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Challenges and Opportunities in the Downturn



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**PLANNING, APPRAISAL AND FUNDING
FOR STRATEGIC TRANSPORT PROJECTS**

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THE STRATEGIC CONTEXT

For much of the last year, it has been difficult to think clearly about the prospects for long term infrastructure projects in the face of the worst economic crisis since the Great Depression. Although it is tempting fate, perhaps the relative calm with which the financial system has responded to recent news on GDP and public budget prospects is an indication that it is time to look forward.

Relative to pre-crisis conditions, *what has changed?* First, many infrastructure projects are appraised on the assumption of increases in real GDP of say 2-3% per annum. These GDP forecasts feed through into traffic volume estimates and, into increased real values of time. Both of these affect benefit estimates in cost-benefit analysis and revenue forecasts in financial appraisal. Instead of trend growth, we are going to experience on official forecasts say minus 4% this year and below trend growth in 2010. So, by 2011 we will be tracking perhaps 7% below where we would have predicted. Taking an optimistic view, GDP growth might then take a higher path and be back on long term trend in a few years. A more cautious assumption is that there will be recovery to trend rates of growth but that the world economy will track at a lower than predicted level for a long time to come ; that is, the ground lost in 2008-10 will not be recovered. Of course the real pessimists expect the recession to be significantly more protracted. So a big challenge concerns the growth scenario to use, which is more than normally uncertain.

A second change is that we are living in a different financial world. It seems to us that in the last six months, the system has rejected the notion of an all-out Keynesian stimulus in favour of planning for very large deficits for the next five years or so followed by a return to financial orthodoxy. Within such a scenario, the debt obligations will mean that we are going to live through a period of acute scarcity of public capital for new investment with a number of consequences. One is an increased marginal required rate of return on public capital. Following on from this, fundability of projects from internal revenue generation will assume enhanced importance. Furthermore, it will be interesting to see in due course whether the private capital market appetite for rather dull boring investment in utilities is restored. It is important to remember that the heyday of the Private Finance Initiative was in times when availability of public capital was squeezed. We return to this in section three.

A third feature is that the condition of labour markets in W Europe is now a very serious worry for policy makers. Far more than ever before, decision makers want to know the net employment effects of all forms of public investment. The effect on the relative balance between investment in human capital (the skills agenda) and in infrastructure is as yet unclear, but the challenge is clear – to model and evaluate via shadow pricing or otherwise the social benefit of employment effects of sector policies.

Fourthly, and somewhat separate from the economic crisis itself, we are at last beginning to see climate change being taken seriously not just as a concept but at the policymaking level. In the UK, the establishment of the Climate Change Commission and the Department for Energy and Climate Change is the political signal, and the current work on Marginal Abatement Cost (MAC) curves is the technical signal that we are looking for a policy package by which to realise the long term commitments we have made. Although the largest consequences may be in power generation and in housing and buildings, it is pretty clear that the transport sector will not be exempt.

Despite these momentous developments, it is also clear that there are other features of the economic landscape *which have not changed*. Of these, pride of place must go to the renewed commitment to open markets and the global economy. Were this to change, the implications for the freight transport sector and its infrastructure and operations would be far-reaching. Given the fundament of the global economy, the single most important determinant of national economic performance is the quality, skills, inherited capital, inventiveness and commitment of the human resources. After that comes infrastructure quality

within which the most important sectors are power, water and transport. We conjecture that transport infrastructure quality for local and long distance, passenger and freight, will remain a strong influence on economic performance in a world of competing city regions.

