

Infrastructure investment, the cost of capital, and regulation: an assessment

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Abstract The paper considers the role of infrastructure in improving economic performance, and its comparative neglect relative to traditional macroeconomic and microeconomic policies. It explains why infrastructure matters, why Britain's infrastructure performance has been poor, and summarizes the scale of the challenge for the coming decade. Privatization, liberalization, and competition have focused on monopoly market failure and private incentives, but they have neglected the time inconsistency problem which confronts investors in networks with high fixed and sunk costs. The failure to commit which has characterized British approaches to infrastructure has been partially addressed through the creation of regulated asset bases (RABs), backed up by the duty on regulators to ensure that functions can be financed. The paper considers how the RABs can be developed to provide credible long-term contracts over a wide range of activities, and how the financial regulatory regime can complement this commitment, notably through the split cost of capital and the indexation of the cost of debt approaches. The paper concludes by setting out the building blocks of a credible regulatory framework for infrastructure, together with the impacts on reducing the cost of capital. The role of the State in reinforcing this commitment and the associated institutions are also set out.

Key words: regulation, split cost of capital, infrastructure, regulated asset base, debt indexation, time inconsistency, role of the State

JEL classification: G32, H54, L90

I. Introduction

There are many determinants of the performance of economies. Economic policy has traditionally focused on microeconomic interventions to correct market failures and on macroeconomic stability. This was formalized in the 1980s into the Medium Term Financial Strategy (MTFS), with targets for monetary aggregates and public borrowing, and increased emphasis on competition.

This framework was carried through into the first decade of the twenty-first century with independence for the Bank of England and inflation targets on the one hand, and the creation

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of a new legal framework for competition policy on the other hand. In the process, almost all the major nationalized industries were privatized, with liberalization and competition being pursued at the European and British levels.

The net results have not been as revolutionary as some of the architects of this framework had anticipated, and in any event have been flattered by the rapid depletion of North Sea oil and gas, as well as the impacts of technical change. Britain has not emerged much better than its European comparators who have followed more conventional paths. Indeed, on macroeconomic stability, Britain's liberalized financial markets have created the very opposite, while at the micro level, on productivity, the large gaps with Germany and France remain.

The concentration of policy on the macroeconomic framework and the microinterventions leaves out the bit in the middle—infrastructure and infrastructure networks. Infrastructure matters because it is the route to market in transport and communications, and the route to companies and households for key factor inputs, notably energy and water. The roads, railways, airports, broadband, water and sewerage pipes, and the electricity and gas pipelines are the necessary conditions for the economy to function, and together they influence or determine much of the cost structure of industry. They are necessary conditions for economic activity.¹

Few companies or individuals would choose to locate in Britain because of its infrastructure. The everyday experiences of Heathrow Airport, the London Underground, road congestion, and the West Coast Main Line, and slow internet access in much of the country provide the anecdotal evidence that poor infrastructure creates a significant drag on economic performance.

Why is British infrastructure apparently so bad? And so expensive? The pervasiveness of the problems point to generic rather than merely case-by-case difficulties. These generic issues include: the institutional structures and the (lack of) coordination; the role of government; and the allocation of risks which cause high costs of capital, which in turn distort the time horizons and raise the costs to infrastructure users. For, unlike the macroeconomic and microeconomic pillars of economic policy, Britain has no coherent overarching infrastructure policy.

This has mattered. But it is about to matter even more, as Britain faces an extremely large infrastructure investment programme over the coming decade. For much of the existing infrastructure needs not only replacement, but also enhancement, with the introduction of major technical change and the additional problem of meeting the challenge of climate change. As we will see below, the aggregate investment requirement over the coming decade may be as much as £500 billion.

The structure of the paper is as follows. Section II sets out the scale of the infrastructure challenge and its importance to the economy as a whole. Section III considers the impact of the policies of privatization, liberalization, and competition on the core infrastructure networks, and considers why the net result has not been the favourable transformation that many advocates of this approach expected. The paper is largely focused on the privatized infrastructure cases. Section IV turns to the underlying economic problems, focusing less on the market failures of monopoly (the preoccupation of the privatization process) and more on problems of time inconsistency and the need for credible commitments by government and regulators. This sets up the central role of regulatory asset bases (RABs) as

¹ See the article by Martin Cave and Keiko Hatta (2009, this issue) on the wider communications infrastructure problems and, for an analysis of the smaller country case in electricity, see the article by Seán Diffney, John Fitz Gerald, Seán Lyons, and Laura Malaguzzi Valeri (2009, this issue).

mechanisms for commitment. Section V turns to the cost of capital and how to set this for the RABs and the operational and investment activities, and in doing so proposes a model for regulating returns which lies between the conventional RPI – X and rate-of-return regimes. Section VI considers the role of government and the economic borders of the state in respect of infrastructure. Section VII concludes with a summary of a proposed new infrastructure policy framework to sit alongside the macroeconomic and microeconomic frameworks.

II. The infrastructure backlog and its impact on the economy—why it matters

How much does infrastructure matter to the British economy? This turns out to be a very difficult question to answer for several reasons: there are no national infrastructure accounts; there is no common accounting basis across the regulated sectors; infrastructure costs are not separately identified in considering their role as factor inputs; and there are at best only qualitative cross-country comparisons.

These are formidable obstacles to assessing the economic impact of Britain's quality of infrastructure. Accounts matter as a way of assessing the economic value of infrastructure assets. Given the assets' long lives, current-cost accounts assuming that the assets will be providing the services in perpetuity provide an appropriate basis in most cases. Over the long lives, inflation will come and go, undermining historical cost valuations: it makes little sense to ask what electricity cables in central London (some of which are still in use) cost in 1900. The infinite lives are not a bad approximation, given the length of life and the impact of even a small change in the discount rate over several decades.

From the perspective of considering the quality of the assets, depreciation and its treatment matter. As has been witnessed in a number of privatized utilities, it is relatively easy to manipulate the maintenance spend to improve short-term financial performance, disguising the long-run consequences. In the public sector, this has been endemic. Short-term budget constraints have meant that capital expenditure and maintenance have frequently been sacrificed for current consumption. Indeed, so widespread has this practice been that it became a major motivation for privatization.

The water and rail industries use current-cost accounting and it is noticeable that it is in these industries that investment has been highest. But, even here, the accounts are open to challenge as a basis of assessing their capacity to deliver services over time. In the former case, some accounting for climate change is required, and, in the latter, new high-speed trains and developments in complementary transport modes will alter future relative prices.

