INFRASTRUCTURE DEVELOPMENT AND PRIVATISATION:
LIMITATIONS OF THE NEW ECONOMIC PARADIGM

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ABSTRACT

Around the world governments are pursuing policies aimed at encouraging private sector participation in the financing and delivery of infrastructure services. However, infrastructure utilities usually have some natural monopoly characteristics that rule out effective competition and necessitate the existence of some form of continued state involvement. In the case of infrastructure services the choice is not therefore between direct state provision and private provision, but rather between state provision and private provision with some form of on-going state regulation. Concession and management contracts are a form of half-way house but run up against some of the same information asymmetries and transaction costs that bedevil state ownership and state economic regulation.

The paper reviews the difficulties that face policy makers when choosing how best to provide necessary infrastructure. It provides a critique of the prevalent paradigm of infrastructure development through private provision and provides a summary of a recent empirical examination of the relationship between the quality of the regulatory framework and foreign direct investment in infrastructure in middle and lower income developing countries, in which the author was involved. The results confirm that FDI in infrastructure responds positively to an effective domestic regulatory framework, placing the emphasis in infrastructure development on governance rather than ownership per se.
In all economies the provision of efficient, reliable and affordable infrastructure services is an essential pre-requisite of economic growth and sustainable development. Key infrastructure services include the provision of water and sanitation, power, transport and telecommunications. Without an adequate infrastructure, market development and output growth is likely to be seriously slowed (World Bank, 1994). Moreover, affordable infrastructure services are critical to the improvement of household welfare and the reduction of poverty. It is a sobering fact that today around 1bn people lack access to adequate, clean water supplies and a further 1.2bn to adequate sanitation. The result is disease and high mortality especially amongst infants. In the developed world, such as Western Europe, water supply and sanitation problems were removed during the latter half of the nineteenth century and the first half of the twentieth century. Today Western Europe’s challenge lies in providing adequate transport facilities, affordable fuels and retaining international competitiveness with world leading telecommunications services. The infrastructure challenge has not gone away; it has simply changed its face.

Traditionally, infrastructure was the exclusive province of the public sector, with large, state-owned enterprises (SOEs) being responsible for investment and service delivery. However, in recent years the inadequacies of state enterprises have been revealed with sometimes costly and inefficient services and insufficient capital investment. When the water and sewerage industry was privatised in England and Wales in 1989 this followed years of under-funding. By 2010 the industry will have invested £69bn since privatisation in improving drinking water and raising environmental standards. The result is cleaner and more reliable supplies and less polluted rivers and beaches. But it has come at a price. Water and sewerage tariffs in England and Wales rose by 39.1% in real terms between privatisation in 1989 and 2006 (Ofwat, 2007). Britain also took the lead in privatising its telecommunications industry (in 1984), its gas industry (in 1986), its electricity industry (in 1990/91) and (most controversially) its railways (between 1994 and 1997). Many ports and airports were also transferred to the private sector during the 1980s and 1990s. Currently the
British Government is discussing the introduction of road charging schemes to cut road congestion. Meanwhile, through the private finance initiative and public private partnerships the private sector has been brought more directly into the building and running of roads, schools, government buildings, defence and hospitals. In Britain over £40bn has been spent on private finance initiative (PFI) schemes. Internationally public-private partnerships (PPP) are mushrooming with France transferring its toll roads to the private sector as a recent example. At the same time, private capital markets have responded with a number of companies specialising in these sorts of investments. Exchange traded funds (ETF) have been established with stock listed and tradeable like equities to invest specifically in infrastructure assets.\(^1\) Barclays Global Investors manages one such fund. The Australian bank, Macquarie, is also very actively involved in this market. Infrastructure assets appeal to private investors because of the expectation of steady income flows and non-competitive pricing of services to consumers. Also, returns, like those from government bonds, are effectively backed by the taxpayer. Infrastructure investments can provide big returns. Standard and Poor’s infrastructure index, including 75 of the world’s biggest operators in the energy, water and transport sectors, returned 24.3% a year over the last five years, compared with 11.3% from a portfolio of global equities (*The Business*, 2007).

Since the mid-1980s governments around the world have also pursued policies to involve the private sector more in the delivery and financing of infrastructure services. The growth in foreign direct investment (FDI) accelerated in the 1990s, rising to US$331 billion in 1995 and to US$1.3 trillion in 2000 (UNCTAD, 2002). A principal feature of the growth in FDI has been the rise in foreign investment in services, which is now the dominant sector in global FDI (Kirkpatrick, Parker and Zhang, 2006a). A significant part of the increase in foreign investment in the services sector has been the growth in private capital flows for infrastructure development. For example, private sector participation in infrastructure projects in developing countries rose dramatically after 1990 with annual investment commitments reaching a peak of US$128 billion in 1997. In contrast, there was a sharp decline in donor support for

\(^1\) ETFs track indices of property and construction businesses without the investor having to own the physical assets.
infrastructure projects during the 1990s, with aggregate flows of official development assistance falling by around a half during the decade (Willoughby, 2002). According to the World Bank’s Private Participation in Infrastructure (PPI) database, 26 countries awarded only 72 infrastructure projects with private participation in the period 1984-89. In the 1990s this grew sharply with the new interest in privatisation in donor agencies and governments. A total of 132 low- and middle-income countries pursued private participation in infrastructure – 57 of them in three or all four of the sectors covered in the database (transport, energy, telecommunications, and water and sewerage), albeit sometimes in response to “conditionality” terms attached to foreign loans and grants. In 1990 to 2001 developing countries transferred to the private sector the operating risk for almost 2,500 infrastructure projects, attracting investment commitments of more than $750billion (World Bank, 2003). After dipping following the Asian financial crisis in 1997, since 2001 private financing has revived.