The prospects for transport investment, including the freight transport sector, depend on how we answer a series of questions such as:

- What do we expect the consequences of the crisis to be for the forward track of GDP?
- What do we expect the implications to be for the availability and price of public and private capital?
- How do we expect future energy markets, trends in resource depletion, and Government action on climate change through carbon taxes etc to influence transport demand?
- How do the feedbacks from climate change via sea level rise, incidence of storms etc influence the case for investment in increased resilience of transport infrastructure?
- How will GDP and transport price scenarios influence strategic choices involving freight transport such as location of production, inventory versus transport costs, distribution networks, modal and routeing choices? In other words, how elastic is the system when put to the test?
- How do we avoid type 1 and type 2 errors: type 1 being to invest in the wrong sort of assets in the wrong places wasting scarce capital, while type 2 being failure to invest adequately with consequences for regional performance and being out-competed by other regions/nations/continents.

If we knew the answers to these questions, we would not be academics. So, in the rest of this paper, we make some conjectures about the implications for the assessment of transport infrastructure. We are guided by two general propositions.

Proposition 1—the ‘world view’ of the Stern and Eddington Reports remains relevant

In 2006, two influential reports were published in the UK—the Stern Report on the economics of climate change and the Eddington Transport Study (in which Sir Nicholas Stern also played a significant part on behalf of the Treasury). The key messages of the Stern Report were that climate change is real, the precautionary principle must be adopted, early policy action is much less costly than late, early action is socially affordable and a range of pricing, investment and non-price instruments need to be brought to bear on a cross-sectoral basis. We are currently at the stage of moving from ‘acceptance in principle’ to the more painful process of ‘implementation’ and this will have consequences for future real transport operating costs although within the ceiling and floor of recent energy price fluctuations.

The key message of the Eddington report is that there is a strong linkage between the quality of transport infrastructure and services and the performance of the real economy. This is discussed in more depth below, but by implication it is no longer sufficient (though it remains necessary) to study the transport sector implications of transport interventions; it is necessary to develop a better understanding of the interactions with the economy via the labour and goods markets and through processes such as clustering and agglomeration.

If proposition 1 is accepted, the consequence is that we will need to understand, include in appraisal, and explain to decision takers how we predict transport interventions will impact upon the real economy and the strategic environment.

Proposition 2 is that the economic crisis and its fallout will place even more pressure on the need to find the golden nuggets (*i.e.* the top quality investment opportunities). This follows from the expectation that capital market constraints (public and private) will be tighter than they have been. This will make the eternal triangle between politics, finance and economics an even more highly contested space. A particularly important issue will be the way in which large projects of symbolic political significance are handled relative to ‘normal’ transport projects. In the UK, projects such as Crossrail, the High Speed Line to the North and runway capacity at Heathrow and Stansted come in this category of projects which could easily acquire prior political commitment ahead of rigorous economic appraisal. So there are implications going forward for the appraisal/decision and decision/funding interfaces for such mega-projects.

This, then, is the strategic context and in the next section we consider at more technical level the implications for appraisal and funding of projects in the freight sector.

2. Investment Appraisal in the Freight Sector

2.1. Introduction

Generally when we talk about appraisal and funding of transport projects, we are referring to public sector investment. In the case of freight, most investment in vehicles, vessels aircraft and in the freight terminals themselves is supplied by the private sector.

Nevertheless, a key factor in the assessment of potential freight transport projects is the pricing of infrastructure, in particular, road and rail networks which are almost always supplied by the public sector. So through its decisions on network expansion, which are usually but not always dominated by passenger rather than freight benefits, and its decisions on the fees, tolls, duties and taxes paid by freight operators, the public sector plays a very substantial role in influencing private sector freight transport decision making.

In countries such as the UK, the private sector funds, constructs and operates freight facilities such as gateway ports and distribution centres subject to the planning controls set up to ensure that new investment takes account local externalities, both positive (additional employment) and negative (noise, emissions, impact on wild life etc). The private sector carries out a conventional financial appraisal, taking account of the overall market for its services, its potential market share, operating costs and the cost of capital. The public sector carries out a social cost benefit appraisal, principally to assess the positive and negative effects on society as a whole and very often as an input to a planning inquiry to determine whether the use of land should be allowed to change. Public comment is often very divided, with proponents of projects suggesting that they will lead to substantial “wider benefits” in regional development, whereas opponents suggest that in a world where carbon emissions must be brought under control, higher transport prices will lead to more local production and that major improvements in freight facilities are unwarranted.