So the starting point in assessing the quality of Britain's infrastructure as a whole—appropriate accounts—is missing. Therefore, in an important sense, we do not know how bad the state of Britain's infrastructure is. There are, however, other ways of getting a snapshot of the economic importance of infrastructure—in particular, by using a conventional economic growth framework. Nicholas Crafts (2009, in this issue) tackles this. Building on the earlier work in the Eddington Report (Eddington, 2006), Crafts sets out a standard production function, with infrastructure as a factor input. He focuses on transport as his case study to illustrate the approach. Crafts finds considerable support for significant productivity impacts from road and rail investments.

These results provide only a partial picture, and, as Crafts notes, there are a number of reasons for thinking that they underestimate the importance of infrastructure significantly. Apart from the limitation of the results to transport, the inputs considered are direct and measureable costs only. Indirect costs are largely absent; for example, the extent to which wage costs incorporate transport costs. Wages in London, for example, are weighted in part to account for the extra costs of commuting. The locational decisions of government offices and support services depend upon the quality of the information technology infrastructure. Agglomeration effects are especially relevant in transport, only some of which are captured in the empirical literature.

Infrastructure provision has significant social and environmental impacts. The absence of public transport in many rural areas contributes to social problems—especially for the young and the elderly. Access to broadband has become an important element in participating in society—what Sen would describe as a capability (Sen, 2005). The environmental impacts of infrastructure are both direct and indirect: directly, the proposed new runway at Heathrow would increase emissions; indirectly, broadband availability may reduce car journeys and commuting, thereby lowering emissions.

The economic impacts of infrastructure depend, too, on the efficiency of its creation and maintenance. The anecdotal observation that Britain is not good at large infrastructure projects is given a more general treatment by Bent Flyvbjerg (2009, in this issue). He documents the problems of cost overruns, benefit shortfalls, and systematic underestimation of risk, and notes how the large infrastructure spending plans in the current macroeconomic stimulus plans may exacerbate these problems.

The remarkable feature of these inefficiencies is that they persist. Despite numerous initiatives, the problem has not been cracked. The reasons are multiple, as Flyvbjerg explains. There are two possible responses: that investment is as much a matter of Keynes's 'animal spirits' as it is rational project analysis, and that big projects attract politicians and managers towards irrational optimism; or that the behaviour reflects deeper costs and problems of institutional design which are left out of conventional cost-benefit analysis. There are too many prestige projects in the former category to discount this explanation—from corporate headquarters and even taller skyscrapers, to the Millennium Dome. But the latter offers a way of modelling what is going on and considering how to minimize the damage. Managers (and politicians) will pursue their own objectives to the extent that they are not constrained by the capital and product markets. By definition, large infrastructure capital expenditure (CAPEX) tends to be unique to the context, and it is often in a monopoly position. Product market competition is therefore limited. Thus, controlling costs turns on the direct control of managers by owners and, in the case of government, the control of ministers by Parliament.

In the capital market, the takeover constraint is very weak for companies involved in planning infrastructure projects. There is a variety of mechanisms to limit managerial discretion, notably the so-called 'discipline of debt'. Yet as Dieter Helm and Tom Tindall show (2009, this issue), the motivation for the major rotation of ownership of the core utilities has not been obviously directed at CAPEX efficiencies. From the initial wide dispersal of ownership, through to the foreign takeovers, and then the arrival of private equity and infrastructure funds, the main action has focused on financial engineering, to which we return below. The private gains from this financial manipulation have vastly exceeded those associated with CAPEX efficiencies. Indeed, to the extent that the latter have mattered at all, the main emphasis has been on playing regulatory games—overestimating CAPEX *ex ante* at periodic reviews and then cutting it *ex post*.

In the political market, controls are limited to parliamentary institutions, notably Select Committees, and to the control of the executive—which, in turn, depends upon the political system and the extent of the government's majority. This has been a much neglected research topic of enormous significance. Institutional structures—such as the National Audit Office (NAO) and the Public Accounts Committee—play a significant role, but there is little empirical evidence on whether they improve future decisions. Revealing past mistakes may be embarrassing, but for major CAPEX projects, these mistakes tend not to reveal themselves for many years, long after ministers and governments have moved on.

For these many and diverse reasons, the inefficiencies can be expected to continue. What makes this conclusion especially important now is that after a period of relatively low infrastructure CAPEX in many of the sectors, the next decade is likely to witness a significant change of gear. Helm (2009) adds up the investment spending projected by government, regulators, and companies in energy, water, transport, and communications for the coming decade to 2020. In each sector, the detailed plans are reviewed and the numbers are deliberately conservative. Large programme costs are incorporated, such as those necessary to meet the EU Renewables Directive by 2020 (around £100 billion), together with the more continuous CAPEX in road, rail, and water. But even in these cases there are big projects, such as the beginning of high-speed rail links, airport runways, the London interceptor sewer, and smart meters. All the costs of public-sector infrastructure in respect of schools, hospitals, prisons, and databases are excluded.² The summary table below brings together all the various projects in just these sectors, showing a potential combined CAPEX requirement of £434 billion. Taking into account the excluded items, the aggregate is likely to be well in excess of £500 billion.

Table 1: Aggregate capital expenditure plans to 2020

Sector	Cost (£ billion)
Energy	264
Transport	120
Communications	5
Water	45
TOTAL	434

Source: Helm (2009).

This is a formidable number, with macroeconomic consequences. The difference is great between delivering this on the basis of current inefficiencies, as discussed above, and at the present costs of capital associated with such projects, and devising a more efficient outcome. A 1 per cent reduction in the cost of capital is worth £5 billion per annum. A 10 per cent improvement in capital efficiency is worth £50 billion to the total requirement.

Section V sets out a number of reforms to address these two dimensions—the cost of capital and the capital efficiencies—and a reformed infrastructure policy and regulatory regime is proposed. But to understand why these reforms are needed, it is first necessary to understand why the privatization, liberalization, and competition agenda of the 1980s and 1990s has failed to provide an efficient investment context.

² On the scale of London's infrastructure requirements, see the article in this issue by Tony Travers (2009). More generally, on the special issues raised by transport, see the articles by Stephen Glaister and John Smith (2009) and by Andrew Sentance (2009), in this issue.

III. Privatization, liberalization, and competition, and their impacts on investment

Privatization was regarded by its advocates as a solution to perceived under-investment in the public sector, and to the perceived inefficiencies of the public sector. Its advocates argued that access to private capital markets would free the companies of the short-term Treasury capital constraints, and that the incentives of private equity, when combined with appropriate regulation, would ensure that profit maximization was achieved through cost minimization.

