fixed radio. There are still crucial network access bottlenecks in telecoms, but the growth of network competition – in developing as well as developed countries – means that telecom regulation is increasingly becoming ever closer to standard competition (antitrust) policy. It is for this reason that telecom companies are rarely classed as "utilities".

25. Besides these infrastructure *industries*, there are also various infrastructure *facilities*. These include:

- Roads (particularly toll roads);
- Canals; and
- Airports and ports.

26. Within each category, there is competition so that, for instance, ports and airports compete with one another both within and between countries. The transport modes also compete with one another. In addition, although there may be a "virtual" network of ports, airports and roads, there is nothing comparable to the industry networks for electricity, natural gas or water and sewerage. Further, they do not necessarily (or usually) employ significant numbers of staff post-construction. Hence, they are not typically subject to economic regulation of the same kind, although they may be subject to quasi-regulatory oversight e.g. by a concession contract monitoring and enforcement agency when built and operated under concession contracts or similar.

27. The following section discusses economic regulation for the infrastructure *industries* listed above.

2.1 The need for economic regulation of infrastructure industries

28. As explained above, the main need for economic regulation derives from the fact that the infrastructure industries are critically dependent on a monopoly network either centrally (e.g. at the national level) and/or at the local delivery level. Hence, economic regulation, although it is primarily concerned with consumer protection, is very different from other forms of consumer protection. Essentially, it is a form of specialist competition policy unlike most other consumer and citizen protection that is delivered via regulation. The latter group includes food and drug safety legislation, environmental regulation, health and safety regulation, financial services regulation, health and social service regulation, etc.

29. Many of the non-infrastructure-related elements cover *all* industries (e.g. health and safety and environmental standards). Others include only some industries but do not involve protection against monopoly as a major concern (e.g. financial regulation and food and drug safety regulation). It is sometimes the case that some elements of these other forms of regulation are the responsibility of an infrastructure industry economic regulator so that, in the United Kingdom, health and safety issues for the railways are handled by the Office of Rail Regulation, the economic regulator, and similarly for United Kingdom airports. However, at least in countries

with sufficient specialist staff, the non-economic elements of infrastructure industry regulation are handled by other and quite separate regulatory entities, such as the United Kingdom Environment Agency and the Health and Safety Executive.

30. One crucial difference – as we will explain further below – is that, for economic regulation, a critical function is to support investment in general and, in particular, to ensure that there is sufficient investment in the network and other elements to ensure continued universal access at a defined quality. Hence, for a commercialized infrastructure industry, economic regulation needs to ensure that investors earn a sufficient rate of return on their installed capital to finance and remunerate an ongoing and sustained physical investment programme. This is necessary to protect *future* consumers. There is no equivalent to this in the other forms of regulation.

31. The argument above does, of course, depend on the infrastructure industry(ies) in question being wholly or very largely commercialized. A relevant set of commercialization criteria are set out in box 1 below.

Box 1. Commercialization criteria for publicly owned utility service industries and enterprises

- The relevant company or enterprise should:
- Have corporatized status and not operate as a government department;
- Be governed by a board with a significant number of non-executive board members who should not be government officials;
- Be in full compliance with internationally accepted accounting standards, including its own balance sheet;
- Pay taxes at the same rate as other companies or enterprises;
- Borrow at market-based interest rates;
- Earn a commercial rate of return on capital or equity;
- Have the autonomy to borrow within limits set by the board and regulator;
- Have the autonomy to procure equipment consultancy, and other services;
- Have the autonomy to hire and fire staff;
- Adopt commercial salaries and employment conditions (including total level of employees); and
- Raise financing from capital market sources rather than from low-cost government fiscal sources.

Source: Brown et al. (2006): 61.

32. These criteria are typically met for almost all countries in telecoms and for many (but by no means all) countries' electricity and natural gas industries. They are, however, met a lot less often for railways (particularly passenger railways) and postal services, and even less for water and sewerage, where unsubsidized private financing of investment at market rates is the exception rather than the norm. This has major implications for the regulation of these industries, as we will discuss later.

33. Although the existence of a monopoly network is the key reason why infrastructure industries are subject to ex ante ("before the fact") economic regulated and others are not, there are some other reasons why they are regulated. These include:

(a) They are *highly capital intensive* and the capital installed is very long-lived e.g. 25–50 years or more;

(b) The capital is very largely comprised of *sunk assets* i.e. capital equipment that cannot be moved or used elsewhere and which have little or no second-hand value[6];

(c) The industries are characterized by considerable *economies of scale and density* (particularly in the network elements) and *economies of scope*; and

(d) The outputs of these industries provide *critical inputs* for all industrial uses and for all households.

34. The first three of these mean that, for most infrastructure industries, the market can only support one commercially viable supplier – at least for the network element. Consequently, the network is a *natural monopoly*. No country in the world has competing electricity transmission or distribution grids, or competing grids for natural gas and water – but, for telecoms, network competition is becoming more important, although whether this will survive the arrival of NGN (Next Generation Network) fibre-based networks is an interesting question.

35. Point (d) above means that there are major political as well as economic sensitivities concerning the quantity, quality and – especially – the price of infrastructure industry outputs. Affordability, particularly to households and peasant farmers, is a major policy concern. This can be a powerful constraint on whether or not countries find it acceptable to adopt economically efficient prices that also provide a rate of return on capital sufficient for continued privately financed investment.

36. In addition, to ensure adequate supply, EU and other developed country Governments have developed *universal service* obligations and developing countries have developed *universal access* obligations.[7] These obligations may be financed by explicit government subsidy or by cross-subsidies between different types of users (e.g. urban to rural consumers). They are often, however, financed by a below commercial rate of return on assets – this is particularly prevalent with public ownership. Hence, unless financed by separate rural electrification/telecom or similar programmes, these universal service objectives can again cause problems or prevent achieving economically efficient prices that also provide a rate of return on capital sufficient for continued privately financed investment.

37. These arguments demonstrate that there can be complex, difficult and politically sensitive tradeoffs between (a) economic efficiency, (b) affordability (c) health or other externalities and (d) universal service requirements. These tradeoffs become more difficult where large numbers of *existing* connected consumers pay a very low and uneconomic price for the service. This last is frequent for urban household electricity and – even more so – for water consumers and (where they are connected) for peasant farmers. This makes it much more difficult to extend developing country electricity and water network services from higher income urban dwellers to lower income rural communities. Partly in consequence, developing country rural consumers typically pay more for their electricity and water service unless granted explicit subsidies or implicit cross-subsidies. (This is particularly true for electricity consumers connected to local stand-alone grids rather than the national grid.)

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[6] Airport runways are classic sunk assets whereas aircraft are not since, if an airline runs into financial difficulties, the aeroplanes can be sold off, repainted and used by another airline. The opposite is the case for airport runways.

[7] *Universal service* obligations require mandatory provision of the service to all households and businesses (e.g. mandatory electricity supply if within a certain distance of a distribution network, a five/six days per week postal collection and delivery service). *Universal access* obligations require all households and businesses to have an accessible service within their local area, whether through individual or collective access. For further discussion, see UNCTAD 2006 Expert Meeting Report TD/B/COM.1/EM.30.3.

38. Reconciling these different claims can be very difficult indeed, unless sufficient tax-finance subsidy is available. Where developing and transition country regulators exist, they are typically placed in the extremely difficult position of having to try to find some workable accommodation between the various interests. Sometimes they are able to find workable solutions to these problems, but in many cases they are either unable to do so or the Government does not allow them the autonomy to do so.

39. The varying needs for economic regulation of different infrastructure industries are set out in the table below.

Infrastructure industries and need for regulation

Industry	Rate of demand growth	Rate of growth of technical progress	Potential for competition (including competition in products and competition between networks)	Degree to which assets are sunk	Externalities (including social benefits and relative costs of achieving them)	Overall importance of effective regulation
Electricity	Low	Low	Medium	High	High	****
Natural Gas	Medium	Low	Medium	High	Medium	***
Telecoms	High	Very High	High	Medium	Low	**
Water and Sewerage	Low	Low	Very Low	Very High	Very High	*****
Railways	Very Low	Low	Low	Very High	Medium	*****

40. The relatively low need for regulation in telecoms arises, (a) from its rapid rate of growth of technical progress and of desirable new products (typically rather faster than national income growth); and (b) from the low level of externalities – universal access can readily be achieved by mobile phones, which, in developing countries are increasingly becoming universal access payphones. The first point means that capital is much less "sunk" and it will typically have a life determined by economic obsolescence rather than by it physical wearing out. In addition, the capital stock has a high proportion of computerized digital switches rather than major physical constructions. Given these issues, telecom regulation, although it requires careful access rules and pricing, is much less demanding or price/quality constrained than for other industries – particularly for mobile telephony.