This is a very wide subject, so we address four topics illustrating the range of issues which will affect freight transport appraisal by the private and public sectors:

- The impact of emissions control and carbon pricing on international trade and production location.

- The role of government in developing International Gateways - container ports.
- The impact of carbon pricing and congestion pricing on national road transport networks.
- The changes which will be needed in national freight transport modelling to ensure that the social benefits and costs ascribable to the freight industry, including both traditional welfare benefits and wider economic benefits, are properly included in public social cost benefit analysis of network improvements.

2.2. *The impact of freight cost changes on international locational decisions*

The 20th century has seen major changes in the locations of commercial and industrial activities driven in part by changes in the cost of transport. Internationally, the major changes in cost drivers have been (in real terms):

- A reduction in the cost of air transport by 92% between 1955 and 2000.
- A reduction in the cost of bulk sea freight by 65% between 1952 and 2000.
- A reduction in the cost of sea freight for manufactured goods and commodities of 20% between 1960 (the start of the container revolution) and 2003.

(Various sources as reported by Hummels, 2007)

It is the last which is the real surprise. In fact, most of this reduction came after 1990. Until then average long term costs had hardly changed in real terms, mainly as a result of the high initial investment costs in the new technology and the relatively high oil, and hence fuel oil, prices between 1970 and 1985. The container revolution held costs down to existing levels rather than reducing them.

After 1990 costs fell as a result of four factors:

- Economies of scale in the larger container vessels (over 4 500 TEUs).
- Economies of scale and technical efficiency improvements in new, larger container ports in Asia in particular.
- Increased technical efficiency in logistics management, supported from the mid 1990s by internet technology.
- Significantly lower oil prices.

Even so, how could the major changes in the global locations of manufacturing have been brought about by a 20% fall in freight rates? The answer is that the container revolution was not the driver of change, it was the enabler. It provided the capacity and service quality needed to allow more fundamental comparative advantages to be exploited as free trade developed. Chief of these was access to highly productive labour forces with good basic education who could readily be trained in modern mass assembly methods and who had comparatively low wage expectations.

This raises the question for the future – how sensitive are freight costs to the changes in maritime environmental legislation and taxation which are likely to occur? Could they bring about a reversal of the globalisation of trade, and manufacturing in particular?

Sea container freight is not the only factor in determining international locational decisions, but it is perhaps the most significant and we do not have time to discuss the roles of international road transport, air freight or trans-continental rail. It allows us to make a rough estimate of the impact of high carbon prices on the landed price of imported goods as a stimulus to discussion.

Large container vessels have diesel engines, but they consume cheap, viscous oil which needs pre-heating before it can be injected into the cylinders. This fuel is “residual” oil – it is what is left after the more valuable gasoline and light diesel fuel components have been distilled off. It has a high sulphur content – up to 4.5%, but usually up to a maximum of about 3%.

International maritime regulations under the latest Marpol Appendix VI are about to restrict the sulphur content of marine residual fuel oil to 1.5%, with further decreases in sulphur content to follow. In addition, many countries are introducing regulations requiring the use of distilled ultra low sulphur diesel fuel with a sulphur content of about 0.1%, drawn from separate tanks, when close to shores and in port.

With the growth in vessel size, reductions in time in port and low labour component, fuel is a large component of total cost. We have checked the likely impact using breakdowns of current costs for 8000TEU vessels as used on the China – Europe deep sea container routes. These usually use a medium grade (by residual oil standards), RMG 380, but will in future have to switch to low sulphur oil at sea and probably a diesel distillate (DMO) close to shores.