Liberalization would add a further discipline: the prospect of competition would bring the product market into play. Incumbents would face the loss of market share, and entrants would bring innovation. Together, private ownership and competition would achieve what public ownership and monopoly had failed to do.

In practice, the motives for privatization and competition were more complex, and there were inevitable political motivations. Curbing union power through restructuring was part of the rationale, as was the creation of a broader share-owning democracy and, of course, raising money, too.

These ambitions were reflected in the peculiarities of each case, and there was much learning-by-privatizing and learning-by-regulation as the process unfolded. What is clear, however, is that the optimism which accompanied these fundamental changes has not been fulfilled: a quarter of a century later, Britain's infrastructure has not become the envy of Europe. The investment problems remain, performance is mixed and the incumbents remain dominant. Indeed, such are the results that some utilities have been migrating back to greater public control, and there has been a general flight from equity.

To see why it has turned out less well than anticipated, four examples illustrate the core problems: BT, BAA, electricity, and rail. BT's privatization was more of an afterthought, the result of an attempt to deal with its proposed investment in System X exchanges. At the time, this was a large-scale project, which passed the normal public-sector investment tests. But in the early 1980s the macroeconomic conditions were such that, under the MTFs, the constraints on the public-sector borrowing requirement (PSBR) meant that no public monies were available. The Treasury initially tried to raise private debt to finance the project, while retaining BT in the public sector. This turned out to be difficult, since the revenue stream could not easily be hypothecated, and thus the Treasury resorted to privatization.

In BT's case the results have been poor. As the incumbent, it proved incapable of rising to the investment challenges of the technological revolution, and ended up ceding much of the market to new rivals. Its mobile venture was sold off, its participation in the 3G auctions proved financially burdensome, and by 2009 it was beset with a pension deficit, considerable debt, and a share price lower than that at privatization. The management failures have been substantial, and yet at the end of this process Britain does not have a broadband network fit for the economic circumstances. The more dynamic rivals have had a major impact, but, revealingly, it remains for BT to provide a critical part of the broadband infrastructure, which turns out to be in effect a normal utility network. The fact that BT is not in good shape to do this feeds back to the economic consequences for the economy as a whole. Privatizing BT did not in the end solve the investment problem: now facing the broadband challenge, it has arguably made it worse.

When it came to privatizing BAA, it was explicitly recognized that there was a real risk that the private company would not invest sufficiently. This fear was actively debated in Parliament at the time, and a reflection of this was that the regulator was given an explicit duty

in respect of investment. Furthermore, because investment might be needed in anticipation of demand, cross-subsidy was built into the charges, in particular so that Heathrow could support investment at Stansted.

Two decades later, it is possible to see whether and to what effect the investment has been forthcoming. Stansted has been developed, and Terminal 5 has been built. Yet these pale into insignificance against the overall performance. Few would argue that Heathrow is fit-for-purpose, the runway capacity does not match demand projections, and the new owner of BAA is so financially stretched that it resists the application of a new regulatory regime—particularly the provision for special administration—on the grounds that this would represent a debt covenant event and as a result the bond holders might pull out. Indeed, such is the financial position that there has been some debate about whether BAA could finance the further investment that the government has indicated (DfT, 2003), notably for a new runway at Heathrow.

The third example is electricity. Here, restructuring was explicit from the outset, with the objective of creating competitive electricity generation and supply businesses, both of which could then be deregulated. The core infrastructure network—the grid—would be passive, investing on the basis of the requests from the generators, and it would be gradually prised open to further competition. The aim was to drive the monopoly gradually to its absolute minimum, and indeed eventually the concept of competitive networks was endorsed by the government and the regulator for the offshore grid for wind farms. At the distribution level, meters were split out and opened up to competition.

For a time the model worked well. Excess supply dominated much of the 1980s and 1990s, and little investment was needed, beyond the development of combined-cycle gas turbines (CCGTs) as environmental constraints began to bite on coal generation. The task in hand was to sweat the assets, not to invest. The new electricity market was well designed to do this, and the excess supply conditions in the face of upstream and downstream competition drove prices down to well below the European averages. For the network companies, RPI – X regulation drove prices down, too, though not before major financial engineering and CAPEX games had produced extraordinary high returns for what were relatively unpromising and low-risk businesses.

These benefits turned out to be largely transitory, and heavily conditioned by the historical conditions. Eventually the assets would need to be replaced, and the new climate change agenda would mandate heavy investment. Whereas excess supply had produced prices below the European average, as the margins tightened so British prices proved volatile and high. Furthermore, the rapid depletion of North Sea gas had not been accompanied by investment in storage, and by the middle of this decade, sharp price spikes and supply scares dissipated the complacent assumption that the new markets were sufficient to ensure security of supply at reasonable prices.

Competition, too, turned out to be a mixed blessing. It brought its own costs, and the incumbent strategies to integrate vertically effectively ended new entry. By 2009, social tariffs and published tariffs were proposed—bringing substantive retail supply competition to an effective end. Upstream, governments had intervened to determine the fate of all the technologies except gas, and even here compulsory strategic storage was being considered. Renewables, notably wind, was protected; coal's future was being determined by the combination of the EU Large Combustion Plants Directive (LCPD) and the British carbon capture and storage (CCS) policy; and nuclear was, at least implicitly, being promoted by the government. As the replacement cycle bites in the next decade, and given the scale of the expenditure on wind, there are considerable doubts as to whether the privatized industry structure, with

liberalization and competition, is up to the task. A return to greater state intervention is almost inevitable.

The fourth example is rail. British Rail was privatized in the run-up to the 1997 General Election, and with the Shadow Secretary of State threatening renationalization. This was not a helpful context, with the result that the industry was sold against a small balance sheet. It was also broken up into fragments: the track was separated from the trains, and the train operating companies were separated from the rolling stock.

The newly privatized industry faced big infrastructure projects from the start, as well as coping with the renewal and maintenance of the existing networks (and in a context of not even having an asset register). The West Coast Main Line was the largest project, eventually costing over £8 billion, after long delays and large cost overruns. It was also confronted in 1997 with the new government's revolutionary 'integrated transport policy' (DETR, 1997),³ which was predicated on an objective of a 50 per cent switch from road to rail, in a context in which the Brown boom was producing an unprecedented increase in demand.