Encouraged by international organisations such as the World Bank, privatisation has been a major component of the economic reform programmes pursued by many developing countries over the past two decades (Parker and Kirkpatrick, 2005). Privatisation has been advanced because it is expected to promote more efficient operations, reduce the financial burden on government budgets, expand service delivery, and increase the level of foreign and domestic private investment (World Bank, 1995). However, because infrastructure services typically have some natural monopoly characteristics, arising from pervasive economies of scale and scope, competition is unlikely to develop or quickly becomes uneconomic because of the duplication of assets. In some sectors technological advances, notably in telecommunications and electricity generation, have reduced the economic advantages of monopoly provision, but natural monopoly remains pervasive in the water and sewerage industry, electricity and gas distribution and transmission, and fixed-line telecommunications (except in dense user areas such as financial centres). There is also limited scope for new competition in trunk roads (even if planning permission could be obtained to build new highways), bridges and airports. In health and education competition may be economically feasible but tends to be politically and socially divisive. As a consequence, privatisation of these industries, in whole or in part, is problematic. Where it does occur it requires either (a) an effective state
regulatory system; or (b) competition “for the market” rather than “in the market” through concession and management agreements and the like. Concession and management contracts with the private sector involve a form of continuing state regulation from the writing of the initial contract specification to the ex post contract monitoring.

The paper reviews the difficulties that face policy makers when choosing how best to provide necessary infrastructure and provides a summary of a recent empirical examination of the relationship between the quality of the regulatory framework and foreign direct investment in infrastructure in middle and lower income developing countries, in which the author was involved. The results confirm that FDI in infrastructure responds positively to an effective domestic regulatory framework. In other words, the provision of adequate infrastructure is not simply a matter of seeking out the optimal ownership arrangements, it is critically dependent upon having “sound government”.

2. WHY INFRASTRUCTURE PROVISION CAUSES DIFFICULTIES FOR MARKETS

The railway network in many parts of the world was developed by private capital and private firms operated “turnpike” roads in Britain in the eighteenth and early nineteenth centuries. So complete private provision of infrastructure is feasible – the problem is it tends not to last! From 1844 in Britain the state became more and more involved in regulating the railways and their charges because of public pressure and concerns about monopoly pricing. The turnpike roads became uneconomic because of competition from rail and fell under central and local government control during the nineteenth century. The gas, electricity and water industries in Britain developed as a mixture of public and private sector provision from the industrial revolution. The result was inconsistent service quality, a lack of economies of scale and sometimes

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2 Leaving aside that each new railway in Britain needed its own Act of Parliament.
inefficient duplication of facilities. In all cases government became involved in regulating the private operators to prevent monopoly abuse. In the twentieth century these sectors came under almost complete state control. For example, in 1926 the state-owned Central Electricity Board was set up to rationalise electricity transmission and develop a national grid, which it did very successfully. The rest of the electricity industry was nationalised in 1947. The gas industry was nationalised in the following year. In England and Wales the water industry was rationalised into mainly 10 state-owned regional water and sewerage utilities in 1973 to take advantage of river basin water management schemes. Overall, the historical evidence suggests that private sector involvement in infrastructure provision has been inadequate over time and transitory (e.g. the turnpike roads). Nor is there any overwhelming evidence that the private sector provided infrastructure services more efficiently and effectively than the state enterprises that took them over (Foreman-Peck and Millward, 1994).

That private investment in infrastructure is problematic and fails to generate the economic benefits that result from private over state ownership in competitive markets, such as manufacturing, relates to the issue of natural monopoly. Infrastructure provision is often a once-off provision (e.g. the Channel Tunnel) where providing a competing structure would be highly uneconomic – so much so that the private sector would not supply it. Indeed, the private sector has failed to supply even one Channel Tunnel profitably, as any investor in the project now knows to their cost! Equally many railway lines built in Britain in the nineteenth century were never profitable. The reasons for private sector failure relate to the technology of the provision, the scale of the investment, and the resulting economies of scale (and sometimes of scope). Private ownership is most effective where there is competition in supply. Competition acts as the incentive to management to hold down costs and maximise consumer benefits. The private sector monopolist may settle for “an easy life”, just like its public sector counterpart.

In infrastructure delivery rivalry under private management is mainly in the form of ‘competition for the market’ or competition to win the contract or concession.