The RMG 380 price has in the past followed the crude oil price closely. Currently (April 2009) RMG 380 is about \$270 per tonne and the crude oil price about \$50 per barrel. At these prices, fuel represents about 45% of total costs including annualised capital costs (Laing 2009).

Longer term we would expect the crude price to be controlled to a mean price of about \$70 to \$80 per barrel (real 2009 dollars) and the price of fuel oil relative to crude oil to rise slightly, giving a long term (high sulphur) fuel oil cost for RMG 380 in 2009 prices of about \$350 per tonne. To this must be added a surcharge for the extra cost of lower sulphur residual marine oil and the use of high cost diesel distillates in coastal shipping lanes and ports. We assess the combination of these two as being approximately an additional \$65 per tonne.

Then comes the difficult part – estimating the price of carbon. This has been suggested to be as low as \$25 per tonne and as high as \$75 per tonne (Stern’s latest informal advice). For this simple exercise, we take \$50 per tonne. Fuel oil creates about 3 tonnes of CO₂ for every tonne of fuel burnt, so the total fuel cost becomes the equivalent of \$565 per tonne. The resulting equivalent fuel price is below the peak reached in 2008 of between \$650 and \$700 per tonne. Nevertheless, it is 110% above April 2009 levels, which are unusually low due to both the low current crude oil price and the lack of environmental regulations.

The impact on the total marine operating costs is lower but still significant. Total marine transport costs increase by about 50%. But the component of maritime cost in the average value of imported goods in the period 2000 – 2005, when oil prices were somewhat higher than at present, was only 5%, a figure confirmed by World Bank analysts. Even the total of all logistics costs between manufacturer and retailer, including international and national transport, was only about 20% of the wholesale cost and is not proportional to distance. So an increase of 50% in maritime transport costs from the current figure will only increase wholesale costs by about 2.5%, of which about 0.6% is a direct result of an increase from the current low, and probably unsustainable, oil price.

The conclusion is that we can in principle afford to price maritime transport more appropriately. The problems are more likely to be agreement and enforcement. And whether there is effective regulation or

not, the effect on manufacturing locational decisions of increased fuel costs is likely to be negligible, since these will depend more on the relative levels of labour costs in developing and developed countries and the skills required in particular industries.

Why do we so often over-estimate the relative importance of freight transport costs in locational decision making? One reason is that we tend to assume the freight market is by nature inelastic and cost-change inescapable. In fact, transport providers are very agile and very efficient short run cost minimisers. As fuel prices rose, shipping lines slow steamed. As prices fell, they steamed round the Cape to avoid Suez Canal tolls and Somali pirates. Changes in relative costs can produce dramatic changes in behaviour, which are very noticeable and can create significant wider effects, even though the absolute cost change is small.

2.3. *The role of government in developing International Gateways – container ports*

In the UK, Container port developers must go through a planning development process taking up to five years and costing millions of pounds. This process is now being streamlined following the Barker Report (2006), but it will still be a public process investigating private sector proposals for strategic infrastructure.

In order to obtain permission to expand, ports must show need, compensate for loss of amenity and give financial support for the construction of new road and rail facilities, in some cases far from the port, which are required in part at least to handle higher traffic volumes.

The first requirement to show need seems reasonable, but it can produce unexpected effects. UK projections of potential container port efficiency have been surprisingly low during the last five years, when four major planning enquiries have been in progress. After rejection of its expansion plans, Southampton rapidly found means of improving efficiency. This is not unexpected – the revolution in container efficiency which occurred in Hong Kong in the 1990s was a direct result of the inability to build additional terminals fast enough to handle freight demand from the Pearl River Delta and was not (at that time) cost driven.

The second relates mainly to coastal wetlands, which is unlikely to be a problem as controlled withdrawal from existing coastlines will allow alternative sites to be provided by flooding unprofitable farmland on marshes reclaimed during the 20th Century.