Railtrack, the privatized network company, had many failings, but at the core its balance sheet was not big enough for the investment task in hand. Even without the investment consequences of the train crash at Ladbroke Grove and the derailment at Hatfield, its balance sheet would have required fresh equity. But the new regulatory structures were never designed with the raising of equity in mind. Almost all the balance sheets at privatization were accompanied by very low gearing, on the assumption that private borrowing would facilitate the catch-up with the perceived public-sector backlog. This was especially true for water, but it also applied to BAA and to the electricity network companies. Equity injections require a return on the equity commensurate with the equity risk. As we shall see below, the approach to regulation was precisely one which did not fulfil this condition—providing a weighted *average* cost of capital (WACC), rather than a marginal cost. This was fine while debt was being raised, since the average was above (often well above) the marginal cost of debt. But the average was below the marginal cost of equity, and not surprisingly, as the balance sheets began to be exhausted, companies then faced the need to raise equity in distress to maintain debt covenants. Notable examples were BT and United Utilities. But some could not even manage this: both Welsh Water and Railtrack collapsed into debt-only, not-for-dividend companies, a fate which may await many of the rest of the privatized infrastructure companies, as we shall see below. In Railtrack's case, the management, in negotiations with the Treasury, did at least try to agree an equity financing, but the Department for Transport was in secret simultaneously plotting to force it into administration, which it succeeded in doing.

These four examples each illustrate different dimensions of the failure of privatization, liberalization, and competition to deliver a permanent solution to the infrastructure investment problem in the British economy. Much did improve—notably in operating costs—but the result is not an infrastructure which is fit-for-purpose, nor indeed has competition been sustained along the lines initially intended. Few argue that competition will provide much by way of sufficient solutions to the investment challenges of any of the above examples going forward. In some cases, it may not be necessary, and in some it may actually be detrimental.

To see why this is so, and why some of the initial hopes have been dashed, we need to consider what the core problems for infrastructure investment are. As will now be explained, it turns out that the overwhelming focus on the market failure of monopoly—and the emphasis on competition as its solution—has led to the neglect of an even more fundamental

³ This was followed in 2000 with its Ten Year Plan for transport (DETR, 2000).

market failure—time inconsistency, and the development of long-term regulatory contracts to address it.

IV. Time inconsistency, sunk costs, and the policy framework—the special economics of infrastructure investment

While most of the literature focuses on privatization, it is instructive to consider an older question: why the infrastructure industries were nationalized in the twentieth century, and why some infrastructure networks began in the public sector. Why did the private sector fail?

The answers are instructive for the question of how to deal with infrastructure investment now, for two reasons: first, they illustrate a core problem for private investors in trusting government and regulators; and, second, because under the current regulatory framework, many may be heading back to mutual or nationalized status.

What distinguishes network infrastructures from other activities is the wide gulf between average and marginal costs. Infrastructure investments tend to be long-term and capital-intensive. Investors sink capital in the creation of networks. Once it is sunk, the marginal costs before congestion is reached are typically close to zero. This feature also characterizes a range of broader infrastructure: wind farms, nuclear power stations, reservoirs, broadband networks, port facilities, and airports share this average to marginal cost difference.

The sunk costs alone make this sort of investment risky, but when the life of the assets is considered, technical progress comes into play, too. For example, a conventional electricity meter may be stranded by new smart meters, and new generation technologies may now put building nuclear pressurized water reactors (PWRs) at risk of stranding.

In such circumstances, in the private sector, the usual solution is a long-term contract. Investors bargain with potential customers: they will sink the capital if the customers agree to buy the output and desist from behaving opportunistically if a better offer subsequently comes along. The contract binds the customers to pay the average costs. Examples such as long-term property leases reflect this. And where such contracts are absent, investment tends to come with vertical integration to capture customers—in effect, to use market power to force prices to reflect the costs. The brewing industry and the supply of petrol illustrate this strategy, and, not surprisingly, these industries feature regularly in competition inquiries and Competition Commission cases.

For the infrastructure networks, investors can only impose prices which reflect the average costs if they have a monopoly or if regulators guarantee that customers will pay. Thus, where the private sector has survived in the twentieth century—notably in the USA—it has been on the back of both monopoly and rate-of-return regulation. Governments, through regulators, guarantee that a reasonable rate of return will be earned. That is the long-term contract.

In Britain in the 1930s and 1940s, this contract broke down. The private sector was widely regarded as short-termist, and its investment record was deemed insufficient. With the coming of the electricity grid, new transport systems, and the growth of the railways into a national network, the fragmented private sector was forced to give way to the State. Much of this was consolidated by the Attlee government after 1945, with two key abiding principles: the public interest would take precedence over the private through public ownership; and competition would be replaced by statutory monopoly.

In principle this solved the average versus marginal cost problem. The State could not commit credibly to the private sector, so it would commit to itself, through its taxpayer franchise. Indeed, since the new welfare economics, developed in the 1930s, had dictated that Pareto optimality would be achieved when price equalled marginal (not average) costs, it would be more efficient to cover the capital costs from general tax revenue. Eventually this was codified in 1967 into a White Paper on Nationalized Industries (HM Treasury, 1967).

The nationalized industry model broke down in large measure because of the strains placed on the Treasury by the broader growth of public expenditure as the public share in the economy rose from the 20–30 per cent range to over 40 per cent by the end of the 1960s, and because the incentive structure for public managers and politicians was arguably even worse than for the private sector when it came to efficiency. The critique of the nationalized industries at the end of the 1970s tended to stress gold-plating of investment, losses, and operating inefficiency through higher wages, labour bias, and poor labour relations.

Because privatization was associated with the period after the economic recession of the early 1980s, when the structure of British industry began to move away from large energy-intensive production towards services, and because the 1980s inherited the assets built in the public sector in the 1960s and 1970s, the need to commit to investors was largely overlooked. The lessons of the 1930s and 1940s were forgotten.

Added to this convenient amnesia about private-sector failure was an aversion to US-style regulation. Britain would not only have private ownership, but it would also replicate a crude version of competitive markets by imposing fixed *ex ante* prices for fixed 5-year periods, on the assumption that, as price-takers, the utilities would maximize profits by minimizing costs. RPI – X was deliberately designed to be the antithesis of rate-of-return regulation, which was argued to exacerbate gold-plating and cost inefficiency (DTI and Littlechild, 1983). Put simply, the problem of rate-of-return regulation was too much investment, and operating cost inefficiency. It was to turn out that the problem of RPI – X was just the opposite: too little investment, but with operating cost efficiency. And in the long run, it is the investment that counts.