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3 Scotland and Northern Ireland have their own, separate, state-owned water and sewerage provision.
Private infrastructure investment has taken a number of forms internationally, involving differing degrees of investment risk (see Figure 1). There has been some divestment of state assets to private ownership, mirroring the infrastructure privatisations in Britain – although seemingly nowhere has anyone copied its privatisation of water and sewerage through the stock market. There have also been some “greenfield” projects or completely new investment by the private sector in infrastructure schemes. But some form of contracting for services with the private sector is prevalent. Management and lease contracts typically involve a private entity taking over the management of the state owned enterprise for a given period, although the facility continues to be owned by the public sector and the public sector remains wholly or largely responsible for new investment. Under a concession agreement a private firm takes over the management and assumes more risk by agreeing to undertake the investment. At the end of the contract period the arrangement is renewed through a further round of competitive bidding or the activity reverts to state control. However, problems can and do arise. These problems relate essentially to the existence of information asymmetries and pervasive transaction costs in infrastructure markets. Infrastructure contracting is subject to the costs of negotiating, monitoring and enforcing the contracts in a world where the contracting parties inevitably face uncertainty about future unforeseen and perhaps unforeseeable events (Williamson, 1985). The government and the winning firm can be expected to have different levels of information about such matters as costs, revenues and demand. The government enterprise may hold the information that a firm needs to bid optimally and the government must establish bidding rules and processes to being forward an adequate number of bidders. Following the contracting, it is highly unlikely that government, now as regulator or contract enforcer, will receive all of the information required to regulate to maximise social welfare. The results of contracting in terms of outputs and prices are therefore likely to be ‘second best’ to those of a competitive market.

(Figure 1 here.)
One particular outcome of competitive bidding for infrastructure is the “winner’s curse”, where a contract is won but the successful bidder subsequently discovers that it is unable to perform the contract to specification at the prices agreed and make a profit. This leads to contract reneging, where the contractor walks away from providing the service, often leaving a gap in service provision and the government to step back in, or contract renegotiation. In Mexico privately built toll roads proved unprofitable and were taken into state control. One of the two water concession in Manila in the Philippines quickly failed (Cuaresama, 2006). The much lauded privatisation of the water supply in Buenos Aires in Argentina turned sour after 2000 due to a change in the economic environment and disappointing profits. Where contract renegotiation occurs either the company or the government could be the loser, depending upon the results of the renegotiation. Guasch (2004, p.13) concludes that a staggering 74 per cent of water concession contracts in Latin America were renegotiated significantly within a few years of being signed – in Buenos Aires prices were raised within months of the start of the water concession (Alcazar et al., 2000). Studying cancelled concession contracts in developing countries, Harris et al (2003) find that water and sewerage concessions have the second highest incidence of cancellation after toll roads.

The explanation is that the transaction costs in infrastructure contracting are peculiarly high and revenues and costs are difficult to forecast when contracts are negotiated. The failure of the Mexico toll road scheme occurred because of disappointing traffic flows when drivers chose at an unexpectedly high rate to use the “free” public roads. Moreover, where the private sector is expected to absorb the costs of bidding and may have to make appreciable investments in the service, the contractor is open to “hold up”. Privatisation requires investors to sink funds into fixed assets that are specific to the venture. Where the investor fears that the government will later attempt to exploit this situation and renegotiate the contract to the contractor’s disadvantage, investors will be deterred from committing to the investment (Hart and Moore, 1988). For example, water provision is a politically sensitive issue and liable to government intervention in pricing and investment responding to public pressure (Kirkpatrick, Parker and Zhang, 2006b). Alternatively, investors may require a front-end loading of returns or sovereign guarantees from the
state or international agencies. In turn such guarantees reduce the net economic benefits of attracting private capital by reducing managerial incentives to control costs. There is the separate but significant difficulty of maintaining incentives for the private contractor to invest and maintain the quality of the infrastructure as a contract gets closer to its completion date. Moreover, there are usually appreciable sunk costs of participating in the bidding process, to which must be added the costs of fixed asset investments once the contract begins. The existence of the “hold up” threat is an important reason why since the Asian financial crisis, when a number of governments reneged on contracts, privatisation of the water industry has been almost entirely in the form of management contracts where the state remains responsible for the fixed assets.

The problems facing infrastructure privatisation through contracting are compounded by the fact that the contracts are typically for long periods of time to justify the sunk costs involved in taking on the contract, especially when fixed asset investments are required. Inevitably the contract will be incomplete, in terms of specifying all of the contingencies that may trigger contract adjustments and the forms the renegotiation might take. This places a large emphasis on the skills of both government regulators and companies when operating concessions, to ensure as far as possible that the outcome remains mutually beneficial. Having government remaining responsible for fixed asset investment is one possible solution. But the incentive to privatise infrastructure on the part of cash-strapped administrations lies in bringing forward new capital investment by the private sector.

In addition, bidding for infrastructure schemes may be subject to a small numbers problem, undermining the benefits of “competing for the market”. In some countries only two or three firms have been serious bidders for infrastructure contracts and in some cases there has been only one bidder. A lack of competition led the government to change the rules on bidding for water contracts in France recently. Low numbers bidding reduces the competitiveness of the contract and can occur because of over-restrictive pre-qualification criteria for contracts, as well as the conclusion by firms that the risks of winning the contract do not justify the costs of bidding. However, it
can also occur because of the relatively small number of large multinational companies that pursue infrastructure concessions and management contracts internationally (albeit often in partnership with local firms) (McIntosh, 2003 p.2). This is not assisted by mergers and acquisitions affecting infrastructure companies. Since 1998 there have been reportedly 3,165 mergers and acquisitions of infrastructure companies at a cost of over US$500bn. Last year, 2006, was a peak year with 400 deals and investment of almost US$148.4bn. (The Business, 2007). Most of this has involved smaller, regional companies. But in so far as infrastructure provision becomes more concentrated, the scope for competitive bidding recedes. Also, the smaller the number of bidders the greater is the scope for either actual or tacit collusion between bidders. The result can be both adverse selection and moral hazard. Adverse selection takes the form of sub-optimal contracts at the outset, resulting from one of the contracting parties acting opportunistically to arrange especially favourable terms; while moral hazard occurs when one of the contracting parties renegotiates the terms of the contract in their favour during its lifetime. The risk of the latter grows when the existing contracting firm knows there is really no alternative supplier to which the government can quickly turn.