41. Water and sewerage is at the other extreme. Demand growth and technical progress are slow (typically rather slower than national income, at least in countries where access to water mains and sewerage is high) and there are few new products. The capital stock is of major new physical facilities (reservoirs, pipe systems, aqueducts, water processing plants, etc.) that have very long lives – in some cases over 100 years. In addition, there are major externality issues, e.g. the role of water in public health, for firefighting, etc. Hence, the demand for regulation is high and it can be very difficult indeed to reconcile the competing policy objectives, let alone to do so in a way that allows prices which can support privately financed investment.

42. Railways (at least passenger railways) are closer to water in its requirements for considerable amounts of different types of regulation that may be in conflict with one another. Urban commuter railways are another area where there are important environmental externalities but existing consumers typically pay a price below economic cost.

43. Electricity is an intermediate case and natural gas is an intermediate case, but closer to telecoms in its requirements for regulation. Electricity demand growth is typically around the same as national income (unless there is a substantial amount of excess demand arising from shortages of capacity) and technical progress is

relatively slow. Assets – particularly network assets – are relatively long-lived and sunk but much less than in water or railways – generating stations typically have lives of around 25 years. In addition, electricity requires complex and virtually instantaneous balancing of physical flows across networks at constant voltage and frequency, which imposes difficult technical and other requirements that need to be integrated into the regulatory framework. Externalities are moderate, although more significant in cold countries. This, however, is changing with an increased focus on climate change. Consequently, electricity requires rather more regulation and this can become complex when vertically and horizontally integrated electricity companies are unbundled so that competition is created in generation and wholesale (and some retail) supply/sales.

2.2 Regulation in monopoly and unbundled infrastructure industries

44. In the past, infrastructure industries were considered as natural monopolies and not just the core physical network elements. Hence, 50 years ago, we had:

(a) In telecoms, AT&T (the Bell system) in the United States, British Telecom and equivalent national companies in France, Germany, Italy and around the world;

(b) In electricity, EdF in France and the CEGB in the United Kingdom, plus vertically integrated state/province level companies in the United States and similar around the world;

(c) In natural gas, British Gas and Gaz de France, etc; and

(d) In railways, British Rail and Deutsche Bahn, etc.

45. In some cases (e.g. German electricity and gas), the vertical integration was by long-tem supply contract to municipalities rather than by industry structure, but it was still effectively a vertical monopoly with the downstream supply part being secured by long-term franchise contract with local authorities.

46. The vertically integrated model was, in the mid-twentieth century, frequently associated with State ownership – although not in the United States and much less in Germany. In developing countries, State ownership was the norm, as the infrastructure industries began seriously to expand their coverage after 1945.

2.2.1 Regulation in vertically integrated systems

47. In all countries and systems, there are some infrastructure regulatory requirements. For monopoly industries, someone has to approve/authorize changes in:

(a) Prices;

(b) Quality;

(c) Investment; and

(d) Efficiency/cost reduction targets.

48. However, these are achieved in very different ways in non-commercialized State systems from commercialized systems and between vertically integrated and unbundled companies.

49. With monopoly State-owned systems, agreement is reached by bilateral bargaining between the company and line ministries (or other executive parts of Government). *Regulation* is intimately bound up with telecom/energy/transport *policy* – and with other government policy objectives (e.g. anti-inflation policy, equity policies, development policy, etc). For water, the equivalent is control by the local authority (as in France) and this model was important in energy in the United

Kingdom until at least 1914 – and still has some role in Germany, Scandinavia and elsewhere.

50. In the system with State ownership outlined above, there is little need or room for an independent regulatory agency, as policy and regulation are wrapped up together. The key objective is meeting the Government's policy goals and consumer welfare plays little or any role – as illustrated by the waiting list of months if not years for household telephone connections in non-commercialized telecom systems. This is the system that prevailed in an extreme form in the pre-1989 regimes in Central and Eastern Europe (CEE) and in the Soviet Union.

51. In Western Europe, there was some movement away from it, as State-owned enterprises were required to operate in a more commercial manner and to earn a positive real rate of return that, from the mid-1960s, became increasingly similar to a commercial rate of return. However, even in the United Kingdom, the breakthrough to having an explicit and independent regulator only arrived with privatization in the 1980s, firstly with telecoms (a vertically integrated company but with initially limited network competition). This was followed in the United Kingdom by natural gas (a vertically integrated company until 1995) and then with water (a set of vertically integrated regional companies), electricity and railways (both vertically unbundled but with some competition form the start in non-network elements). In both telecoms and energy, similar paths were followed by other EU States and then by CEE accession countries, which were required to adopt these reforms as a condition of joining the EU.

52. However, in the United Kingdom and the other European countries, as well as in developing countries, the arrival of explicit regulatory agencies for telecoms and energy was very largely a product of opening up to private investment and/or private finance of investment, either directly or by allowing competitive entry by other EU member State enterprises. Hence, we see the emergence of independent regulatory agencies in previously State-owned infrastructure monopolies from the late 1980s and through the 1990s.

53. In this model, policy and regulation are separated with the setting of policy goals assigned to a ministry and regulation implemented by the regulatory agency. However, it needs to be recognized that the boundary between policy and regulation is not fixed and varies considerably both (a) between countries; and (b) within countries over time, and between Governments. Nevertheless, the introduction of a genuinely autonomous or independent regulator does mean that other considerations in infrastructure investment and pricing are given a lot more weight relative to government policy objectives (e.g. consumer welfare and investment profitability). Of course, benevolent Governments place some weight on consumer welfare, even with monopoly State ownership. However, how far this translates into good outcomes for consumers varies considerably and the consumer benefits are inevitably less direct than in a commercialized, market-based system, whether with public or private ownership.

54. There are regulatory agencies with State-owned facilities and they may be important *provided that* the industry has been commercialized.[8] However, regulation of state-owned companies is inherently more difficult because:

(a) Commercial incentives are inherently weaker than for privately owned or financed companies. This leads to higher costs, lower efficiency as well as excess investment volume and costs;

(b) State-owned companies tend to control their Government/ministry rather than vice versa. This is because companies have much more knowledge of their

[8] Norwegian electricity distribution provides a good example of an efficient (locally) publicly owned system that operates in a strongly commercialized way and is very consumer-responsive. However, such examples are rare.

business than does the supposed controlling entity (as well as considerable political power)

55. The examples discussed above relate monopoly with State ownership and private ownership with competition. However, the United States provides an example of private ownership with monopoly – but with a powerful role for regulation. In the United States, telecom services were provided almost entirely by the Bell System until its mandatory breakup in 1984. Similarly, electricity services were supplied by often weakly interconnected State-level monopoly electricity systems. In both cases, regulation was the condition for allowing the monopolies to operate, with federal and State-level regulation (the latter by multi-sector State commissions).

56. The key point about how and why effective regulation developed in the United States was that, from around 1900, electricity, water and tram companies were able to negotiate embryonic cost-of-service regulation by their local municipality in return for a monopoly franchise. Hence, in contrast to the position of the United Kingdom or France, where franchisee rights were heavily protected, United States franchise contracts often made *explicit* provision for renegotiation in response to changes in circumstances, subject to arbitration or reference to an independent committee. These independent committees could take the responsibility for monitoring service quality, either by arbitration or by regulatory review. The municipal committees gradually evolved into State public utility commissions with substantial power to extract concessions from the utility as a condition of maintaining their franchise without competitive entry. From around 1920, these arrangements were gradually codified and, in the 1930s, brought under federal regulatory agency supervision.[9]

57. The resulting United States regulatory compact was based on companies having to charge prices that are (a) based on "just and reasonable costs" and (b) offer the opportunity to obtain a fair rate of return after recovery of investment and operating costs. This position was established by the 1944 Supreme Court ruling in the *Hope Natural Gas Company* case. A fair rate of return is defined, from a 1923 water sector judgement, as the rate of return that investors can earn in other sectors, after adjusting for differences in risk, etc. These rulings plus vertically integrated monopoly or semi-monopoly provision led to the development of classic cost-of-service regulation.

58. Cost-of-service regulation is conceptually very straightforward but requires large numbers of middle-skilled people to record and analyse the expenditure and cost data. However, it has increasingly been criticized for encouraging excessive investment and for providing weak incentives for efficiency improvements. In the United States, the major introduction of competition in telecoms and, to a lesser extent, in electricity and natural gas (along with the criticisms above), has led to "pure" cost-of-service regulation being very largely replaced by forward-looking price cap- or revenue-based regulation. However, costs and their control still play an important role.

59. The United States cost-of-service model provided a strong basis for rolling out infrastructure services across the country to all States and all consumers – and for doing this on a very largely commercialized basis, with private investment dominant. The key point was that the cost of service regulation provided the underpinnings for bond issues by companies and others. The regulatory guarantees implied low risks and thereby kept low the debt interest requirements from the bonds. This, in turn, meant a low cost of capital to be recovered from costs.

[9] See Newbery (1999): 23 for a description of the evolution of United States municipal regulation. See Troesken (1997) for a detailed discussion based on a case study of nineteenth and early twentieth century Chicago town gas.