More by accident than design, the application of RPI – X gradually evolved to take some account of the sunk-cost problem. Although the early applications envisaged that—in Austrian fashion—the regulators would face such serious informational asymmetries that they could not possibly forecast costs accurately over the coming 5 years at periodic reviews, and hence the task was simply to fix crude price limits and let the companies reveal their costs, periodic reviews of prices rapidly became more complex. It turned out that prices needed to be such that the companies could earn a return not only on their operating and capital costs going forward, but also on the stake in the businesses established when the companies were sold—the initial values—and on past sunk investments. The regulatory framework entrenched this through the placing of a duty to ensure that the functions could be financed.

The value of these past investments was to emerge as the regulated asset base (RAB) to which the regulator had to assign a value—the regulatory capital value (RCV). At each periodic review this had to be updated to include capital investment in the previous period which had been efficiently conducted.

The concept was more powerful than it originally seemed: it was not just a piece of arithmetic to do the periodic review sums, but it guaranteed that investments would not be expropriated by opportunism. The *time-inconsistency problem*—promising to pay average costs *ex ante*, but driving prices down to marginal costs *ex post*—was solved. The RAB represented the long-term contract between investors and customers, and credibility was provided by the (legal) duty to finance functions.

Considered more broadly, the RAB is potentially the centrepiece of infrastructure investment more generally. Thought of as a particularly credible and robust long-term contract ultimately guaranteed by law, it could be applied in a host of other areas—indeed, implicitly it has been. A good example is the Renewables Obligation (RO). Suppliers, and hence customers, are forced to buy a proportion of their electricity from renewable sources. The Renewables Obligation Certificates (ROCs) must be purchased to cover this proportion of sales, and the costs are consequently passed through. The RO is set for the medium to long term, so that, although the RO/ROCs turns out to be an incredibly inefficient and expensive support mechanism, from the point of view of investors, they get average not marginal costs.

By providing explicit guarantees to the RAB, the regulators in effect transfer equity risk from the companies to the customers. There is nothing that managers can do to influence the number: it is a contract value for investments that have happened in the past and been completed. It follows that it can be debt-financed: the risk has been socialized to the customer base (or, in the case of Network Rail, to the taxpayers), and the debt is a proxy for index-linked gilts since the return is linked to the RPI via the RPI – X formula.

This equity risk transfer has not gone unnoticed by the capital markets, and it has given rise to an extraordinary bout of financial engineering. To see why this has happened, a further dimension of the regulatory regime needs to be considered—the weighted average cost of capital (WACC).

V. The split cost of capital, tradeable RABs, and indexation—how to finance infrastructure investment

A second building block which was added to the RPI – X regulatory framework—in addition to the RAB—was an *ex ante* cost of capital. Periodic reviews resetting prices needed to apply a reasonable allowed return to the existing assets in the RAB, and to the running of the businesses (the operating expenditure, or OPEX) and new capital expenditure (CAPEX) before going into the RAB. Note immediately that these two domains—the RAB, and the OPEX and CAPEX—are quite different. The former, the RAB, is an accounting number, representing past investment; the latter is a business risk activity which managers can control. There is no equity risk in the former, and a great deal in the latter.

Notwithstanding this distinction, regulators chose (and the Competition Commission endorsed the decision) to lump both together and to calculate a WACC. In making this calculation, the capital asset pricing model (CAPM) was used, and estimates were made for the costs of debt and equity. The average was created by regulators assuming a gearing level.

This technical exercise has a number of fundamental economic consequences, and was the motivation for both the financial engineering which followed and for the demise of equity in Welsh Water and Network Rail. And, as regulators persist with this approach, a further exit of equity is to be expected.

The problems with the WACC approach begin with the components. The cost of debt to the regulated utilities has a considerable exogenous element. The risk-free rate, to which the debt premium is added, is beyond their control. As an exogenous factor, in a competitive market it would be passed through. The obvious answer is to index the cost of debt—as proposed by Helm (2008). Companies may be able to influence their own debt premium, but indexing the market rates would provide an incentive to companies to minimize their premium. Indexing is further explored by Richard Brealey and Julian Franks (2009, this issue).

The impact of indexing since 1990 would have been considerable. In every periodic review the regulators assumed an *ex ante* interest rate which turned out to be generous as rates fell for the subsequent two decades. The difference between the assumed rate and the outturn was a windfall to the shareholders at the expense of customers, since the allowed rate was above that necessary to finance their (debt-related) functions.

Regulators have raised a number of objections to indexing. Most revolve around the practicalities rather than the principle. It is argued that there is no exact index and that any proxy will encourage gaming. The argument is flawed: the current 5-year indexing at periodic reviews is very imperfect: more frequent revisions are a better proxy than the existing one, and hence improve efficiency. Then there is the spurious argument that indexing requires revisions. Prices are, in fact, revised each year on the basis of the X factor and whatever RPI turns out to be. It is simply a matter of passing through—or clawing back—the index. And, in competitive markets, prices change frequently.⁴

The calculation of the debt premium depends in large measure on how much risk the companies face which cannot be diversified in the debt markets. This has two components: regulatory and political risk; and the capital structure. On the former, a clarification that the financing of functions guaranteed the RAB (even in special administration—see below) removes that risk in respect of the RAB. Hence the case for any significant debt premium over and above the returns on index-linked gilts is at least questionable. On the latter, credit ratings play an important part in pricing debt risk, and these, in turn, depend on cover ratios (especially interest cover) and the gearing levels. As we shall see, these have been adversely affected by the dash-for-debt and the lack of incentives to raise fresh equity.

Calculating the cost of equity on a forward-looking basis is fraught with difficulty. From the great economic boom of the late twentieth century through to the crash in 2007 we witnessed fundamental changes in capital markets, beginning with the abolition of exchange controls and financial liberalization. The combination of loose monetary policy—especially after the stock-market falls in 2000, and then again on a spectacular scale after the credit crunch broke in 2007—and irrational exuberance created conditions which are likely to be confined to their historical period. They give virtually no guide to the future, except perhaps to illustrate how different the pre- and post-2007 macroeconomic conditions are. The capital base of the banking system has contracted. This will arguably raise the price of credit, and as the quantitative easing is eventually withdrawn and interest rates begin to return to their long-run levels, the cost of equity will be affected. Choosing too low a cost of equity based on the boom years will have serious consequences: capital will flow into other higher-return activities, and the exit of equity will continue. At the limit this may turn out to be total.

If there are real problems with the numbers, these pale into insignificance compared with the fundamental flaw in using a WACC—an average—to cover two very different activities—the RAB, and the OPEX and CAPEX. Starting with the RAB, here there is no equity risk. Managers can do nothing about this number; it is beyond their control. Even in the event of the company being placed in special administration, the RAB remains. The number does not change. A new owner will have the same income stream in respect of the RAB and the same risk. Losing the licence is an equity, not a debt risk, and this has been reflected in all the failures to date—notably for Welsh Water and Railtrack. Even in the collapse of British Energy, the bondholders were effectively protected.