3. THE IMPORTANCE OF GOVERNANCE

Transaction costs inherent in infrastructure delivery using the private sector are reinforced by weaknesses in government (Spiller and Savedoff, 1999:1-2). The decline in private sector infrastructure investments in developing countries after the Asian financial crisis in 1997 was consistent with growing concerns amongst investors about regulatory capacity (Harris, 2003). Some countries lack the administrative and institutional capacity to regulate effectively, whether through formal regulatory offices or concession and management contracts. All methods of price, profit and quality of service regulation are demanding in terms of their information needs. The design of contracts and post-privatisation regulatory measures

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4 Harris (2003) suggests that weaknesses in regulatory contract design have contributed to the high level of renegotiation of private infrastructure contracts.
becomes more complex when the need to allow for the impact on different income
groups and especially the poor is an issue, as it often is. Ensuring that the poor are not
disadvantaged by private sector involvement requires an institutional capacity to
regulate private sector activities effectively to ensure affordability, especially where
there is an inadequate or non-existent social welfare policy (Clarke and Wallsten,
2002). However, in developing countries, in particular, there is frequently a lack of
regulatory capacity, including a limited availability of skilled staff to bring about the
desired result. Shortage of regulatory skills constrains the regulatory authorities’
ability to formulate and design appropriate regulatory measures, including writing and
monitoring contracts certain to advance the interests of the poor.

Constraints on regulatory capacity increase the degree of regulatory risk and
transaction costs (Parker, 2002). Many developing countries lack the necessary
trained personnel to sustain regulatory commitment and credibility. Regulatory offices
in developing countries tend to be small, under-manned for the job they face, and
more expensive to run in relation to GDP than in developed countries (Domah, et al.,
2003). Familiarity with regulatory models and methods of regulatory policy analysis
is often limited (Kirkpatrick, Parker and Zhang, 2005). The other main difficulties
found in many developing countries relate to broader governance problems (Stern and
Holder, 1999; Minogue, 2002) or the legal powers and responsibilities of regulators,
including their effective independence from regulatory (including political) capture.
Regulatory risk is the outcome of uncertainty and inconsistency in a regulatory
regime, which leaves private agents fearful of current and future regulatory decisions.
Where regulatory risk is appreciable, investors will either not invest or will seek
compensation in the form of a larger expected return, leading to a higher cost of
capital. A higher cost of capital will mean higher consumer charges (or state
subsidies) or a lower rate of investment (Guasch and Hahn, 1999; Hahn, 1998).

State regulation including writing contracts attempts to ‘mimic’ the economic welfare
results of competition. But it can do so only in a ‘second best’ way because
competitive markets generate superior knowledge of consumer demands and producer
supply costs (Sidak and Spulber, 1997). Indeed, government involvement introduces
important economic distortions into market economies: ‘regulation… is far from being a full substitute for competition, it can create systematic distortions, it generally faces a trade-off between promoting one type of efficiency at the expense of another, and it is likely to generate significant costs, in terms of both direct implementation and exacerbation of inefficiency’ (Hay and Morris, 1991, pp.636-7). The difficulties in designing an effective and efficient regulatory framework acquire an additional degree of complexity in the context of developing countries where significant capacity and resource constraints often arise. The impact of infrastructure regulation on market incentives, and on investment behaviour in particular, is therefore uncertain and difficult to predict a priori.

The aim of infrastructure regulation should be to establish a policy environment that sustains market incentives and investor confidence. For this to be achieved, the regulator needs to be shielded from political interference, and government needs to support a regulatory environment that is transparent, consistent and accountable (Parker, 1999). This implies that the capacity of the state to provide effective and efficiency regulatory institutions will be an important determinant of infrastructure provision. The challenge of providing infrastructure regulation which establishes credibility with the private sector and at the same time ensures efficient economic performance on the part of the regulated enterprises, is not easily achieved. There is an extensive literature on the distorting effects of state regulation even when conducted by dedicated regulatory bodies (Armstrong et al 1994; Guasch and Hahn,1999). This leads to ‘credibility’ and ‘commitment’ considerations: credibility on the part of investors that the regulatory rules will bring about the intended outcome; and commitment of government to the regulatory rules, so that post-privatisation or post-concession award, the regulator does not act opportunistically to reduce the prices and profits of the private regulated businesses. Regulatory regimes are also prone to “capture”, where the regulatory process becomes biased in favour of particular interest groups and notably the regulated companies in an attempt to acquire economic rents (Stigler, 1971; Peltzman, 1976; Laffont, 1999).
What is clear is that the capability of firms to influence public policy is an important source of comparative advantage (Shaffer, 1995). Balanced against the risks of regulatory capture, however, is the possibility that regulators might develop a culture of arrogant independence, bordering on vexatious regulation. This creates some uncertainty about the desirable degree of regulatory independence that is desirable. The “independent agency” is normally favoured by western advisors, who draw from the experience of regulation in the UK and US. However, regulatory independence and an impartial judicial review of due process may not be credible in some institutional structures.

