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Public Investment, Productivity and Economic Growth - the Role and Contribution of Debt Funding

**Report prepared for the Public Service Association
of South Australia**

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1 KEY ISSUES AT A GLANCE

- Investment in infrastructure has productivity, economic and social benefits.
- Whilst in the short run, public investment has a negative impact on the government's fiscal position, this impact will be reversed over the long term, to the extent that productive public investment leads to improved economic and productivity outcomes that flow through to increased economic activity and increased tax revenue.
- Expenditure on infrastructure needs to recognise future needs, rather than be determined by recent trends, for it to drive productivity growth and a higher standard of living.
- Future capacity to pay debt liabilities must be the focus of sound debt management strategies. While debt should be cautiously used to fund recurrent spend deficits, its use to fund long-term infrastructure development has productivity, employment generation, economic and social benefits that are broadly welcomed by communities and credit rating agencies.
- If credit rating agencies are aware that planning and decision processes are rational and focus explicitly on fiscal sustainability, they are less likely to reduce ratings at any particular level of debt.
- There is a need to undertake a more balanced assessment of the implications and desirability of public investment and the policy issues arising from the use of public debt generally.
- Government needs a framework and assessment model to rationally plan, rank and schedule competing projects in a manner that is responsive to the need to optimise the effectiveness of infrastructure expenditure, the need to minimise the long run accumulation of public debt and the need to make timely responses to unexpected downturns to maintain activity and employment.

2 INTRODUCTION

2.1 MODELLING FISCALLY NEUTRAL PUBLIC FUNDED INFRASTRUCTURE INVESTMENT

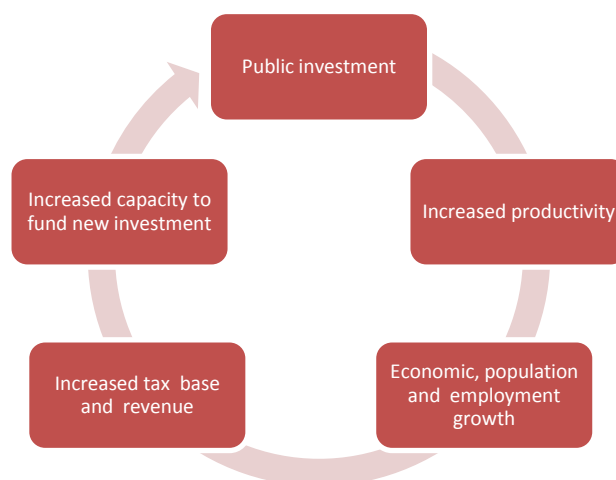
A critical issue facing governments today is how to maintain and expand infrastructure without accumulating excessive levels of long term debt. All parties in the discussion of this issue recognise that governments have a role in infrastructure development and recognise that well-targeted infrastructure investment creates significant social and economic benefits. Infrastructure investment increases productivity and competitiveness and the capacity of the private and public sectors to deliver high quality services. Ultimately it helps to build a stronger economy, raising real incomes and improving community well-being.

A key question, then, for governments seeking to promote economic development and growth is to what extent should investment in public infrastructure be funded by public debt? This report addresses this question and outlines a model for estimating the fiscal impact of public debt funded infrastructure to inform infrastructure investment decision making.

The decision making framework typically adopted by governments for assessing the desirability of large infrastructure projects is cost benefit analysis (CBA). Ideally, a CBA will indicate to decision makers the expected economic welfare outcome should the project go ahead. The method by which an infrastructure project is funded, however, is generally not a direct part of the CBA framework – focussing on consumer surplus measures rather than indirect taxation implications. Treasury guidelines incorporate consideration of budgetary and financial impact, but generally are looking at the direct revenue implications only. The model developed in this paper is designed to assist decision makers by providing an over-arching framework within which the long term fiscal impact of a particular project can be assessed.

It is arguable that in recent years, Australian state governments have become overly concerned with minimising the use of debt, driven primarily by the desire to maintain a high credit rating. This focus on the single criterion of maintenance of credit ratings has tended to displace a more systematic analysis of the benefits and costs of infrastructure spending and obscured the significant economic and social returns that well-directed infrastructure investment generates. Further, this perspective ignores the fact that well targeted infrastructure investments sets in train economic consequences which have positive fiscal impacts as indicated in Figure 1.

Figure 1: Virtuous cycle of public investment



Investment in physical infrastructure such as transport and utility infrastructure has clear economic benefits in terms of productivity, economic activity and growth. Whilst in the short run, public investment has a negative impact on the government's fiscal position, this impact will be reversed over the long term, to the extent that productive public investment leads to improved economic and productivity outcomes that flow through to increased economic activity and increased tax revenue. Improvements in quality of life and services that are associated with better infrastructure also encourage inward migration.

The simple model developed in this paper provides guidance to infrastructure investment decision makers on how potential projects can be structured and assessed. The model is preliminary only and based on a range of parameter assumptions that require further investigation but it does indicate the set of 'hurdle tests' that will allow the selection of investment projects which are fiscally neutral even when some proportion of the project is funded by public debt.