⁴ See the article by Brealey and Franks (2009) for a more detailed and comprehensive presentation of the case for indexations.

But the regulator allows a WACC across both activities, and hence the RAB attracts a return higher than the cost of debt. This arbitrage is an opportunity the capital markets have pounced on, and the financial engineering documented in Helm and Tindall (2009) has been the result. In some cases gearing has been taken to the limits of the financial ratios, as debt has replaced equity. The regulators stood idly by: they argued that the capital structure was a matter for the companies.

This is surprising: when the companies were privatized their balance sheets were—as noted above in section III—relatively ungeared. The reason was that it was assumed that the borrowing capacity would be used to pay for the physical capital investment which had been neglected in the public sector. In other words, the balance sheet capacity was deliberately designed to facilitate real capital investment. Instead, it has been used for an enormous exercise in financial engineering, largely carried out through takeovers. The capitalized difference between the actual cost of debt and the WACC has been passed to shareholders, with customers receiving little benefit, and they are now confronted by companies with exhausted balance sheets. Not surprisingly, as a result, many now seek to minimize CAPEX, with considerable consequences for Britain's infrastructure going forward.

While the WACC is too high for the debt, it is too low for the equity. The marginal cost of equity is by definition above the WACC, and as regulators assume higher levels of gearing, the gap between the WACC and the marginal cost of equity has grown. This matters because the OPEX and CAPEX are very much equity activities, within the scope of management control. Indeed, since the completed CAPEX goes into the RAB at periodic reviews—and hence, in effect, it is sold on—the role of debt in the OPEX and CAPEX is largely confined to project finance and working capital. The appropriate capital structure for the OPEX and CAPEX resembles that of a conventional operating and construction company with fixed-price contracts, and these are largely equity-financed.

Raising equity for these activities for incumbent WACC-based utilities is not a particularly attractive proposition—indeed, it is notable that a number have tried to exit this side of the business. Welsh Water contracts out almost all of it, as did Network Rail until the operational consequences became apparent. Anglian Water tried to split its company into a support services business and a core utility, in the process buying a construction company. The results have been at best mixed.

The logic of the structural split is sound, however: the RAB and the OPEX and CAPEX are very different, and require different managerial skills. In principle, the split could be completed, introducing the possibility of auctioning the contracts for the periodic reviews. Companies would bid an X factor, and regulators—or indeed the residual RAB owner—would select the lowest X subject to an assessment of the quality of the outputs. This would introduce a major new element of competition, and radically reduce the regulatory burden of detailed examination of business plans.

The corollary would be that the RABs would be tradeable, and this would create a distinct asset class for investors, notably pension funds, but possibly retail investors too, to sit closely alongside index-linked gilts. This is further developed in Helm (2008, 2009).

It would remain to be decided where the licence obligations formally lie—how the contract would be administered and enforced, how the contractors' performance would be monitored, and who would be liable for failure. This turns out to be a complex issue, once the functions of the licence are unpacked. For the coordination of investment depends on a prior set of decisions about the CAPEX programme itself and the operational output standards and targets. Much of this is already ceded to the regulators. They—not the companies—decide on the allowed CAPEX, and they typically cut back what the companies propose in their business

plans. The recent draft determinations by Ofwat and Ofgem do precisely that (Ofwat, 2009; Ofgem, 2009). Indeed, the complexity and detail of the regulators' decisions are striking. As regulators take on more and more of the role of determining the scope and scale of the business activities, the job of contract management becomes more narrowly defined. Even it, too, could be put to competitive tender.

The equity incentives for the OPEX and CAPEX have been blunted, and increasingly so. Since the equity risk does not go away, it will gradually be revealed through the prices for the contracts. Instead of an explicit recognition of the cost of equity in CAPEX and OPEX, it will become implicit in bid prices for the work programmes. There is then a (very) imperfect way around this aspect of the problem.

For the balance sheet as a whole, the problem is of a different order of magnitude: rights issues may prove impossible—or at least be in distress. Whereas the balance sheets were ungeared to allow debt to finance investment, the financial engineering has left them stretched. In some cases, the balance sheets are so stretched as to threaten the viability of the company. As the companies reach the limits, the financial ratios decline to the point where the cost of debt rises.

There are three solutions to exhausted balance sheets: rights issues; pay-as-you-go; and mutualization and nationalization. Rights issues are not attractive to investors where the WACC is (well below) the marginal cost of equity. There has been none, other than in distress. A surrogate for rights issues is to insist that the companies retain earnings on the basis of lower dividends. Cutting dividends reduces the returns to equity and hence is just a mechanism for enforced rights issues. Shareholders are forced to inject equity that would otherwise have been distributed to shareholders. The recent proposal by Ofwat, mentioned above, along these lines has had the predictable effect on share prices, driving down the market values of the water companies.

Pay-as-you-go is a policy to provide a big enough income stream to negate the need to raise more debt (or equity). In effect, customers are financing investment—assets in the course of construction have their costs paid directly from customer bills. This was a regular feature of the nationalized industries and one of the purposes of the ungeared balance sheets was to avoid this: in privatization, future customers would pay for future benefits; in pay-as-you-go, current customers pay for future benefits.

The third option is that equity just exits and the companies become debt-only vehicles, as with Welsh Water and Railtrack. Although these companies may claim that they have some equity in the form of retained earnings, these are just customers' monies held back. The difference between mutuals, not-for-dividend companies, and full nationalization are matters of degree. In all cases the equity risk remains—it never goes away. In most cases, the equity risk lies with customers. In some, it lies with taxpayers.

The pros and cons of nationalization are beyond the scope of this paper, but one feature stands out. The transfer of equity risk has an inevitable effect on incentives. Without equity owners there is little incentive to outperform on efficiency. There is no one to capture the resulting rents. Although it is claimed that the management can have contracts which reward them according to efficiency performance, this is largely spurious. If this could be sufficient, capitalism could be replaced by nationalized industries with appropriate management contracts. There is a vast literature on the problems of matching executive pay to performance, and in the public sector the added dimension of media and political pressures makes the problem even worse.

The implications of the above discussion are profound and have serious consequences for the ability to deliver the major infrastructure investment programme over the coming decade.