An important policy implication that follows from the regulatory capacity constraints existing in many countries is that the optimal regulatory measures to be adopted need to be developed in the specific context of these institutional constraints. Recent research relating to utilities’ privatisation in developing countries has shown that the sequencing of privatisation and regulation reforms has a significant impact on the economic outcomes. In particular, the establishment of an effective, independent regulator before embarking on privatisation is associated with more favourable outcomes in terms of capacity expansion, service penetration and productivity (Wallsten, 2001; Zhang, Parker and Kirkpatrick, 2005 & 2007). More generally, the experience of private investment in the former communist countries of Central and Eastern Europe, and in Latin American economies with ‘Washington Consensus’ market liberalisation reforms, has highlighted the importance of first establishing an institutional infrastructure including appropriate regulatory systems (Roland, 1994; Kuczynski and Williamson, 2003). As Stiglitz (2002, p.18) comments in relation to economic development: “successful economic programs require extreme care in sequencing – the order in which reforms occur” (emphasis in the original).

The importance of the regulatory environment is reflected in the data on private sector investment in infrastructure. As Figure 2 shows, Latin America and the Caribbean accounted for 48% of the cumulative investment in infrastructure between 1990 and 2001. Also the region dominated in terms of divestitures, greenfield investments and concessions (see Figure 3). In this region private participation in infrastructure was
often part of a broader sectoral reform programme, aimed at enhancing performance through private operation and competition and generating the financial resources needed to improve service coverage and quality through tariff adjustments (World Bank, 2003, pp.2-3). The East Asia and Pacific region has been the second largest recipient of private investment in infrastructure. Over the period 1990-2001 it accounted for 28% of cumulative private participation in infrastructure in developing countries. However, in South Asia, the Middle East and Africa, where the regulatory resources are in particularly short supply and governance regimes are often poor, private investment in infrastructure has been very limited. In sub-Saharan Africa private investment has been negligible - yet the need for infrastructure investment is nowhere more pressing.

(Figures 2 and 3 here.)

Also, consistent with the expectations from transaction cost theory, private participation in infrastructure in developing countries has been concentrated in the telecommunications sector (Figure 4). In this industry competition “in the market” is feasible especially due to wireless technology. Therefore, long-term contracts between the government and the private sector either may not be necessary or need to be less detailed. Telecommunications accounted for 44% of the cumulative investment in 1990-2001. Energy, which includes electricity and the transmission and distribution of natural gas, attracted the second largest share of capital, accounting for 28% of the cumulative investment in private infrastructure projects in 1990-2001. Electricity generation is particularly suitable for competition, except where there is a dependence on hydro or nuclear schemes. In contrast, private participation in the water and sewerage sector has been very limited, accounting for 5% of cumulative investments over the period 1990-2001. The limited amount of private involvement in water utilities reflects the inherent difficulties that face privatisation in this sector, in terms of the technology of water provision and the nature of the product and transaction costs, alongside regulatory weaknesses (Kirkpatrick, Parker and Zhang, 2006b).
It is increasingly recognised that differences across countries in economic conditions provide only a partial explanation of the location choices of multinational enterprises and that the quality of a country’s institutional framework can have a significant impact on the perceived investment environment. Institutions have been defined in a variety of ways. Following North’s (1990, 1991) widely cited definition, the institutional framework has been represented as the set of informal and formal “rules of the game”, which constrain political, economic and social interactions. From this perspective, a ‘good’ institutional environment is one that establishes an incentive structure that reduces uncertainty and promotes efficiency, thereby contributing to stronger economic performance. Included in this institutional structure are the laws and political and social norms and conventions that are the basis for successful market production and exchange. This broad concept of institutions has been incorporated into empirical studies of FDI using a range of indicators. It is now common, for example, to include a variable to control for inter-country differences in the broad political environment (Altomonte, 2000; Morisset, 2000), although as noted by Dawson (1998) the results have been mixed. A measure of inter-country differences in corruption has also been shown in several studies to have a significant impact on private investment (Wei, 2000; IFC, 2002). The extent of legal protection of private property and how well such laws are enforced, is an additional factor that has also been shown to have a significant effect on foreign investors’ location decision. A parallel stream of research has focused on perceptions and assessments of the quality of public institutions – especially on how well they function and what impact they have on private sector behaviour (IMF, 2003).

The term ‘governance’ has been adopted in the literature to cover different dimensions of the quality of public institutions, including government effectiveness and efficiency. Recent empirical evidence has confirmed that cross-country differences in growth and productivity are related to differences in the quality of governance (Rodrik 2000; IMF, 2003; Jalilian, Kirkpatrick and Parker, 2007). This approach has been extended recently to consider the impact of governance on cross-
country differences in FDI flows. Globerman and Shapiro (2002) use the six governance indicators estimated by Kaufmann et al. (1999) to assess the impact of governance quality on both FDI inflows and outflows for a broad sample of developed and developing countries over the period 1995-97. The Kaufmann indices describe various aspects of the governance structures, including measures of political instability, rule of law, graft, regulatory burden, voice and political freedom, and government effectiveness, and therefore encompass many of the individual institutional variables used in earlier studies. The Kaufmann governance variables are combined with measures of physical, human and environmental capital to explain FDI flows, and the results indicate that the quality of governance infrastructure is an important determinant of both FDI inflows and outflows (Globerman and Shapiro, 2002:1908-14).