2.2 CYCLICAL AND NON-CYCLICAL INFRASTRUCTURE INVESTMENT

It is not a radically controversial proposition to say that the Federal Government undertook some sub optimal investment projects in the period after the 2007 GFC. Optimising infrastructure investment in response to downturns in the economic cycle is difficult for government given pressures to generate short term economic stimulus and jobs. The goals of cyclical fiscal stimulation and optimising investment spending need not be in conflict.

In situations where governments perceive that the economy is threatened unexpectedly with a downturn there is pressure to act quickly. Usually there is insufficient time to assess projects, determine funding arrangements and begin executing them. This can lead to projects that are far from optimal. The challenge for government is to develop a set or 'queue' of projects that are desirable in terms of their economic and social benefits and in terms of their potential positive fiscal impacts. This set of projects should be subject to a 'rolling reassessment' process to ensure that their assessment reflects current conditions. More projects than could reasonably be expected to be funded should be maintained. In periods of expected economic downturn, projects that had been so assessed could be quickly initiated with higher levels of public debt funding than would be the case at other times in the economic cycle. It is also worth considering that, in the modelling of benefits, projects that were expected to have greater employment benefits would be preferred if unemployment were expected to be increasing in response to a downturn. This consideration would be factored into benefit assessments.

Another principle of the framework we propose in this paper is that it emphasises the benefits of infrastructure investment in stimulating economic activity rather than focusing on the employment and economic activity created by the construction or deployment of the infrastructure itself. This perspective is critical if the fiscal neutrality of projects is to be achieved in the long run.

Putting these ideas together, we have a framework to rationally plan, rank and schedule competing projects in a manner that is responsive to the need to optimise the effectiveness of infrastructure expenditure, the need to minimise the long run accumulation of public debt and the need to make timely responses to unexpected downturns to maintain activity and employment.

2.3 THE NEED FOR RATIONAL TRANSPARENT DECISION PROCESSES

It should be emphasised that our discussion does not presume that all infrastructure investment is in 'hard' infrastructure such as transport and communications. Investment in social infrastructure that produces

superior outcomes in, for example, education, health and community services also produce economic benefits that will improve productivity and growth as well as addressing a range of social concerns that underpin this. Improvements in social infrastructure will also encourage population growth particularly in the context of tight labour markets and high labour mobility within Australia. A more detailed discussion of these issues is provided in Appendix A.

There is a need in this context to undertake a more balanced assessment of the implications and desirability of public investment and the policy issues arising from the use of public debt generally. It should also be emphasised that a rational, incisive and transparent approach to public debt-funded investment is an important input for the determinations of credit rating agencies. These agencies are primarily concerned with the ability of governments to service public debt into the longer term, rather than the level of the debt per se. Putting this another way, if credit rating agencies are aware that planning and decision processes are rational and focus explicitly on fiscal sustainability, they would be less likely to reduce rating at any particular level of debt.

The critical questions concerning public investments are:

- How can proposed investments be assessed to ensure that economic and social returns are maximised?
- What are the quantitative dimensions of the links between investment, economic growth and growth in the tax base (see Figure 1) and how can the performance of investments be assessed?
- Given the above what is the likely impact of any particular investment under consideration on the government's debt rating?

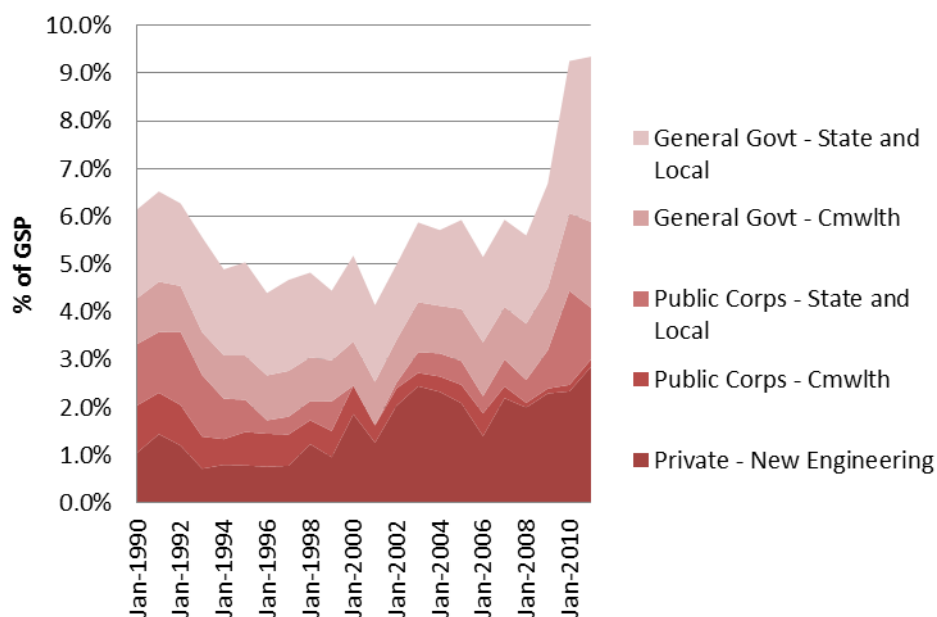
Understanding the real benefits and costs of a given level of debt-funded infrastructure investment and how the benefits can be maximised and costs minimised is the focus of this report.