The employment of the WACC has led to a massive exercise in financial engineering, leaving the balance sheets exhausted. They are no longer in a fit state to carry the physical investment they were intended for. Equity incentives on OPEX and CAPEX have now been sufficiently blunted that companies are less enthusiastic about CAPEX. The exhausted balance sheets cannot carry ever more debt. Short-term measures to force equity injections through cutting dividends and retaining earnings will be just that—short-term. The result will be to undermine equity further, and there is a real possibility that many more utilities will collapse back into not-for-dividend, mutual, or nationalized industry status. With this comes the effective end of the RPI – X incentive structure. Equity risk will lie with customers and taxpayers, and implicit rate-of-return regulation will be back. The more public the companies, the greater the scope for media and political pressure, which in the nationalized industries held prices down, reducing the pay-as-you-go cash for investment. The end result will be to put the major infrastructure investment programme for the next decade in serious jeopardy. The regulated networks will have come full circle, back to where they started—but with a high level of debt inherited from the financial engineering.

VI. The role of government—how to set the policy framework

Typically, infrastructure does not get created spontaneously. The role for the State is crucial. Market failures are endemic, among which the problems of time inconsistency and commitment are central to the investment issue. As noted above, it was the failure of the State to guarantee that private investors would not be expropriated that led to nationalization of much of the infrastructure in the mid-twentieth century, and it was the failure of the State that led to the privatizations of the 1980s. The delivery of the major investment programme going forward will require the State's role to be reformed and appropriately defined.

A major change which followed privatization was the retreat of the State from the role of producer. As the process of privatization unfolded, the State virtually ceased to be involved in producing, except in health, education, and the services of administration of taxation and social security. Only in roads and road maintenance does the State retain a direct infrastructure presence. The great State monopolies have gone.

But it was a mistake by the advocates of privatization to assume that ceasing to own assets meant that the State would also cease to exercise elements of control. Public ownership has not led to the end of public control—indeed, as many private-sector firms have discovered, it is often easier to impose control in the absence of ownership. Supermarkets do not typically own farms and Marks & Spencer does not own clothing manufacturers, yet each exercises powerful controls through contracts.

The State mediates the contracts with the privatized infrastructure companies. It defines the roles of the parties, and it sets the powers and duties of the regulators. It provides for a guarantee for the RAB, and requires that the functions can be financed. This is a major advance on the problems facing the networks in the mid-twentieth century. The RAB is the basis on which this guarantee—and the solution to time inconsistency—is founded.

But the role of the State goes well beyond solving time inconsistency; it is for the State to decide on the overarching objectives within which the CAPEX programmes are set. The State decides on climate change targets; it is ultimately the locus for security-of-supply requirements; and it decides on the major investment projects needed. Its intervention in infrastructure is therefore multifaceted and pervasive.

What is less clear is how this intervention is best structured. Should the State confine itself to overarching targets and outcomes, or should it make individual project decisions. Should it, rather than the regulators, ultimately adjudicate on the CAPEX programmes?

Overarching targets make more sense in some areas than others. On climate change, the State enters into negotiations and agreements, and it signs up to overarching carbon-emission reduction targets and to directives, such as the EU Renewables Directive. Beyond these overarching targets, it has set up institutions to provide credibility and to assist in allocating the targets to sectors. The Climate Change Committee is an example of such an institution and it is also responsible for advising on allocating the carbon budgets between sectors and monitoring compliance with the targets.

In principle, this function—and, in energy, the security-of-supply targets—could be met through market prices. In practice, the State cannot avoid following through these broad policy targets into specific investments. One reason is administrative: the State ultimately controls planning, which is therefore ultimately determined through the political process rather than by markets. Decisions have to be made about whether to grant planning permission to projects such as the third runway at Heathrow. Similarly, the State has to decide ultimately whether new roads and high-speed train lines will be built.

The planning function is a hook on which much by way of more directional intervention is based. The involvement of the State in planning means that developers have to engage in the political process from the outset. Again, the Heathrow example is pertinent: both sides of the argument have mounted media and political campaigns and sought to lobby and influence accordingly.

The nature of networks is such that there is very little potential for the market to dictate outcomes. Most networks are monopolies, and almost all are implicitly or explicitly regulated. Thus, investors rely on the political stamp to ensure that they become functions which regulators have to finance. The market cannot commit future customers to pay the average costs—that requires a contract. The State is the ultimate guarantor of contracts. It also has the power to change its mind, and investors require reassurance as to the consequences. For example, in a number of European countries, nuclear moratoria have been imposed after private investments have been made. Not surprisingly, therefore, new nuclear build proposals seek State approval.

The choices of networks and their scale are therefore inevitably governmental decisions. The State will decide on the runways, the high-speed links, the energy grid forms, the renewables programme, the roll-out of broadband, and much else. Almost all the £500 billion estimated to be spent in the next decade is subject to decisions by the State.

The planning system is now the mechanism for setting the overarching sectoral frameworks within which these decisions are set. As part of the recent planning reforms, and with the creation of a new Infrastructure Planning Commission (IPC), the government is committed to making national policy statements for each of the main sectors. These are then the texts from which the IPC will work. It remains for the private sector to bring forward proposals which are consistent with the national policy statements, and then for the regulators to take these into account in setting the CAPEX.

Although the broad approach is correct, there are two worrying aspects. First, it is not enough for a government to set out a national policy statement. What matters for investors is whether subsequent governments will stick to it. There is at present no provision for a parliamentary vote: the statements just have to be tabled. Thus, for example, in the contentious issue of the runway at Heathrow, a subsequent Conservative government could simply insert

the word 'not' for this project, and policy would be reversed. Sunk costs would have been stranded as a result, unless the regulator were to pass them through.

The second aspect is the translation of a planning intention into actual CAPEX. For example, the government may wish for a fleet of new nuclear power stations, but private-sector investment is a voluntary activity. Therefore the government has to consider how it can not only desire the outcome, but get it delivered, too. This feeds through to ensuring that private investors can expect to make a profit. The role of the State here can be various: it can provide the contract itself—or through local government—as in the case of many Private Finance Initiative (PFI) and public-private partnership (PPP) contracts, including, in the latter context, the London Underground. It can require regulators to take these projects as functions that have to be financed. And it can provide for customers compulsorily to provide the contracts through obligations to purchase, for example, through the RO.

It is apparent that there is no single solution—that each depends upon the context. Yet this complexity carries its own problems: how should the particular mechanism of intervention be chosen? How can inefficiency and corruption be avoided? What happens when—as is often the case—the costs overrun?