The study by Stein and Daude (2001) uses the gravity model approach to test for the role played by institutional quality on FDI location in Latin American countries during the period 1997-99. A group of four alternative measures of institutional quality is combined with two other sets of variables and tested as potential determinants of FDI flows. The first consists of variables which are typically used in gravity models of trade, such as GDP, per capita income and distance between the source and host countries (Greenaway and Milner, 2002). The second group consists of variables, other than the institutional ones, which can affect the attractiveness of a country as a location for FDI, such as the level of taxes on foreign investment activities, human capital, and infrastructure quality. The results show that the governance variables are almost always statistically significant, confirming that the quality of institutions has a positive impact on FDI. The results are shown to be robust to the use of a wide range of institutional variables, to different model specifications and to different estimation techniques. It is increasingly clear that privatisation and the introduction of regulatory agencies modelled on western lines, at best, may have only partial effects on access, affordability and the quality of infrastructure services. Meanwhile poor governance, reflected particularly in high levels of corruption and cronyism in a country, dulls the efficiency incentives resulting from privatisation (Estache, Goicoechea and Trujillo, 2007).
4. MODELLING REGULATION AND FDI IN INFRASTRUCTURE IN DEVELOPING COUNTRIES

It seems clear from the discussion so far that the conditions for the provision of adequate infrastructure in any country are much more than a matter of substituting private for state financing (or vice versa) and more a matter of developing adequate regulatory capacity and providing the right governance environment to promote sufficient investment. In the case of infrastructure industries, simply moving a monopoly from the public to the private sphere will not result in competitive behaviour. Therefore, a key requirement for privatisation success, whatever the precise form the privatisation takes, becomes the effectiveness of the regulatory regime including contract monitoring. As a result, a large number of countries have introduced new, dedicated regulatory offices with independence from day-to-day ministerial intervention to supervise the activities of their privatised utilities. Evidence on the impact of utilities regulation in developing countries is still limited; but studies for telecommunications and electricity confirm that privatisation brings greater benefits when it is accompanied by an effective regulatory regime (Wallsten, 2001; Zhang, Parker and Kirkpatrick, 2005 & 2007).

Research involving the author was undertaken into FDI and infrastructure provision to see whether regulation had influenced the flow of foreign direct investment to the infrastructure sector, specifically in developing countries where we expected that governance issues would be paramount. More precisely, the research examined whether the perceived quality of the regulation framework had an impact on the locational choice of multinational enterprises when investing in infrastructure projects in developing countries. Where the regulatory regime is successful in establishing credibility with investors, regulation may be expected to have a benign influence on investment commitments. But where the regulatory institutions are perceived to lack independence of government and to be vulnerable to political interference, investors may be deterred from committing to large-scale, sunk cost capital investments. The

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*This section draws heavily from Kirkpatrick, Parker and Zhang (2006).*
research was therefore based on the hypothesis that the quality of regulation matters for investment and that there would be a positive relationship, other things being equal, between the quality of infrastructure regulation and the inflow of FDI to the infrastructure sector.

The relationship between FDI in infrastructure and regulation was empirically tested using a model which regressed the FDI data for a sample of countries on a measure of regulatory institutional quality and a set of control variables. Data on foreign (private) direct investment were obtained from the database on Private Participation in Infrastructure (PPI), made available by the World Bank (World Bank, 2003). The PPI database records infrastructure projects with private investment in low- and middle-income countries and at the time of the research over the period 1984 to 2002, included were projects in transport, energy (electricity and natural gas transportation), telecommunications, and water and sewerage. The database relates to total investment in infrastructure projects with private participation, rather than private investment alone. The information on individual projects was therefore used to estimate the non-private contribution to the projects, which was then excluded from the PPI data to give the level of private investment in infrastructure projects. Examination of the detailed project information in the database also showed that, on average, about 80% of private contribution in infrastructure projects in developing countries came from foreign investors. The data on private investment were adjusted accordingly to give the estimated value of private foreign investment in infrastructure.

A number of control variables were used which might be expected to influence FDI flows, including GDP to reflect the level of income and demand in the economy, and the inflation rate, the exchange rate and the level of taxation. The inflation measure and the exchange rate were included as macroeconomic stability measures, with the expectation that greater economic volatility acts as a disincentive to inward investment. The average tax burden was expected to have a negative impact on FDI. Other control variables included were the degree of trade openness (measured as the ratio of imports and exports to GDP), a labour force quality measure (secondary school enrolment) and a variable to reflect the level of a country’s financial
development. The final control related to the quality of the infrastructure stock in the sample countries. The investment decision is expected to be influenced by the need for additional infrastructure provision (Leipziger et al., 2003; Fay and Yepes, 2003). Countries with greater infrastructure needs might be expected to attract foreign investment in infrastructure. Two measures of the level of infrastructure provision were included: telephone lines per 1000 population and electricity generation per capita.