60. In any privately financed regulatory system, consumer welfare considerations play an important role. Furthermore, the United States concept of “just and reasonable costs” implies cost and investment supervision to ensure that service providers can only receive revenues from consumer tariffs in respect of reasonably incurred costs, as judged by independent regulatory agencies. This grew up under the monopoly provider environment and represents a major difference from the state-financed model, where government policy objectives dominate.

61. In general, the problems or regulating vertically integrated private (or privately financed) utilities must address the following:

(a) Managers have incentives to restrict supply, reduce quality, not to increase efficiency and to charge prices much greater than costs:

  (i) A standard solution: service obligations to connect and supply customers within a certain distance of networks;

(b) Governments have an incentive not to allow companies to earn a reasonable rate of return on their investments, e.g. by refusing to allow cost-justified price increases:

  (ii) A standard solution: investment plans approved and price rises agreed by regulator or according to formula laid down in contract.

2.2.2 Regulation in unbundled infrastructure systems

62. Technological progress has allowed the unbundling of monopoly infrastructure industries. In particular, this has been fostered by the development of computers and sophisticated information and communication technology systems. Hence, previously vertically integrated industries can be vertically separated into their different elements and, in addition, vertical unbundling allows the introduction of competition into upstream production and downstream supply elements.

63. The clearest example is in electricity, where the most fully unbundled industries involve:

(a) A number of competing generating companies (plus, typically, imported generation);

(b) A single monopoly transmission company, owned and operated separately from both generation and supply/sales companies;

(c) A system operator (often part of the transmission company if the latter operates under full ownership separation);

(d) One or more monopoly distribution companies operating low voltage networks;

(e) Several competing wholesale supply/sales companies; and

(f) A number of competing retail supply/sales companies.

64. In an electricity system of this type, there would also typically be a trading exchange, forward and derivatives markets, electricity traders, etc.

65. There are relatively few fully unbundled systems of this type in the world. The England and Wales system is the best known example, but Scandinavian electricity markets, some Australian ones and some United States states (e.g. Texas) represent others. Over the last few years, the EU has been moving increasingly towards this type of model, but France and Germany have been resisting full ownership unbundling of transmission.

66. Fully unbundled markets such as the one above require sophisticated market and other arrangements, and a large enough market to support genuine competition in both generation and supply. Hence, fully unbundled electricity systems only exist

in (a) relatively large electricity systems (e.g. the England and Wales system and Australia); and/or (b) in highly interconnected smaller systems (e.g. the United States and, increasingly, the EU).

67. Consequently, the degree of competition – and unbundling – is typically much lower in developing countries. The largest (e.g. Brazil and the Russian Federation) have been moving in this direction and Chile has long been a pioneer but for most developing and (non-EU) transition countries, unbundling is typically limited to:

(a) Limited generation competition based on costs rather than market bidding – mainly in middle income and larger countries, particularly in Latin America;

(b) Wholesale competition by generators to sell to integrated distribution and retail supply companies;

(c) Generator competition to supply large industrial consumers, again mainly in middle income and larger countries; and

(d) Limited generation competition in relatively vertically integrated generation and transmission single buyer companies via power purchase agreements (PPAs) (common in Asia and increasingly in Africa).[10]

68. There may also be some competition *for* the market e.g. contracting for generating capacity via independent power producers (IPPs), frequently to supplement generation supplied by the incumbent national power company.

69. Similar unbundling patterns can be found for natural gas and, occasionally, in railways but not in water, but even more focused on the highest income and largest countries.

70. In telecoms, there are more competing companies. Mobile telecoms and Internet service providers are typically highly competitive in both developed and developing economies. For fixed line services, there has been less vertical separation than in electricity and gas but now, at least in the United Kingdom and some other countries of the EU, there has been growing interest. In the United Kingdom, "functional separation" (i.e. business and management separation but not ownership separation) has been adopted by BT and local loop unbundling is a major EU policy. In the United States and Canada, competition in telecoms is expected to develop vertically via facilities competition based on fibre, cable television, fixed radio, etc., rather than by unbundling. In developing countries, there is less fixed line competition (and much less in Africa and most of Asia) but it is growing e.g. via leased lines, VSAT, etc.

71. The common feature about all of the electricity and telecom systems discussed above is that competition policy issues increasingly dominate over the classic regulatory functions concerning investment in networks and its financing, plus the costs and prices of network services. The classic regulatory functions have been retained for the network – where there is a monopoly network or there are monopoly bottlenecks – but even there, the role of competition policy is much more important than it was 25 years ago, e.g. as regards access rights and prices. For upstream and downstream services in unbundled systems, competition policy provides the main framework and this area has become progressively more important; competition policy has also become more important where there are competing networks. Indeed, telecom regulation in developed countries is almost entirely applied competition policy, and EU telecom regulation directives are firmly based on EU competition policy rules.

[10] PPAs are long-term contracts for generation e.g. for 25 years. They are frequently (but by no means always) associated with IPPs (independent power producers). In a PPA, the generation company sells bulk power on a contract to one or more offtake purchasers (e.g. the incumbent power company, retail supply companies or large industrial consumers). .

72. For electricity and gas, the more competition-related aspects of regulation include:

(a) Market power and potential abuses in generation markets;

(b) Market power and potential abuses in wholesale and retail supply/sales markets;

(c) Vertical linkages allowing the leverage of market power from one market to another (e.g. from supply markets into generation); and

(d) The role of transmission bottlenecks or constraints on market outcomes.

73. Access rules and access pricing are crucial issues for all partially or wholly unbundled infrastructure industries. For telecoms, this means access by companies to other companies' networks. Regulators play a major role in developing access rules and prices, particularly in the early stages of unbundling and competition. For electricity and gas, this means third-party access where the EU now has mandatory *regulated* third party access to transmission/transport and distribution systems. For telecoms, this means fixed network access rules and prices, termination charges, roaming charges, etc.

74. As yet, these are issues primarily for richer developed countries – who typically have established competition (antitrust) agencies. However, they are becoming progressively more important in the larger middle income developing countries (e.g. Mexican telecoms) and where countries are setting up multinational electricity or similar markets.

75. Even with very limited unbundling, competition issues are still important for regulation, e.g. in the Asian IPP electricity model. Indeed, some of the hardest entities to regulate are combined transmission and generation national power companies but with competing IPPs. Similar issues can arise with competition where nationally competitive integrated telecom companies can exercise very substantial market power.

76. Controlling the market power of the incumbent is the main problem. It is even harder if, as is often the case, the incumbent was previously the national or regional/provincial/State monopoly supplier.

3. Infrastructure regulation: the objectives and functions of infrastructure regulation and the substance of regulation

77. This chapter first discusses the objectives and functions of economic regulation of infrastructure industries and then turns to discussing the main governance issues that affect the design of regulatory agencies.

3.1 The objectives and functions of economic regulation

78. The key objective of economic regulation of infrastructure industries is t*o ensure the continuous supply, over the long-term, of specified infrastructure services of defined quality at the minimum necessary cost (and prices) to the population and industry of the country.*

79. Note that consumers' welfare is paramount in this objective but meeting that does not mean the lowest possible price to *current* consumers. Economic regulation has to protect the interests of *future* consumers as well as *current* consumers (as in the United Kingdom Utilities Act 2000). Hence, setting the *"minimum necessary"* costs and prices implies the need for investors to earn a reasonable, risk-adjusted rate of return on their investments. This last is necessary to achieve *continuous* supply of the service in question and to maintain quality standards over the long term.

80. Consequently, investors must be allowed a return over operating costs to allow for:

(a) Maintenance costs of the existing networks;

(b) Renewal and expansion investment;

(c) Depreciation; and

(d) The reasonable expectation of a post-investment, post-depreciation normal, risk-adjusted rate of return on capital.

81. The prices that include the elements above are *long-run marginal cost*-based prices which are significantly higher than operating costs or *short-run marginal cost*-based prices.

82. Unless they are allowed to prices at this level, *commercialized* infrastructure companies will *either* (a) be unable to maintain and renew the network and industry; *or* (b) the Government will have to finance some or all of investment. At the limit, public ownership and non-commercial operation operates as the fall-back solution. A classic example of (a) is the pre-1990s history of the Jamaican telecoms industry.[11] On (b), issues of affordability and the position of current consumers frequently prevent Governments and regulators from pursuing the objective above, as discussed in section 2.1. If that happens, it is not possible to reach the balance between investors and consumers outlined above.

Box 2. Affordability, capital costs and pricing in infrastructure industries

For water and sewerage (and, to a lesser extent, railways and postal services), Governments in most countries are unable and/or unwilling to charge prices that fully cover capital costs that include a normal rate of return so that direct or indirect public subsidy is required. Direct public finance of water and sewerage is common (e.g. via French-style *affermage*/lease contracts or management contracts). In Central and Eastern Europe and many developing countries, indirect public support was – or still is – achieved by the State providing investment funds, but the Government does not require a normal rate of return on assets or any dividends. This is then used to maintain prices to households and/or small farmers that do no more than cover short-term operating costs.