It is in this context that the role of RABs and competitive contracting comes into play. The RAB provides a generalized way of committing to paying the sunk costs. It can be applied well beyond the regulated utility sector. As a long-term contract, it is relevant to renewables, windmills, and a host of capital-intensive, long-lived projects. Take windmills: once built, the asset is sunk. There is an operations and maintenance contract, but the value of the asset remains. This could be rolled up into a 'wind RAB', and financed through debt. Customers would pay the debt costs plus the operating costs—and these could be subject to competitive tender. Compare this to the current RO/ROC system, which is among the most expensive support systems in the developed world. Since the cost of capital is the dominant number in wind economics, and since the government has committed to a major expansion of wind energy, the difference between committing customers to a wind RAB and maintenance contract, and the current system, is very large. The same logic could be applied to the Severn Barrage proposal and to nuclear power stations. In the latter case, this is implicitly what has happened in France, with major implications for the cost of capital.

Once the State recognizes its central role in guaranteeing the sunk costs and the RAB concept is generalized, the focus can be on the efficient delivery of the project itself. Project coordination is potentially something which can be contracted out, although it is important to specify who the client is. In practice, it is often the government, or implicitly the regulator, as in the case of many of the regulated utilities. This role is often confused; for example, the government has created delivery offices inside Departments for renewables and nuclear power, but created a new body for the Olympics 2012.

There are clear advantages in government confining its role to the specification of what should be delivered and creating arm's-length agencies to ensure the delivery. But these are agency functions, and not ones which lie easily with notionally independent economic regulators. The slow progress in coordinating network investment for the development of renewables is a good example in the case of Ofgem, as is Ofgem's pursuit of competitive networks for new grids offshore. Economic regulation is a well-defined and narrow technical activity. To date, these economic regulators have been encouraged to stray well beyond their proper domain, so that the delivery functions are blurred with economic regulators' other priorities.

It follows that the institutional structure needs to be revisited. Given national policy statements, and assuming that these are given greater political credibility through mechanisms

such as Select Committees, cross-party scrutiny, and ultimately parliamentary votes, the role of the Departments is to develop these statements and to provide the high-level specification of what needs to be delivered. That delivery should then be delegated to sectoral agencies whose functions and duties are to ensure that high-level targets—such as carbon-dioxide reduction targets and security-of-supply targets—are met. The Civil Aviation Authority (CAA) and Ofcom already have some of this structure—the former in respect of safety and the latter in respect of spectrum and broadband roll-out. Their functions could be further clarified. The Highways Agency has this form, too.

The glaring exceptions are Ofgem and Ofwat. In Ofgem's case, it is proposed that the duties in respect of climate change and security of supply will be added to its customer and financing functions duties (DECC, 2009). This could be substantive—in effect changing Ofgem from an economic regulator into an Energy Agency in all but name. But the relationship between the duties would need to be sorted out: it is not the role of regulators to make what are ultimately political trade-offs between customer bills, carbon, security, and other duties. In the case of Ofwat, it was envisaged at privatization that the outputs would be set by the then National Rivers Authority (subsequently the Environment Agency), but, in practice, Ofwat has sought to manage the CAPEX within its own narrower duties. There is a good case for merging it into the Environment Agency. In all these cases, the economic regulation bits can go within the broader bodies. This already occurs in the CAA and Ofcom, with the added advantage that it brings economic skills and expertise to bear upon the broader contracting and delivery decisions.

Clarifying the role of the State, developing the concept of national policy statements and adding to their (inevitably political) credibility, and providing for arm's-length delivery bodies would enhance the prospects of delivering the infrastructure investment programme. In the process, much regulatory bureaucracy would be reduced, and the number of bodies reduced to one for each major sector. There would be the CAA, Ofcom, an energy agency or office of energy, and the Environment Agency would subsume Ofwat. There would be advantages, too, in merging the Office of Rail Regulation and the Highways Agency into a single surface transport body.

VII. Conclusion: A new infrastructure strategy for the UK

Britain faces an enormous infrastructure investment challenge in the next decade, of an order of magnitude greater than over the last two decades. Its existing infrastructure is widely regarded as poor, and in a number of cases not fit for the current or for the future purposes for which it is intended. As a result, Britain's economy is weakened, and going forward the adverse effects on productivity and welfare may be magnified. Without North Sea oil and gas to shield lower productivity, with the claims to macroeconomic stability demonstrated to be illusory, and facing rising taxation, the need for infrastructure to underpin economic recovery and growth is obviously important. The need to respond to climate change provides an additional imperative.

Delivering this infrastructure investment programme requires a rethinking of the role of the State and of the regulators, and the ways in which the interests of investors and customers are reflected in the regulatory structures. The current position is one of muddle and confusion as to the role of the State. The current approach to the cost of capital encourages a flight of equity and major financial engineering, leaving balance sheets weak and few incentives for

new investment. If the current approach persists—and Ofgem and Ofwat's recent positions indicate it will—then the privatized utilities may be on their way back towards quasi- or even actual nationalized status. Network Rail and Welsh Water may be examples of the future.

Privatization, liberalization, and competition have not delivered a sufficient basis for the new investment requirements. Although this transformation bore down on operating efficiencies, it has not provided the basis for investment, in the context of the regulators' approach to the cost of capital. Yet building on the RAB concept, and generalizing it across infrastructure sectors, has sown the seeds of a credible regime to deliver the required investment. Reforming the approach to the cost of capital—splitting out the RAB from the OPEX and CAPEX—is a further necessary step.

Using the RAB to commit credibly to the sunk costs provides a solution to one of the problems of infrastructure investment which has persisted since the 1930s. It is a much better solution than the nationalization route chosen in the middle of the last century. But it is only a necessary, rather than a sufficient solution, even when combined with the split cost of capital. The role of the State is crucial, and this requires much more definition and clarification. National policy statements provide a route forward, but here further reform is necessary to entrench and formalize the decisions that result. The role of Departments should focus on these statements, and the responsibility for delivery should be delegated to agencies, and an associated restructuring of the existing regulatory bodies should follow.

These steps—entrenching the RABs, moving from the WACC to the split cost of capital, and creating effective delivery bodies—would provide a basis for the infrastructure investment programmes ahead. To this must be added the finance—a supply of capital for physical investment in a context where to date the main impact of the capital markets has been perverse financial engineering. Making the RABs tradeable, and using competitive auctioning of the OPEX and CAPEX functions could add transparency and liquidity. But the rewards have to match the risks, and, in particular, equity risks need to earn an equity return. Having allowed balance sheets to be stripped out—something never intended at privatization—politicians and regulators will need to explain to customers and voters that they must pay a higher price for the future infrastructure.

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