The main focus of the research was on the effect that the regulatory institutional framework may have on foreign investors’ decision to commit resources to infrastructure projects in developing countries. Two variables were used as measures of the quality of the regulatory environment for the infrastructure sector. The first was taken from the set of governance-related variables estimated by Kaufmann, Kraay and Mastruzzi (2003). These indices describe six aspects of the governance structures for a broad cross-section of countries: voice and accountability, political instability, regulatory quality, rule of law, control of corruption and government effectiveness. These indicators are estimated based on several hundred individual variables measuring perceptions of governance, drawn from 25 separate data sources constructed by 18 different organizations. The indicators are normalised, with higher values denoting better governance. Of the six measures, the index of government effectiveness was used in the research as a proxy for the regulatory environment. This index is described by Kaufmann et al. as being based on ‘perceptions of the quality of public provision, quality of bureaucracy, competence of civil servants and their independence from political pressure, and the credibility of government decisions’. A limitation of this measure is that it relates to regulatory effectiveness at the level of the economy as a whole, rather than the infrastructure sector specifically.

In the light of this limitation, an alternative measure of the regulatory environment was used, in the form of a dummy variable to indicate whether independent regulators were established in the telecommunications and electric power sectors. According to

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6 The Kaufmann index of regulatory quality measures the burden on business via quantitative regulations, price regulations, price controls and other interventions in the economy, and was judged to be less suitable than government effectiveness as a proxy for the quality of infrastructure regulation.
the PPI database, almost three-quarters of the private investment in infrastructure in
developing countries during the 1990s was undertaken in these two sectors.
Information on the existence of independent regulators in the electric power sector
came from World Energy Council and Energy Information Administration (Zhang,
Parker and Kirkpatrick, 2007), and that on the telecom sector was obtained from
International Telecommunications Union (ITU). The dummy took a value of 1 if there
were independent regulators in both of the sectors. While this dummy had the
advantage of relating directly to the institutional structure for utility regulation in the
sample countries, the data were based on the organisational independence of the
regulatory bodies rather than their actual autonomy from government interference. In
addition to regulatory quality, other broader aspects of governance and institutional
development can affect the level of FDI in infrastructure. Therefore, the first principal
component of the Kaufmann et al. indices was constructed to capture the quality of
governance infrastructure in general. The variables for income per capita openness,
inflation, education, and the real exchange rate were all lagged, to allow for potential
endogeneity bias and adjustment lags. A number of the variables were entered in log
form.

The model was specified as follows.

$$\ln(PPI) = \beta_0 + X_i \beta_1 + REG_a (GOV_a) \beta_2 + e_u,$$

where \( REG (GOV) \) refers to the regulation and governance variables, and \( X_i \)
represents the control variables. Data from 67 low- and middle-income countries for
the period 1990-2002 were used in the estimation of PPI. Panel data estimation
methods were employed and both fixed and random effects models were tested.
However, in all the cases the Hausman statistic supported the fixed-effect
specification.

Table 1 present a summary of the main findings.\(^7\) In Table 1 the results are reported
separately for each of the three measures of regulation quality, namely, the principal
components index, the Kaufmann et al. government effectiveness index, and the

\(^7\) For the full results and further analysis see Kirkpatrick, Parker and Zhang, 2006.
utility regulation dummy variable, combined with the same set of control variables (equations 1-3). The combined effect of utility regulation and broader governance was tested by combining the principal component variable and the utility regulation dummy in the same equation (equation 4).

(Table 1 here.)

Turning first to the results for the control variables, in most cases the variables displayed the correct sign. FDI in infrastructure is positively related to the economy’s level of development as proxied by income per capita, which is always statistically significant. Among the three macroeconomic variables included only the instability in the real exchange rate was statistically significant. The proxy for human capital was negatively related to FDI, but was never statistically significant. The openness variable was always negatively signed, and in some cases statistically significant. The level of financial sector development, as measured by the ratio of private sector credit to GDP, was negative and in two out of the four model specifications statistically significant, providing some support for the hypothesis that foreign investment will be greater where the capacity of the private sector to finance its investment is constrained by an underdeveloped domestic financial sector. Finally, although not reported in the table, the physical infrastructure variables were negatively signed, tentatively confirming that FDI in infrastructure is attracted, other things being equal, to countries where the need for additional infrastructure provision is greater.

Considering the results for the regulation variables, the sign for each of the three regulation measures confirmed that FDI in infrastructure is positively influenced by the quality of the regulatory framework. The general measure of regulatory quality, proxied by the principal components measure of the Kaufmann et al. indices, was statistically significant, confirming that the overall quality of the governance environment attracts inward FDI in infrastructure. The Kaufmann index of

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*Ghura and Goodwin (2000) also report a negative (and statistically significant) relationship between FDI and openness, for sub-Saharan countries*
government effectiveness was also positive and statistically significant. The alternative regulatory measure, a specific measure of infrastructure regulation based on the existence of an independent regulatory agency in the telecommunications and electricity sectors, was also statistically significant. However, when the independent utility regulation variable and the measure for overall governance were both included in the same equation, the former became insignificant. The research was therefore unable to detect a strong influence for independent utility regulation separate from the quality of a country’s overall governance. This may indicate that investors in infrastructure are more likely to be influenced in their location decision by the overall governance environment than the existence of an independent utility regulatory authority.