83. The key functions of economic regulation are the regulation of:

(a) Prices/rates of return on assets;

(b) Quality of service; and

(c) Development plans/investment (at least regulating the investment plans in monopoly network elements).

84. In addition, as discussed in chapter 2 above, economic regulation also needs to covers anticompetitive behaviour, economic purchase obligations, dispute resolution, etc. In addition, for unbundled utilities or where competition is present, regulation of network access and pricing are crucial elements.

3.2 Core regulatory substance

85. Regulatory substance (or regulatory content) is the "what" of regulation. The definition of regulatory substance is how regulatory objectives and functions are transformed into functioning entities making substantive decisions.

[11] See Levy and Spiller (1994).

86. It should be noted that the list below is a general list of headings and that no detail is presented on the individual items. This is deliberate since the content of what is regulated varies considerably *both* between infrastructure industries *and* between countries.[12] In particular, the list will vary substantially depending on whether and how far the industry has been commercialized, liberalized and privatized. (See discussion in section 2.2 above.) The headings and other lower-level items will also vary by legal system, by whether or not the relevant companies are publicly, privately or mutually owned, and by whether or not there are concession contracts.

87. It should be remembered that regulation follows – and is determined by – industry and market structure. Hence, it is only by careful and detailed consideration of specific country and industry regulatory frameworks (laws, concession contracts, guidelines, codes, etc.) that one can make the list more precise in any meaningful or useful way. Nevertheless, subject to the caveats above, most infrastructure industry regulatory frameworks typically involve many or all the following:[13]

(a) Tariff levels (particularly for network tariffs and final price tariffs for household and other small consumers);

(b) Tariff structures (e.g. the balance between fixed charges and volumetric charges and between different groups of consumers);

(c) Automatic and non-automatic cost pass-through mechanisms (e.g. fuel cost adjustments in electricity);

(d) Quality of service standards;

(e) Handling of consumer complaints and general dispute resolution;

(f) Investment or connection obligations and reviews (e.g. network investment requirements, rural electrification and telephone rollout programmes);

(g) Network access conditions for new and existing customers;

(h) Competition issues (e.g. in telecoms and in wholesale and retail markets in energy and transport), including both market abuse and merger issues;

(i) Accounting systems (particularly regulatory accounts);

(j) Periodic reporting requirements (accounts, annual reports, consultations, etc.); and

(k) Social obligations (e.g. specifying service obligations for consumers with special needs).

88. In addition, regulators are often involved in granting licences/franchises either with decision-making powers and/or advising government ministries. They are also frequently involved in competitive tenders, e.g. specifying tendering rules and approving specific tenders, as well as acting as appeals bodies in cases of tendering disputes.

89. More generally, regulators have major monitoring and enforcement responsibilities. The monitoring responsibilities include all regulated aspects of the relevant infrastructure industry. Making these operational and effective is crucial for a well-functioning regulatory entity.

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[12] This is the logical counterpart of taking a view that regulatory institutions will vary with circumstances – a rejection of the "one-size-fits-all" approach to institutional design.

[13] This list is reproduced from Brown et al. (2006), which refers to electricity (see Brown et al.:20) An equivalent list for other infrastructure industries would add or delete headings.

90. Annex 2 sets out a non-exhaustive list of other responsibilities, some or all of which can often be found in regulatory frameworks.

4 Regulatory governance

91. This chapter discusses regulatory governance issues. It starts with a discussion of the principles of good regulatory governance, and then discusses the impact of good (and bad) regulatory governance on infrastructure industry outcomes. It concludes with a discussion of human and financial resource requirements for infrastructure regulation.

4.1 Principles of good infrastructure regulatory governance

92. The fullest statement of these is in Brown et al. (2006). In what follows, we largely follow this handbook.

93. The handbook sets out three "meta-principles" of infrastructure industry regulation. These are intended to apply to all regulatory or similar agencies, including concession contract monitoring and enforcement agencies. They are also applicable for all intermediate, transitional and partially or wholly autonomous regulatory entities. The three meta-principles are:

(a) Investors must have confidence that the regulatory system will honour its commitments;

(b) Consumers must be convinced that the regulatory system will protect them from the exercise of monopoly power, i.e. excesses from high prices, poor service or both; and

(c) The regulatory system must operate transparently so that investors and consumers know the "rules of the game" (or the "terms of the deal.").

94. From this, one can derive principles of good infrastructure regulation. The handbook suggests 10 principles. These are:

(a) Independence;

(b) Accountability;

(c) Transparency/public participation;

(d) Predictability;

(e) Clarity of roles;

(f) Completeness and clarity of rules;

(g) Proportionality;

(h) Requisite powers;

(i) Appropriate institutional characteristics; and

(j) Integrity and ethical behaviour.

95. Another relevant criterion often mentioned is adequate human and financial resources to carry out regulatory tasks. (We will discuss this later in this chapter.)

Box 3. Principles of good practice regulation

The 10 principles listed above draw on an extensive range of previous similar lists, e.g. by Warrick Smith and by Stern and Holder (1999). The latter has six principles, three of "formal accountability" (i.e. *de jure* legal requirements) and three relating to "informal accountability" (i.e. *de facto* regulatory practice).

The six principles are:

Formal accountability

1. *Clarity of Roles and Objectives:*
   - Between Ministry, regulator, regulated company and consumers;
   - Preferably specified in a primary law:

2. *Autonomy:*
   - Autonomy from political intervention and company capture;
   - Appointment & dismissal criteria, funding rules, responsibility to legislature not a specific Minister/Ministry;

3. *Legal Accountability:*
   - Clear specified procedural rules;
   - Proper appeals/reconsideration processes.

Informal accountability

4. *Participation:*
   - Opportunity for all relevant parties of contribution to regulatory discussions and influencing decisions before they are made;

5. *Transparency:*
   - Publication of decisions with reasons;
   - Publication of methodologies, procedural rules, etc.;

6. *Predictability:*
   - Consistency in decision-making, continuity in approach;
   - Evolution so no sudden break in "rules of the game".

The 10 handbook principles include the six above but also add more on procedural aspects of regulation. A critical point for any regulatory framework is that it should be established in a primary law, enacted by the legislature.

96. From the 10 principles above, the handbook derives a set of regulatory standards. The headings for these standards are as follows:

- Legal Framework;
- Legal Powers;
- Property and Contract Rights;
- Clarity of Roles in Regulation and Policy;
- Clarity and Comprehension of Regulatory Decisions;
- Predictability and Flexibility;
- Consumer Rights;
- Proportionality;
- Financing of Regulatory Agencies;
- Regulatory Independence;
- Regulatory Accountability;
- Regulatory Processes and Transparency;
- Public Participation;
- Appellate Review of Regulatory Decisions; and
- Ethics.

97. The purpose of the regulatory standards is to provide the basis against which the quality of regulatory governance can be appraised. For each of the standards listed above, there are a number of elements. A full listing of these is set out in chapter 3 and appendix A of Brown et al. (2006).

98. Of course, these criteria and standards can be met in various ways and, as discussed in section 4, the types of regulatory arrangements and institution by which they are handled can and will vary considerably according to local circumstances. In terms of the *means* by which the principles and standards are met, it is emphatically the case that we are not in a world of "one size fits all". Nevertheless, the arguments are extremely powerful for using a single set of "best practice" principles and standards. These provide unambiguously the most useful benchmark for appraising the governance quality different institutional settings found across countries.[14]

4.2 The impact of good and bad regulatory governance

99. Good regulatory governance is not only desirable in its own right but, more importantly, it contributes to good quality regulatory decisions. There is now abundant – and growing – evidence that better quality regulatory governance contributes to better outcomes for infrastructure industries.

100. Good regulatory governance and practice produce a flow of good quality decisions with few poor/bad ones. In addition, with good governance, regulatory mistakes more likely to be quickly discovered and rectified and, in particular, regulatory agencies are much less likely to have repeat bad decisions on same topic. Finally, regulators with good governance are more likely to implement lessons from best practice regulation in other countries.

101. These conjectures have been confirmed in a number of case studies, in particular for telecoms and electricity. There is increasing evidence that good quality regulatory governance associated with higher efficiency and investment in developing country telecom and electricity industries. This evidence is surveyed and reported in Stern and Cubbin (2005), along with the results from a number of econometric studies.[15]

102. In terms of appraising the impact of regulatory governance on outcomes, the key point is to consider whether the *decisions* of regulatory agencies helped improve (or hindered) the achievement of good industry outcomes. Brown et al. (2006) identify the following as the main relevant outcome indicators:

(a) Output and consumption levels and growth rates;

(b) Efficiency/productivity levels and growth rates;

(c) Quality of supply level and improvement rates;

(d) Financial performance of companies in infrastructure industry;

(e) Adequate levels of capacity, investment and maintenance expenditure;

(f) Effective price signals and price levels for consumers and producers; and

(g) Degree of competition.