The third has been justified as payment for external costs. But it is an additional indirect tax on container port operators whose users already pay heavy road user and fuel taxes.

The approach of Government authorities, local and national in the Low Countries of the Netherlands, Belgium and Germany could not be more different. Authorities frequently carry out primary development of port facilities including land formation for container terminals, which are then completed and equipped by private sector operators under long term leases.

This system allows the operators to be isolated from the rigours of the planning system and reduces their investment risk, since facilities can be completed at short notice as demand increases. It has however been criticised as a means whereby indirect subsidies can be (and probably have been) provided in contravention of EC regulations.

Road and rail connections are provided as part of the local and national networks and funded by the public sector. Network improvements have included dedicated freight rail links such as the Betuwe Line from Rotterdam to the German Border.

The reasons for this difference appear to be three fold. First, to the local economy undoubtedly gains additional benefits from the presence of an international gateway, in particular, from the expansion of logistics facilities and services. Second, there is strong competition between neighbouring coastal ports to act as the transshipment point for freight flows into and out of the deep interior of a Continent. Third, the UK public sector appears to see the private sector as an additional source of funding and a means of transferring risk, whereas the Continental European authorities regard the development of gateways as being a joint, long term public / private endeavour with far wider implications for the commercial and social roles and responsibilities of the two groups than is envisaged by current PPP contracts in the UK.

2.4. *The impact of changes in freight costs on national locational decisions*

Over the period from 1890 to 2000, the real cost of transporting manufactured goods and food from door to door fell in the United States by about 90%. In Western Europe, the equivalent figure in smaller countries was about 75%. The reason was the development of heavy road freight vehicles and national road networks. The rate of change accelerated from 1950 onwards as heavy diesel vehicle technology improved and national and international freeway systems were built.

The role of rail is now confined to heavy minerals, solid fuel, long distance containerised goods (generally over distances exceeding 600km) and container liner trains connecting ports to inland collection (in the case of exports) and distribution centres. Whilst rail proponents often claim that for environmental reasons rail should be used over shorter distances, the costs of road links to final destinations and additional transshipment preclude this solution for short distances, even under very high carbon prices.

So what would be the effect of carbon pricing on national freight distribution? The surprising answer is that in many countries, including the UK, taxation on long distance road freight vehicles through fuel duty and licence charges is already close to, or possibly above, the sum of the costs of provision (including maintenance) and the externalities, including carbon pricing – though studies such as UNITE find that the answers here depend on whether road taxes are viewed as needing to cover average or marginal social costs.

Treasury officials would argue that we need to distinguish between indirect taxation as a means of raising revenue and as a charge for public services provided to end users. But the “hidden hand” cannot tell the difference, and if we are to develop a framework for efficient transport decision making in a new world of carbon pricing and road congestion, we will need to reform indirect taxation of transport. Stimuli will include on the passenger side the need to develop a tax regime capable of handling electric vehicles and on the freight side the likely need to revisit the Eurovignette tax per kilometre.

And if we do create a rational indirect tax system of this nature, we could find that the impact of carbon pricing in many countries, and hence the changes in locational decisions, are quite small and that in addition, we can continue to raise revenue for purposes other than transport through environmental taxation.

2.5. *Improving the appraisal of freight projects – some future issues*

How can we improve the appraisal of freight projects? Since private sector investment is so important a component, it is worth considering the post – crisis changes in private sector investment decision making. One issue is the returns which can be expected from freight investment. Likely policy changes include using existing facilities more efficiently and expanding capacity “Just in Time” rather than going for growth. Freight may become a well managed but institutional business, with lower leverage, lower risk (in so far as than can be achieved in shipping in particular) and lower expectations of equity returns than in the past.

A question for discussion is whether the private sector will be willing to accept lower leverage and lower rates of return to equity over the next twenty years. As noted earlier in relation to container terminals, there are alternative models for the development and operation of transport facilities which retain public ownership and partial capital provision whilst ensuring that private sector efficiencies in management, design, construction and operation are mobilised.