5. CONCLUSIONS

Since the early 1990s a dominant economic paradigm has emerged that infrastructure development requires privatisation. A number of countries have privatised infrastructure services and there has been an unprecedented increase in private foreign investment in infrastructure projects. Much of this investment has been in the telecommunications and electricity sectors, but there has also been private investment in other areas, such as roads, ports, airports, and water and sanitation. However, economic analysis suggests that private sector infrastructure investment is associated with significant investor risk linked to the long term, sunk cost characteristics of infrastructure projects. Moreover, the involvement of the private sector in ‘natural monopolies’ raises challenges when creating regulatory capacity, including establishing effective regulatory agencies and/or contract negotiating and monitoring skills within government, both to control monopolistic behaviour and attract investors to the infrastructure sector.

This paper has assessed the possible economic barriers to private sector infrastructure investment arising from the pervasive information asymmetries and transaction costs that surround regulation and contract negotiation. It has particularly flagged the
importance of regulatory governance. A number of important problems facing private sector investment in infrastructure schemes have been highlighted and the results of research using a dataset on private participation in infrastructure projects in developing countries for the period 1990 to 2002 have been summarised. The research confirmed that foreign investment in infrastructure responds positively to the existence of an effective regulatory framework. By implication, where regulatory institutions are unpredictable and untested, foreign investors will be reluctant to make a major commitment to large scale infrastructure projects. The main policy implication is the need to support capacity building and institutional strengthening in countries. In other words, infrastructure development is not about privatisation and less government *per se* but rather about building better government.
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Oftwat (2007)  


Figure 1:

Number of Projects by Types of Contract 1990 - 2003

Source: World Bank’s PPI Database

Figure 2:

Cumulative Investment in Infrastructure Projects with Private Participation by Region, 1990-2001

World Bank Overview: US$ billion

- Latin America & Caribbean: 48%
- East Asia & Pacific: 28%
- Europe & Central Asia: 13%
- South Asia: 5%
- Sub-Saharan Africa: 3%
- Middle East & North Africa: 3%

World Bank Overview: US$ billion
Figure 3:

Cumulative Investment in Infrastructure Projects with Private Participation by Type & Region, 1990-2001

Figure 4:

Cumulative Investment in Infrastructure Projects with Private Participation by Sector, Developing Countries, 1990 - 2001
Table 1: FDI in Infrastructure and the Importance of Regulation

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>Ln GDP per capita (lagged)</td>
<td>1.596</td>
<td>1.641</td>
<td>1.862</td>
<td>1.591</td>
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<td></td>
<td>(1.721)*</td>
<td>(1.773)*</td>
<td>(2.006)**</td>
<td>(1.715)*</td>
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<td>Annual change of inflation (lagged)</td>
<td>0.0003</td>
<td>0.0003</td>
<td>0.0003</td>
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<td>(1.454)</td>
<td>(1.243)</td>
<td>(1.527)</td>
<td>(1.504)</td>
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<tr>
<td>Tax burden (lagged)</td>
<td>-0.016</td>
<td>-0.014</td>
<td>-0.001</td>
<td>-0.014</td>
</tr>
<tr>
<td></td>
<td>(0.362)</td>
<td>(0.324)</td>
<td>(0.035)</td>
<td>(0.333)</td>
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<tr>
<td>Export and import/GDP (lagged)</td>
<td>-0.023</td>
<td>-0.020</td>
<td>-0.021</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>(1.879)*</td>
<td>(1.630)</td>
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<td>(1.798)*</td>
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<tr>
<td>School enrolment rate (lagged)</td>
<td>-0.015</td>
<td>-0.015</td>
<td>-0.017</td>
<td>-0.015</td>
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<td>(1.348)</td>
<td>(1.408)</td>
<td>(1.532)</td>
<td>(1.383)</td>
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<td>Annual change of real effective exchange rate (lagged)</td>
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<tr>
<td></td>
<td>(2.721)***</td>
<td>(2.911)***</td>
<td>(2.906)***</td>
<td>(2.661)***</td>
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<tr>
<td>Domestic credit to private sector/GDP</td>
<td>-0.013</td>
<td>-0.013</td>
<td>-0.012</td>
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<td></td>
<td>(1.696)*</td>
<td>(1.635)</td>
<td>(1.559)</td>
<td>(1.703)*</td>
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<td>First principal component of Kaufmann</td>
<td>1.131</td>
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<td></td>
<td>(2.800)***</td>
<td></td>
<td></td>
<td>(2.643)***</td>
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<td>Government effectiveness index</td>
<td>0.773</td>
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<td></td>
<td>(1.796)*</td>
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<td>0.504</td>
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<td>(1.791)*</td>
<td>(0.987)</td>
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<td>Constant</td>
<td>-2.767</td>
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<td>-5.886</td>
<td>-3.560</td>
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<td>(0.409)</td>
<td>(0.576)</td>
<td>(0.865)</td>
<td>90.987</td>
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<td>D-W’d Statistics</td>
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<td>1.863</td>
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<td>0.502</td>
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<td>No. of Obs.</td>
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</table>

t-statistics in parentheses. *, **, *** indicate that the coefficient is significant at the 10%, 5% and 1% levels, respectively.