[14] This issue is discussed at length in Brown et al. (2006), particularly in chapter 3. See, in particular, p.54, which emphasizes the advantages of a single governance benchmark and the consistency of a single benchmark with multiple forms of infrastructure regulatory institution as well as industry ownership and market structure. This is the same approach as taken in the Kaufmann et al. country governance indicator measures.

[15] For water and sewerage, Shirley (2002) reports a number of carefully structured comparative case studies while Ehrhardt et al. (2007) provide lessons from more recent studies. See also Foster (2005). Unlike telecoms and electricity there are a lot more regulatory and reform failures than successes.

103. Items (a)–(c) are *final* outputs. Items (d)–(g) are *intermediate* outputs. A fuller and more detailed list of outputs, including subheadings, is set out in annex 1.

104. One essential point to note is that the quality of regulation (and regulatory governance) is only one element in delivering good economic outcomes. Other issues (e.g. industry and market structure) are at least as important. Using this framework provides the basis for public evaluations of regulatory systems. In particular, it provides the basis for single-country, structured case studies, supplemented by benchmarking if available, that will help inform why as well as whether regulatory institutions have helped or hindered the development of infrastructure industries.[16]

Impact of governance quality on regulatory outcomes: evidence from panel data econometric models

105. There is now over 10 years of experience with using econometric models to establish the impact of infrastructure regulation on (a) telecoms and (b) electricity industry outcomes. This literature focuses primarily on developing countries and I will stick to summarizing the developing country literature in what follows.

106. These econometric studies do not provide information on the *how* of regulation, but they do provide strong cross-country evidence on the impact of regulatory governance and what aspects seem to be of most importance. As noted above, although there has been some work on this for developed countries, the main focus has been on developing countries and, in particular, on the impact of the quality of regulatory governance (a) on investment and (b) on efficiency (e.g. labour productivity growth).[17]

107. The new standard best practice econometric procedure is to take a panel data set (e.g. around 20 countries with 10–20 years of data for each) and to estimate an econometric model for physical investment (and separately for efficiency) in telecoms or electricity that allows for both observable and unobservable country-specific effects.[18] The models also include terms for regulatory quality, industry liberalization and competition, as well as country governance characteristics and other relevant control variables (e.g. income growth, urbanization rates, relative prices, etc). Variants of this model have been estimated for telecoms (fixed and mobile), and electricity (generation and distribution).

108. The power of this method arises from the fact that countries in the sample established infrastructure regulatory agencies at different dates. The same applies to liberalization and privatization (where relevant). Also, there are a few countries which have not established a telecom or electricity/energy regulator by the end of the observation period. Combining these factors provides considerable power to the panel data economic techniques, which means that comparisons can effectively be made across countries over time periods as well as within countries over lengthy periods.

109. Initially, the research agenda focused on whether or not the *existence* of an independent regulatory agency significantly improved investment and efficiency outcomes. However, over the last five years or so, the research has focused more on whether the quality of regulatory governance, as measured by a number of indicators, significantly improves performance. Unfortunately, as the number of

[16] For further details, see Brown et al. (2006), especially chapters 2, 5 and 6. See also Stern (2007).

[17] Efficiency – and efficiency growth – as regulatory objectives since they very largely determine costs and prices. The higher the levels of productivity and its growth, the lower the costs. For operating costs, this means (other things being equal) lower prices to consumers; for capital efficiency, it also means lower financial and/or physical investment requirements to meet demand and/or to meet service rollout targets.

[18] Unobservable fixed effects are estimated via fixed effects or similar econometric techniques. They should capture important elements of variations in country governance and its reputation – in practice as well as on paper.

indicators increases, the harder it is to establish which are the most important, as the quality of governance across indicators is typically very similar for any individual country (i.e. strong – or weak – on most or all governance variables). Hence, indicators are usually grouped together e.g. in one or more indices.

110. Of the first generation of telecom studies, Stern and Cubbin (2005) point to Gutierrez (2003) as a particularly strong paper on fixed-line telecoms in developing countries. He employs a 12-element regulatory governance index for a set of Latin American and Caribbean countries. More recently, Gasmi et al. (2006) and Maiorano and Stern (2007) have extended the analysis to mobile telecoms as well as fixed line. All of these papers describe the quality of regulatory governance by the *formal, legal* aspects of regulation. However, a forthcoming paper by Montoya and Trillas (2009) also provides evidence on de facto practical aspects of the quality of telecom regulatory governance (viz. the security of tenure of regulatory of commissioners).

111. In general, this literature suggests positive effects of the quality of regulatory governance on telecom industry outcomes. Montoya and Trillas (2009) also show that adding data on the degree to which legal requirements are actually met in practice strengthens the estimates of the effect of good regulatory governance on industry outcomes. In their model, better performance on de facto governance significantly improves the association between regulatory quality and investment. The results on the tenure of regulatory commissioners (or similar), is very consistent both with case study work on regulatory governance and with research on the effectiveness of independent central banks. It is particularly important as to whether regulatory commissioners remain in post following a change of government.

112. Competition from liberalization and privatization are usually (but not always) strongly associated with better investment and/or efficiency and there is also some evidence of positive interaction effects between regulation and competition/privatization (i.e. examples where better regulation reinforces the positive benefits of competition and/or privatization – and vice versa.).

113. For electricity, Cubbin and Stern (2006) have carried out a similar analysis on 28 developing countries using panel data to explain the determinants of investment in generation. They find strong evidence of positive effects of regulation – particularly once regulatory agencies have been operational for three to five years or more. Their study suggests that whether or not the regulatory framework has been established by a primary law is the single most important governance characteristic. More recently, Andres et al. (2008) find strong impacts of regulation on the performance of electricity distribution and retail supply companies in Latin America and the Caribbean. Many of these involve private investment via concession contracts.

114. This is an important, state-of-the-art paper and it is worth summarizing its results in a little detail. The main findings were:

(a) Private sector participation (mainly by concession contracts) was strongly associated with improved performance on virtually all of the performance indicators;[19]

(b) The existence of a regulatory agency was strongly associated with further improved performance on virtually all of the performance indicators;

(c) The longer the time that the regulator had been in place, the more performance appeared to improve; and

[19] The performance indicators used were residential connection rates per employee, distribution losses, coverage rate, energy sold per connection, duration and frequency of interruptions, Opex per connection and per megawatt hour sold (i.e. average tariff), average industrial and average industry tariff and the utilities' cost recovery rates.

(d) Increases in the autonomy and effectiveness as measured by the various (detailed) components of regulatory governance were also strongly associated with improvements in performance.

115. In addition, they show that some elements of regulatory governance appear to be more effective at affecting different aspects of performance than others.

116. The authors conclude by pointing out (a) that regulators improved performance for these utilities, whatever their ownership – including the (small numbers of) State-owned electricity distribution utilities; and (b) that "… the highest achievements are reached with the combination of private sector participation regulated through a regulatory agency that exhibits good governance." (Andres et al. (2008):25.)

117. This recent paper by Andres et al. supports earlier work on Latin American and Caribbean infrastructure concession contracts by Guasch, Laffont and Straub, which shows that concession contracts in water and transport (mainly toll roads) are less susceptible to major renegotiation if there is a pre-existing regulatory entity.[20] This effect applies both to company-initiated and government initiated concession contract renegotiations.

118. One major issue that affects the quality of the results outlined above is that regulatory agencies do not operate in a vacuum nor are they introduced randomly. Governments with strong legal traditions and a history of generally good country governance are more likely to introduce good quality regulatory institutions than others – and vice versa for countries with poor country governance and/or major problems with institutionalized corruption. However, it is also the case that some countries introduce regulatory institutions for infrastructure because it helps satisfy loan conditions for assistance from the World Bank and other multilateral or bilateral development agencies.

119. These factors give rise to what econometricians call an "endogeneity" problem. In other words, the modeling has to take seriously the issue that the existence of an infrastructure regulatory agency – and its governance quality – are systematically related to *country* governance and other factors in the model to be estimated. This issue has been much explored e.g. by Gutierrez as well as Maiorano and Stern for telecoms and by Cubbin and Stern for electricity generation. They find that endogeneity problems do exist, but that estimating the models taking account of the potential endogeneity makes relatively little difference to the results, which continue to show positive impacts of the quality of regulatory governance on industry outcomes.[21]

120. Of course, econometric evidence has limitations. In particular, it does not explain *how and why* the results occur and there may well be concerns about whether the results demonstrate causal impacts or non-causal statistical associations. Nevertheless, the use of panel data should reduce this risk and the results are very consistent between continent, industry and researcher. However, perhaps the strongest argument for placing weight on the results of the studies discussed above is that they are highly consistent with the results obtained in case studies of infrastructure industry reform and regulation, as well as other research that is less dependent on high-powered statistical methods.[22] Case studies and similar are very interesting but cannot provide strong generalized arguments. The econometric evidence discussed above provides strong generalized corroboration of the results from case studies and similar investigations.