Public Sector Appraisal

Freight is usually a secondary consideration in national transport appraisal. In the UK, heavy goods vehicles (HGVs) represent about 6% of veh.km km and light vans about 14%. If we assume that about a third of light vans carry freight, and a passenger car equivalent unit of 2.5 for each heavy goods vehicle (HGV), freight vehicles represent about 20% of the traffic stream, with food distribution representing about 7% of total road traffic.

Freight forms a higher proportion of traffic on critical national freeway links, near ports and near the major inland distribution centres. It is in these regions that conventional models tend to perform poorly because they do not include a good representation of the “logistics network” for long distance HGV movements connecting gateways and distribution centres. Improvements are needed in several areas to ensure proper evaluation of public investments which could benefit freight transport.

Forecasting trade and freight movements

Freight forecasting is currently a crude process, relying on correlations between GDP growth and trade by sector and commodity which are not stable over time and estimates of GDP growth, which themselves present difficulties. Forecasts need careful checking by experienced consultants with a deep knowledge of the economies of particular areas. Practitioners usually prefer to offer high and low estimates, but political interest tends to focus on the central estimate, rather than on developing a decision process which will minimise investment risk if the central forecast does not eventuate.

Work has begun in Europe on more sophisticated economic development models. Most proposals to date have focused on the use of Leontieff type sub regional input output models. But it is unlikely that many countries would have the data required to build such a model at the national level, let alone at the sub regional level.

This move should be encouraged in part because our regional development policy making often appears to be based on a poor understanding of the relative importance of the various drivers of regional economic development and models of this nature, whilst being by no means infallible, can assist.

Road Freight Surveys

Information on the detailed origins and destinations of heavy goods vehicles in particular will need to be improved. Data for road is an order of magnitude poorer than for rail or air. Possible means of surveying long distance freight movements include surveys at major gateways and distribution centres. Number plate recognition systems using motorway cameras could also be used to track routing decisions, although even if data is destroyed after locating individual movements through the network this may be regarded as an invasion of privacy.

Logistics network modelling

A key feature of any improved modelling of the impact of network improvements on freight must be the development of an additional assignment stage which allows heavy goods vehicle movements to be assigned to a network of links connecting up major gateways and centres of distribution. This has been

used in the Netherlands and has been trialled in the UK for a study of Trans Pennine east west freight movements.

Valuing the wider benefits of freight transport improvements

This is perhaps the most difficult and controversial area. It is surprising how often it is claimed that transport improvements will have major effects in regenerating regions or stimulating GDP growth. Where basic infrastructure already exists, improvements may produce dramatic switches in route but lead to much lower absolute reductions in transport cost and even lower changes in total input factor costs.

Research carried out by Graham has shown that there are wider “agglomeration” benefits resulting from increases in productivity and hence GDP when commercial and industrial sectors cluster together. The latest work (Graham *et al*, 2009) suggests that these effects are relatively short range and hence are of most importance in evaluating network improvements in extended urban areas such as the London conurbation and the Randstadt.

The wider economic but geographically local benefits arising from gateway development raise problems of distinguishing local, national and community wide benefits, since gateways in different countries may be competing for the same hinterland markets and double counting wider benefits which cannot accrue to all the developing gateways. This is not just a theoretical concern. Overprovision has undoubtedly occurred in the Pearl River Delta north of Hong Kong as a result of competition between local authorities – even under what is regarded as a centrally planned state.

The longer distance over which freight networks operate requires analysis of the wider benefits of improved transport connections between multiple nodes of activity. This type of benefit is not included in the agglomeration analysis unless the nodes are relatively close to each other. The most encouraging routes forward appear to be those exemplified by the SASI model (an advanced LUTI model) and the CGEurope model (a spatially computable general equilibrium model) as used to evaluate the TENS network.