[20] This work is summarized in Guasch and Straub (2006).

[21] More recently, Gasmi and Recuero Virto (2008) explore endogeneity issues in more detail for telecoms, taking account of mobile fixed-line interactions. They do not find the positive effects of regulation as in their 2006 paper. It remains to be seen whether these results are replicated in further work.

[22] See Stern and Cubbin (2005) for further discussion.

4.3 Human and financial resource issues and infrastructure regulation quality

121. These issues both raise major concerns about the potential *supply* of regulatory services. In practice, human resource issues seem to be much more of an issue. In this section, I will discuss human resource issues at some length before making a few comments on financial resources.

4.3.1 Human resource issues and regulatory quality

122. The problem of human resources for effective infrastructure regulation in developing countries is one that has been much discussed. The key problem is to ensure that there are sufficient numbers of *professionally qualified specialist* regulatory staff, including accountants, economists and lawyers.

123. Stern (2000) discussed this in the context of small and low income countries. The paper discusses the example of Botswana, which established a telecom regulator (the BTA) under a good quality statute. However, the BTA had only 22 staff, of which less than one half were regulatory professionals. Botswana, in spite of having a high level of per capita income for sub-Saharan Africa, is only a very small country with a population of under 2 million people. Hence, its annual supply of graduates in 1997 was under 2,000 and the number of new graduates in law, commercial studies and social sciences was 864. Even allowing for Botswanans graduating elsewhere, this is a very small base on which to staff the governmental organizations and major companies as well as to find a reasonable number of high-level staff for the BTA and other regulatory entities. In Botswana, as in many other countries with small numbers of qualified professionals, the question arises as to whether and how far these scarce professionals should be employed in infrastructure regulatory agencies rather that in ministries or other government institutions – or in companies.

124. Stern (2000) also provided some initial statistics on the numbers of regulatory staff in a variety of developing countries. For telecoms, staff numbers seemed reasonable – 50–100 or more, except in Colombia and Jamaica (both of which in 1999 had under 30 permanent staff). However, for electricity/energy regulators, the available data showed that none of the non-ministry African regulatory agencies had more than 25 staff in total, and several had fewer than 10. Of course, many were very young regulators, but it is difficult to see how any regulatory agency could be effective with this number of staff – and with rather fewer regulatory professionals.

125. This analysis was taken a lot further in Domah et al. (2002). That paper reported data on professional staff as well as on total staff.[23] The study, which focused on electricity/energy regulators, again found very small numbers of regulatory staff – particularly regulatory professionals – in African countries. However, they also found quite well-staffed regulators in middle income countries in Asia and Latin America.

126. *Absolute* staff numbers was not the main issue. The key point was the high level of fixed costs given that developing countries have a very much lower level of electrification. These high fixed costs imply that to be an effective regulatory agency, there is a need for at least 20 or more qualified professional staff.

127. The problem is that the number of regulatory staff and professional staff *per number of connections* (or customers) is *much* higher in developing countries, particularly for electricity (and water). This is due to the much lower number of connections per million population than in developed countries. In Africa, several

[23] Although data were collected and reported, it was not possible to check on how far the definition of "professional" was comparable across countries. It is likely that the definition of a "professional" employee is very different between low- and high-income countries.

countries have electrification rates of 10 per cent or lower (e.g. Malawi and Uganda) and others both in Africa and among the poorer Asian economies have electrification rates of 10–20 per cent (e.g. Cambodia and Zambia).[24] For such countries, any regulatory agency – however low-geared to the actual number of customers and companies – will inevitably look highly staffed relative to its developed country counterpart. Where connection rates are high, those fixed costs can readily be justified. However, when connection rates are low, the high fixed costs imply that to have an effective regulatory agency means that the scarce specialist staff cannot be used elsewhere – and that can be hard to justify in small, low-income developing countries.

128. It is this last that gives rise to the observed high fixed costs and leads policymakers to explore alternative options to regulation by the local agency. These alternatives include contracting out some regulatory tasks (and much of the detail of regulation) to consultants or regulatory swaps with neighbouring countries that reduce the regulatory burden. Other alternatives are:

- Multisector regulators (covering telecoms, energy, water, etc);
- Multinational regulators; and
- Multinational regulatory collaboration.

129. More radically, some people argue for non-discretionary regulation with much greater reliance on expatriate regulatory experts or expert panels. Another more radical option is greatly increased use of contracts relative to regulatory processes, sometimes with binding arbitration either in-country or externally. These more radical options potentially offer the possibility of greatly reducing or even perhaps eliminating the need for a separate autonomous regulatory agency. However, they have the obvious disadvantage that they *substitute* for domestic regulatory capabilities rather than *enhancing* them as is done by the less radical options listed above.

130. Considerable and useful progress seems to have been made by contracting out of regulatory tasks and regulatory swaps (either by twinning or with neighbouring countries in regional groups such as the Southern Africa Development Community (SADC)). However, multisector regulators seem not to have been successful except in a few small countries such as Jamaica. Multinational regulators face an acute problem of perceived regulatory legitimacy. This is still a major problem within the European Union, so the idea of a single and both effective and accepted Mekong River or Southern Africa regulator seems extraordinarily unlikely. There have been attempts at doing this in the Caribbean (e.g. for small Caribbean islands over telecoms regulation), but they have made very little real, practical progress. Multinational ad hoc and informal regulatory cooperation seems to be much more successful.

131. Another option that has grown considerably in popularity is the use of "hybrid" regulatory models, which combine aspects of concession contracts with regulation. The contract terms are typically relatively fixed for the first few years, so that the need for extensive regulatory oversight builds up relatively slowly and countries have time to build up specialist regulatory professional staff resources. Eberhard (2007) has particularly argued for greater use of the "hybrid" model in Africa for this reason, as well as for the use of some of the other options listed above.[25]

132. Pollitt and Stern (forthcoming) try to update the earlier 2002 Domah, Pollitt and Stern study. They confirm that many of the African electricity regulators (and a few of the Caribbean and Central American regulators) still seem to be very short on

[24] See Human Development Report 2007–08,

[25] See Eberhard (2007) for a good and full discussion.

staff, particularly professional staff. This is even more so for Indian State-level electricity regulators. However, the size of the African electricity regulators has grown, so that for the few countries with regulatory staff data both for 2001 and 2005–07, all had grown in size and, in the later period, only two regulators (Namibia and Uganda) had fewer than 20 staff. Conversely, some of the Latin American electricity regulators are very large. Twelve national regulators had over 100 staff and two had over 250 staff – and several of these (including both Argentina and Brazil) had provincial level regulators as well as national ones.

133. This new evidence leads to focusing more on how to cover the fixed staffing costs of regulation, particularly in countries with low levels of electricity connection. (This is much less of an issue for telecoms where mobile connection rates are typically 25–35 per cent, even in India and sub-Saharan Africa, implying usage rates of over 50 per cent.)

134. In addition, Pollitt and Stern point out that no international agency currently seems to collect data on staff or professional staff numbers on a regular or systematic basis. There are many good reasons why this should be done. It may well be a task that UNCTAD would be well placed to carry out. As such, it would provide the base data for establishing what educational, training and exchange programmes were necessary to help developing countries establish a sufficient human resource base for effective infrastructure regulation.

135. Finally, one would expect UNCTAD to have a major role in facilitating the development of specialist human resources for effective infrastructure regulation, particularly in small and low income countries. Eberhard (2007)[26] reports that, in a recent global survey of regulators, the most frequently reported constraint was the lack of specialized skills in regulation. Thirty per cent of survey respondents cited insufficient training as a significant constraint and 61 per cent reported serious deficiencies in the regulatory training that had been received. The conclusions of the Tremolet and Shah survey cited by Eberhard were that "quality human resources are scarcer than money" and quotes regulators as saying "we lack good people."[27]

4.3.2 Financial resource availability

136. The discussion above has focused on human resources. Financial resources should be much less of an issue. This is (a) because the financial costs of regulation rarely if ever amount to more than 1 per cent of consumer revenues; and (b) because it does not require either tax revenue or foreign exchange to cover these costs.

137. The key issue is whether or not infrastructure regulators are funded (a) out of a licence fee or levy from sales revenues; or (b) whether they are funded out of government revenues. The latter is far inferior and almost always causes complaints of insufficient funding.[28]

138. Funding from government revenues is, however, primarily a mechanism by which Governments that are wary about regulatory independence can retain control over the regulator and exert pressure on it. Cubbin and Stern (2005) show that poor quality governance as represented by central government funding rather than licence fee/levy funding is significantly associated with lower investment in electricity generation. The Cubbin and Stern result that government funding of regulatory agencies results in inferior infrastructure industry outcomes has been replicated in other econometric analyses as well as in several case studies.

[26] Citing Tremolet and Shah (2005).

[27] Eberhard (2007): 7.

[28] See Energy Group Prayas Report (2003) for a discussion of this in the context of Indian state electricity regulators.

5. The main types of infrastructure regulator

139. This chapter discusses the main types of infrastructure regulatory agency, their characteristics and the circumstances for which they are most appropriate.

140. Regulators essentially differ in the degree of independence or autonomy that they have. However, this raises the question as to independence from *what* or *whom*.

141. Most of the discussion of this issue primarily relates to independence from the Government (or at least from government ministries). There is, though, a prior issue, namely independence from the incumbent infrastructure supply company.

142. This is now much less of an issue than it used to be. However, it is not trivial. In India until 1997, the incumbent fixed-line long-distance telephone company was also the regulator, particularly regarding new entrants into telecoms. Similarly in the United Kingdom, until privatization in 1990, electricity companies wishing to enter the generation market had to get regulatory permission from the incumbent vertically integrated transmission and generation company. Not surprisingly, no company actually succeeded in obtaining that permission to enter the market.

143. This paper assumes that regulation has been fully separated from infrastructure company operations (as required by the First EU Electricity and Gas Directives of 1996) and focus on the degree of autonomy from Government and government ministries.

144. It is not obligatory to carry out infrastructure regulation via a regulatory agency, even for countries that operate commercialized infrastructure industries. It is possible to try and do without explicit regulation altogether and rely just on competition law and the threat of regulatory intervention – as New Zealand and Germany did until recently, but both now have explicit sectoral regulators for electricity/energy and for telecoms.

145. It is also possible to regulate by contract, e.g. via a concession contract with regulatory aspects specified in the contract and disputes, modifications, etc., handled by the standard commercial courts.[29] However, this is now becoming increasingly unusual – particularly for telecoms and electricity – and this has also not been a successful option, as shown by the poor record in Latin America and the Caribbean of concession contracts without pre-existing regulatory agencies. (See discussion in section 3.3.1 above.)

146. Leaving these options aside, the main alternative models for infrastructure industry regulation are:

- Regulation by minister/ministry;
- Regulation by ministry after consideration by non-ministry advisory body;
- Regulation by independent regulatory agency;
- Regulation by agency *and* contract; and
- Regulation by competition agency or similar.

147. Each is considered in turn below.

148. Under *regulation by ministry*, the minister (e.g. of industry) takes and announces regulatory decisions (usually after discussion and agreement with the Minister of Finance, Prime Minister, President, etc). This option is typically associated with State-owned monopoly incumbents. It does not provide any of the key attributes of regulation to support private investment. This model has considerably declined in importance over the last 10–15 years (at least in telecoms and electricity/energy) given the decline in the number of countries providing these

[29] Note that here and in what follows, I define independent regulatory entities to include concession contract monitoring and enforcement agencies that operate independently of Governments.

services via State-owned industries. However, it remains more frequent, even in the EU, for railways and postal services where private investment is less prevalent.

149. Some countries have *separate regulatory departments/divisions* within ministries. However, even for those, regulatory independence is still only notional and private investors (especially foreign investors) place little or no weight on it when making investment decisions. For telecoms and electricity/energy, it remains an option that is still used in some African and Asian countries, particularly where state direction of these industries remains dominant.

150. Under regulation by *ministry plus advisory body*, the minister (e.g. the Minister of Industry) takes and announces regulatory decisions/after discussion and agreement with colleagues following advice from external regulatory agency. This is often advocated and used as transitional step to independent decision-making regulator. However, it is very difficult for a new advisory agency to establish its regulatory reputation and credibility. It is also essential for advice to be published, but this is rarely done.

151. Most advisory regulators have *not* been upgraded into autonomous decision-making regulators, although the Jamaican Office of Utility Regulation (OUR) is one that has done this very successfully. Noticeably, this was an advisory agency whose annual advice on the regulatory determination of the telecom concession was published. Other successful examples of upgrading from advisory to decision-making regulators are the Central European countries that have joined the EU over the last decade. In their case, it seems that meeting EU membership requirements were crucial for them to make the transition. However, in general, the advisory regulator option does not offer a stable long-term solution for Governments that wish to introduce private investment into infrastructure other than at the margin.

152. *Regulation by independent regulatory agency* is still the standard model for commercialized utilities. Independent telecom and/or electricity/energy regulators have been established within the last 10–15 years in over 200 countries, including most Latin American countries, Central and East Europe and the Russian Federation, many Indian States, Pakistan, South Africa, and Uganda, Zambia, and other African countries. However, the model is much less widely used for other infrastructure industries.

153. It takes at least three to five years for regulatory agencies to establish a sufficient reputation to induce larger inflows of private investment at a lower cost of capital.[30] Consequently, many recently established regulators still have to establish their role and reputation. Overall, the reform model based on independent regulators seems to work well in North America, the EU and similar countries. There have, however, been many problems in developing countries, even middle-income Latin American countries, which will be discussed in more detail below. In addition, it has been more successful in telecoms than electricity – and far less successful in water and transport industries.

154. Note that there are independent regulators of (majority or totally) State-owned infrastructure industries and there is evidence that regulation can improve their performance. However, this is far more likely the more commercialized is the State-owned company.

155. *Regulation by agency and contract* (the hybrid model of regulation) seems to be growing in importance, particularly in Africa. It also seems more relevant for electricity/energy and water than for telecoms (viz. the long-standing French water concession model). In this model, the regulatory agency's decisions are often set

[30] This is because the regulator has established a reputation for fair dealing between consumers, investors and Governments, which reduces risk perceptions of investors in long-lived, sunk assets.

down or limited by clauses in the privatization or concession contract for the first few years (e.g. five to seven years).

156. This model is most useful if the regulatory office is newly established, if it has few staff or if it has major political tasks, e.g. in raising prices to economic cost levels. However, the contract may need outside backing (e.g. international arbitration, regulatory risk or similar guarantees). In addition, the model only works *provided that* the underlying contract is commercially sustainable. In those circumstances, this approach can reduce regulatory risks and help provide early gains to consumers. However, there remains the problem of how and when to make the transition to a more discretionary system. This can be a major problem, as shown in the Delhi electricity distribution reforms. Examples where this approach has been used with success are in Romanian and Ugandan electricity distribution.

157. Regulation by concession contract and independent concession contract agency is a longer-term version of the transitional hybrid model of regulation above. It raises some of the same issues but, in addition, there is also the problem of keeping full alignment between regulatory methodologies, decisions, etc., and those in the original contract. The two can easily drift apart, which can then cause significant difficulties.

158. The final model is *regulation by competition agency*. This has been used with some success for federal level infrastructure regulation in Australia but, for energy, this has now been separated out into the Australian Energy Regulator. In some other Organization for Economic Cooperation and Development (OECD) countries, infrastructure regulators are specialist parts of competition agencies, but they still operate as *ex ante* regulators, as was the case in Australian energy, rather than relying on *ex post* competition policy remedies (as Germany and New Zealand did). Relying just on *ex post* competition policy has not proved to be a sustainable regulatory model.

159. For developing countries, relying on a competition agency is rarely likely to be an option, as there are a lot fewer States with competition agencies than with infrastructure regulators. In any event, this model is one where the difference relative to independent regulation is primarily one of style rather than of substance.

160. The standard model for regulation in developing countries remains the independent regulatory agency model, although the hybrid (regulator plus contract) model has become more important in recent years, particularly for younger and small regulators, as in several sub-Saharan African countries. The hybrid regulatory model seems to have much to offer, particularly in countries with limited institutional capacity and/or human resource problems, or where prices need to rise considerably to cover economic costs.

161. The rise of the hybrid model among developed countries is, however, in significant part a response to the difficulties that many developing countries have had in trying to implement the full independent regulatory agency model. These include:

(a) The weakness or absence of effective “civil society” and effective consumer voice leaves a big hole in the regulatory process, which means that regulatory capture by companies is more likely. (See the 2003 Prayas Report on State-level electricity regulation for a good example.);

(b) The difficulties in establishing effective regulation in countries with low-quality law enforcement (from either slow or unreliable courts) and in countries with high levels of institutionalized corruption;

(c) The difficulties in ensuring regulatory commitment by *successive* Governments, particularly if changes in government also represent effective changes in political regime. This is because there are strong temptations to

renege on initial agreements if large consumer price rises are needed to cover economic costs;

(d) This has been a relatively minor problem in telecoms (especially mobile telephony), but more important in electricity and very important in water and transport;

(e) In many developing countries, particularly in small countries, there is only a limited number of well-qualified specialist staff. To some extent, this can be alleviated by the use of regional cooperation agreements (as in Southern Africa, the Caribbean, and Central and Eastern Europe);

(f) Many developing country Governments seem to be unable or unwilling to "let go" and give real decision-making power to regulatory agencies, particularly when there are major crises;

(g) There can be significant difficulties in achieving transparency of regulation (particularly in Asia). Regulatory transparency is crucial for establishing the reputation and credibility of infrastructure regulators;

(h) There can be difficulties in containing regulatory discretion and avoiding idiosyncratic behaviour of newly-established regulators. This can be more of a problem where ministries and policymaking resources and experience are relatively weak (as in CEE countries in the 1990s and in many African countries);

(i) In some countries, it can be difficult to enforce domestically contracts and international arbitration decisions, particularly when foreign investors are involved.