The conclusions to date appear to be that these wider benefits are very important where associated with user-charges, usually in developing countries, but that most of the benefits in developed countries can be described by standard welfare models (travel time and cost coupled in the case of freight with inventory costs) and that additional benefits and costs are, with the exception of those close to large facilities such as gateway ports etc are likely to be very limited.

This is emphatically not the case in developing countries. Work in China has confirmed that providing the basic road, rail, river and air networks is vital to development, particularly in those continental areas far from the coast. But transport remains an enabler of development – other essential input factors for economic development must be present. Otherwise, transport can have a negative effect on local small scale producers whose goods cannot compete with imports.

3. Funding

One of our main propositions is that one of the consequences of the economic crisis is that public budgets for infrastructure will be tighter for some time, placing increased pressure on the need to find maximum social value for money, and also in the need to bring social appraisal of projects and the funding of projects much closer together. As an example, our experience has been that social appraisal of project through cost-benefit analysis often takes place at a stage where the level and structure of user charges and tolls is not modelled in great detail, and for demand is not represented in a way which pays close attention to revenue modelling for different classes of traffic. The result is that there can be inconsistencies between the pricing assumptions on which the CBA is conducted and the later work on tolls and revenue.

Affordability is going to become a much more critical element in appraisal, and therefore the balance between public funding, user charges, social benefits and value for money is likely to become more important. The proposition 'decide on the project and then set the charging structure separately' is unlikely to be tenable. Similarly, closer attention to competition modelling – between free roads and tolls roads, between modes, and between nodal points such as ports and airports – is likely to be required. We have seen a number of cases, not least the Channel Tunnel, where competition assumptions turned out to be wrong, with dire consequences for traffic levels on a fixed piece of infrastructure.

These are really examples of a broader category of revenue and benefit risks, and more careful risk analysis is an element of better project appraisal. Within that context, a more mature understanding of the cost side is also important. Flyvbjerg *et al* have famously pointed to the existence of systematic optimism bias in transport infrastructure capital cost estimates. In the UK, the response has been to add uplifts (by broad asset category) to allow for this bias in the appraisal. However, that is really only a band-aid solution; it is desirable to drill down deeper to understand what mixture of strategic behaviour, project specification creep, optimism re speed of decision making and site preparation, land acquisition etc, estimates relating to statutory services such as gas, electricity and water which need relocation/diversion, geology, assumptions re industrial relations and so on. Are capital cost estimates unbiased estimates of cost if everything goes according to plan? We need better understanding here in order to work out where to put effort in mitigating these risks. Transport infrastructure has become much more expensive in the last 10-15 years and that affects both affordability and value for money.

What are the prospects for public private partnerships? As long as Governments own land, control the planning system, secure provision of infrastructure and either own or support some operators, it is inevitable that major infrastructure will involve partnership agreements in which risks are reduced by incentivising parties to behave in particular ways. In that sense, PPPs are just a sub set of multi-party agreements which are an inherent feature of major transport projects.

More interesting is the future role of private finance as a particular way of constructing a financial package out of various revenue streams, public and private, against which capital can be raised to deliver the project. Private finance has gone through a cycle over the last twenty years and we may be about to enter a new phase.

In some respects, the situation has entirely changed. Most of the 'political' arguments for private finance – to heap public sector liabilities off balance sheet, to obey golden rules of balancing the books over the cycle and not allowing public sector debt to exceed (say) 40% of GDP – have been completely obliterated either by changes in financial audit rules or by the economic crisis. So, most of the worst reasons for going the private finance route no longer apply, and the Ryrie rules used by the UK Treasury in the 1980s suddenly look very relevant as guideposts. These were:

- No additionality – use private finance as a vehicle to deliver projects which social decision makers have decided are good value for money and should be built.
- Risk transfer – if private capital is going to command a risk premium, that is only worth paying in return for something.