162. The list above sets out some of the main difficulties that have arisen. However, there are many success stories in the development of effective infrastructure regulation, most obviously in telecoms, but also in electricity/energy. In addition, these and similar problems have all been experienced in the past in almost all rich developed countries, including the United States and the United Kingdom.

163. Introducing effective and credible infrastructure regulatory frameworks is difficult in political and legal as well as in economic terms. It also requires considerable amounts of very specialized human resources and a lot of learning time. The main issue for developing countries is how to develop regulatory frameworks that foster a virtuous circle of continuing improvement and learning.

6. Concluding comments and recommendations for further work

6.1 Concluding comments

164. It should be clear from the arguments of the paper that there is no "blueprint" for best practices (or even good practices) infrastructure regulation. Effective infrastructure regulatory frameworks not only vary by industry, but do so greatly by country. For any country, they are best established by building on existing and past arrangements that have previously existed in that country for that sector (formal and informal), or at least in similar sectors. To that can be added mechanisms from other countries – provided that they are adapted as necessary to fit the specific circumstances and requirements of that country and sector.

165. It should be remembered that some of the worst examples of poorly functioning regulation have occurred where countries have tried – or been pushed – to adopt regulatory frameworks based on examples from elsewhere. Examples of this include Philippines infrastructure regulation (largely based on United States models that have worked badly in the circumstances of the Philippines) and the

post-1990 reforms of the Ukraine electricity industry (which were largely – and over-ambitiously – based on the 1980s' United Kingdom electricity reforms and privatization).[31]

166. The key point, particularly for countries with limited regulatory capacity, is to find good regulatory fits, and that means finding matching solutions for problems that are effective in the specific local context. For countries starting with interim or transitional regulatory frameworks, there are many hurdles to overcome. There are many potential solutions, but most of the solutions have their own limitations and difficulties.[32] Among the main difficulties that arise are:

(a) Moving successfully from initial transitional arrangements (e.g. on subsidies and regulatory risk guarantees) to a sustainable long-term basis;

(b) Achieving "strong" rather than ineffective "weak" advisory regulators;

(c) Ensuring consistency between regulatory legislation and contract provisions and procedures;

(d) Enabling contracting out processes and expert panels to promote and complement rather than act as a substitute for building up regulatory capacity; and

(e) Managing the expectations of consumers, investors and Governments.

167. There are a number of good examples of the long-term development of effective infrastructure regulatory frameworks and agencies in developing countries. It is of course possible – and highly desirable – to learn from these examples, but it is not possible to transfer such models directly, and it is even less sensible to try and transfer OECD country models directly. Examples of good practice worth further consideration include (in alphabetical order):

(a) Botswana Telecoms: a high quality regulator in a very small country;

(b) Chilean Water: a rare developing country example of successful water commercialization and regulation;

(c) Jamaica: the OUR, which (particularly for telecoms) is a rare example of an advisory regulator that has successfully graduated into an effective decision making regulator; and

(d) Ugandan Electricity: an interesting example of the use of the hybrid regulatory model.

168. Some of the main reasons for their success are set out in box 4 below.

[31] For a discussion of 1990s Philippines and other Asian regulatory governance experience, see Stern and Holder (1999). For a discussion of the first wave of Ukraine electricity reforms in the 1990s, see Lovei (1998).

[32] See Brown et al (2006) Chapter 4 and, in particular, see table 4.2, p.143.

Box 4. Key points in the success to date of the Botswanan, Chilean, Jamaican and Ugandan infrastructure industry regulatory frameworks

(a) Botswana telecoms

- Strong and consistent support from the Government and the courts for property rights and their enforcement;
- A strong and sustained commitment to telecom commercialization and liberalization by the Botswanan Government;
- A high quality regulatory law;
- Strong and effective leadership at the Botswana Telecommunications Authority and a commitment to best practice; and
- The involvement with and support from TRASA (The Telecommunication Regulators' Association of Southern Africa);

(b) Chilean water

- Strong and consistent support from successive Governments and the courts for property rights and their enforcement;
- A culture of non-political professionalism in both the water regulatory agency and the water companies;
- The creation of effective commercialized regional water companies;
- A spread of water services to all groups and areas matched by strong enforcement of bill payment; and
- The use of subsidies carefully targeted on low income households;

(c) Jamaican telecoms

- Strong political leadership and central government support both for the development of a strong, commercialized telecom sector and for the OUR;
- A good quality Telecommunications Act implemented with the assistance effective technical and financial support from aid donors;
- Strong leadership and continuity from OUR directors-general and senior staff, and a high level of professionalism;
- Effective use of the GATS agreement to help push forward reform, fixed-line liberalization and competition; and
- The involvement of and support from the Organization of Caribbean Utility Regulators;

(d) Ugandan electricity

- The recognition of the need and sustained support for the commercialization of and the use of private investment in the Ugandan electricity industry;
- The careful use of a combination of concession contracts with economic regulation for Ugandan electricity distribution;
- A well-led, competent and independent electricity regulatory agency operating under a well-designed law, allowing a reasonable degree of regulatory flexibility where necessary;
- The use of the regulatory framework and the electricity distribution concession, along with the Ugandan Rural Electrification Fund, to increase electrification rates; and
- The use of World Bank Partial (regulatory) Risk Guarantees to support the concession contract and the regulator for the first seven years of the distribution concession.

6.2 Recommendations for future work

169. The major areas where further work would be required are:

(a) Advice in the design and operation of infrastructure regulation and institutions and interface between regulatory / institutional issues, development and trade;

(b) Impact of foreign direct investment into infrastructure industries and regulation;

(c) Dissemination of different approaches to the substance of regulation and how it varies by industry, by market and industry structure, by legal framework, etc.; and

(d) Improving human capacity-building, and developing regulatory training programmes, information exchanges and twinning arrangements with regulators and infrastructure suppliers in other countries.

Annex 1

Infrastructure industry outcomes

Regulatory decisions help affect industry performance on the following infrastructure industry outcomes:

1. Output and consumption

(a) Household and business access levels
(b) Consumption levels and growth rates per head and per unit of GDP
(c) Levels of unsatisfied demand

2. Efficiency

(a) Productivity levels and growth rates
(b) Cost levels and changes
(c) Capacity availability and utilization, losses (technical and commercial)

3. Quality of supply

(a) Continuity of supply
(b) Quality of supply and customer service

4. Financial performance

(a) Financial surpluses and losses, achieved rates of return
(b) Measures of indebtedness and interest burden

5. Capacity, investment and maintenance

(a) Capacity levels and margins
(b) Levels of investment and share of private and foreign investment
(c) Levels of maintenance expenditure

6. Prices

(a) Relationship of prices to full economic costs (including a reasonable rate of return on assets)
(b) Explicitness, transparency and efficiency of subsidies and cross-subsidies
(c) Tariff design that promotes technical and economic efficiency

7. Competition

(a) Well-functioning bid and auction markets e.g. for new capacity
(b) Well functioning supply competition markets

8. Social Indicators

(a) Affordability of supply – particularly for low income consumers
(b) Impacts on economic development

Annex 2

Infrastructure responsibilities

The following is a non-exhaustive list of regulatory responsibilities assigned to infrastructure industry regulators. The relative importance of these issues and how they are handled varies a lot between infrastructure industries (e.g. monopoly network issues are much more important in electricity, railways and water, while competition issues are much more important in telecoms). They also vary considerably by country (e.g. according to the degree of development and sophistication of market and institutional arrangements).

The list is derived from Brown et al. (2006):

- Defining and publishing regulatory methodologies as well as keeping them updated;
- Monitoring costs, including defining benchmarks (and benchmark comparison procedures) for costs;
- Setting a cost of capital that reflects the risks and rewards necessary for the particular infrastructure industry (or industry segment) in the particular country;
- Setting and monitoring benchmarks for efficiency and operational improvements;
- Establishing effective procedural rules that allow for genuine participation by all relevant parties and which also provide appropriate appeals rights;
- Maintaining privatization/concession agreements, investment decisions and price reviews, unless there are strong and justifiable reasons for modifying them;
- Preventing growing divergences between costs and prices for regulated consumers;
- Advising Governments on regulatory and regulated industry issues;
- Including stated government policies into regulatory decisions – provided that Governments act in accordance with stated policies (e.g. promised subsidies are actually paid); and
- Public statements on matters affecting the regulation of the industry, e.g. to the legislature, to regulatory and policy specialists and to the wider public.

Further details on these and how they vary by country and industry will need to be developed by UNCTAD in subsequent papers and discussions.

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