What could that something be? Here perhaps we have moved forward in the light of experience. It could be that:

- Risk transfer locates incentives appropriately to secure asset delivery at best available cost/quality/timeliness.

- Risk transfer market tests conventional ways of doing things, enables innovation in construction, eliminates the adversarial approach in conventional procurement.
- Private finance is an enabler of bringing high quality management to the table in the structuring of the multi-party agreement and securing all party commitment. In short, it could be a lubricating device.

The issues for the future will be whether and how the terms of trade between the various forms of procurement (Mackie and Smith 2006) change going forward. Just as it will be increasingly necessary to select projects and project options which deliver best social value for money, so the same test will apply for the financial and organisational structuring of the consortium. In this context we offer two final thoughts.

We think it is a likely consequence of the crisis that when the dust settles, real public sector discount rates will need to rise to around 5-6% if they are to reflect the long term low risk tax free cost of capital. Discount rates as low as 3% have made it particularly difficult to stand up private finance against a public sector comparator. If the benefits outlined in the paragraph above could be shown to be worth, say, a 3% risk premium in particular cases and if there were ways of keeping the industry onshore rather than offshore, then we could be in territory which would be more favourable to private finance as a procurement vehicle. This might be the case if one consequence of the crisis is that the financial system takes a more favourable view of long term safe bets, with sufficient insurance safeguards through ceilings and floors, variable franchise periods and so on.

Finally, although for projects with mixed funding streams and multiple partners, PPP including private finance can be a useful umbrella organising device, there are other cases where the advantages of bundling the project organisation structure and the finance together are not so clear. For projects such as roads, the arguments for PFI have turned out to be rather weak (Bain 2008) but the arguments for top quality private sector management of turnkey projects with the construction risk passed to the consortium and the operating risk covered by consortium insurance remain very strong.

4. Conclusions

We are living in a world which has experienced a recent economic and financial earthquake and we do not know the number or amplitude of the aftershocks. Therefore, levels of system uncertainty are high and scenario planning for fixed and sunk facilities with zero alternative use value needs to accommodate that.

With that in mind, the main debating propositions of this paper are:

- Appraisal should assume that GDP will track lower than tend forecasts from three years ago imply.
- Given other pressures on Government budgets, public capital for infrastructure will be scarce and its real price will rise.
- Labour markets will be of enhanced policy concern and the links between transport infrastructure, the real economy and employment will come under closer scrutiny.
- Climate change will move from theoretical to actual policy, although unless Stern is an order of magnitude wrong because of revisions to scientific models, the price of carbon will be

manageable (i.e. well within recent oil price fluctuations) and will not have fundamental consequences for freight transport.

- Therefore we can afford to price carbon appropriately (actual price, not shadow price). More generally we should follow efficiency pricing and investment pricing for freight transport.
- There are issues of how best to handle developments of ports and airports of national importance within planning systems which are sometimes not well adapted to dealing with mega projects and their environmental and regional economic consequences.
- Appraisal of freight transport infrastructure projects would benefit from improved behavioural representation of modes and competitive interactions between ports/airports. The wider economic impacts are of interest, but our view is that provided the direct transport benefits are correctly measured, additional wider economic impacts such as agglomeration efforts are likely to be small in developed economies. Regional employment impacts are of interest, but these need to be estimated at system level and in both the transport sector and the rest of the economy. This is challenging.
- The ‘political’ arguments for private finance are dead. We now enter a healthier world in which the questions are the real ones of the value of efficiency gains and efficient risk transfer against the value of the risk premium. A modern version of the Ryrie rules is relevant.
- There are organisational options ranging from deeper more enduring PPPs of which finance is an element across to the use of private sector management to procure public projects.

Finally, there will be a lot of pressure on the political system at every level from EU to regional and local authorities. Many many projects on political wish lists are not going to be affordable. The process by which institutional priorities are rationalised and accommodated to the new circumstances in which we find ourselves is going to be fascinating.

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