3 DISCUSSION OF FUNDING TRENDS AND OPTIONS

3.1 TRENDS IN INFRASTRUCTURE SPENDING IN SOUTH AUSTRALIA

ABS national accounts data provides a useful perspective on relative roles and trends in State capital formation (Figure 2). Using capital formation (excluding categories such as dwellings and business spend on equipment) provides an indication of spend on infrastructure. The level of expenditure as a proportion of Gross State Product (GSP) fell steadily across the 90's and picked up a little in the beginning of the last decade. However what the trends indicate is that the proportion of GSP investment spending by Government, and particularly public corporations had been falling up until 2007. Private sector gross capital formation has however been consistently increasing, reflecting growing dependence on it as a source of infrastructure investment. One of the policy responses to the GFC (in South Australia and nationally) has been to provide a stimulus to the economy through a range of infrastructure projects that provided job impacts. There is no question that this policy approach, resulting in a 40% increase in public capital expenditure, provided a cushion for the local economy. As the effects of this stimulus have worn off there is a risk that the trends of the past will not be sufficient to sustain productivity growth and modernise ageing and inefficient infrastructure. Expenditure on infrastructure needs to recognise future needs, rather than be determined by recent trends for it to drive productivity growth and a higher standard of living.

Figure 2: Gross capital formation by sector



Source: ABS National Accounts, 5220. State Accounts, Table 5. In 2000 and 2001, state and local expenditures were negative due to major privatisation initiatives, and the

There are four basic options for funding infrastructure. These are:

- current taxation revenues (retained surpluses are less likely in government financing)
- public debt
- developer levies and/or private provision
- private investment through public private partnerships (which involves foregone future revenues)

One of the core principles of corporate finance is that, in the context of private sector investment, the net present value of a project is more important than the means used to fund it, and that principle could be considered equally relevant from a public policy perspective.

One of the fundamental roles of government is to fund the underlying infrastructure needs of the community it governs. In economic terms this role cannot be fully left to the private sector funding because:

- the intrinsic public good nature of infrastructure as well as network and externality effects means that infrastructure will be undersupplied if it is left to the market alone.
- infrastructure projects are generally very long term, and private sector project discount rates mean that the benefits into the future are discounted so heavily that many projects with a net positive social welfare return will not proceed.
- they involve large sums of capital.

It should be noted, however, that over recent years, technological and other developments have changed pricing options, and therefore the potential sources of financing, with observable options that have been implemented globally including:

- Greater implementation and acceptance of the introduction of user pays systems across a range of services to pay for the private good component in their use. For example, there has been a proliferation of road tolling around cities of the world – to fund freeways and bridges. Vehicle scanning equipment has enabled this to occur at low transactions costs, particularly in areas with significant congestion (where the private benefits of alternative routes are clear). Examples range from the Sydney Harbour tunnel and freeways in Sydney and Melbourne..
- The development of more sophisticated pricing structures and options, often enabled by new technologies have increased the ability of infrastructure providers to identify users and the value they place on infrastructure services. Consider, for example, the complexity of broadband plan options designed to extract rents from frequent versus casual users.
- More effective use of subsidies – again linked to greater ease of identification of user, there are therefore improved methods for direct subsidy.

The overall conclusion is that the nature of infrastructure requires the government to continue to be a major participant in funding and operation. It is clear that if private sector funding is to be attracted the providers of capital will want a financial return that compensates them for the opportunity cost of funds and project risk. Because of the public good characteristics of infrastructure, however, the requirement of a commercial rate of return for public infrastructure projects would lead to a significant undersupply. Therefore, a partnership approach is required where government takes a lower rate of financial return in recognition of the public good and externalities associated with many major infrastructure projects.

The State infrastructure plan (2006) clearly recognises this, and in step four of that plan, *Funding method and resource allocation*, it suggests that “this step leads to a decision on the funding method, which may involve an allocation of state capital funds or opportunities for private participation”.

Governments have traditionally funded capital budgets by issuing bonds. SAFA is South Australia’s primary face to domestic and international financial markets for the management of the state’s funding and investment flows.

So **indirectly** infrastructure projects have traditionally been privately funded, in that it is based on debt financing from private sector investors. Given recent volatilities in equity markets, and the growth in long term investment funds such as superannuation, there has been a shift in the interest of private investors, with something of a switch to project funding, and further to equity funding.

That this interest is developing is evident from the positioning of the investment advisors. For example Philippe Valahu, the Acting Director of Operations, Multilateral Investment Guarantee Agency (MIGA) says that “Matching cash-rich institutional investors with promising infrastructure projects in need of a deeper financing pool creates the proverbial win-win situation” and “Increasingly, fund managers are realising the advantage of infrastructure investments to balance and diversify their portfolios, which may be excessively liquid, or overly weighted toward short-term returns. For institutional investors, infrastructure assets can provide longer-term, relatively stable returns that are less sensitive to business cycle fluctuations or stock market volatility. Returns are often positively correlated with inflation, another important hedge for the portfolio”.

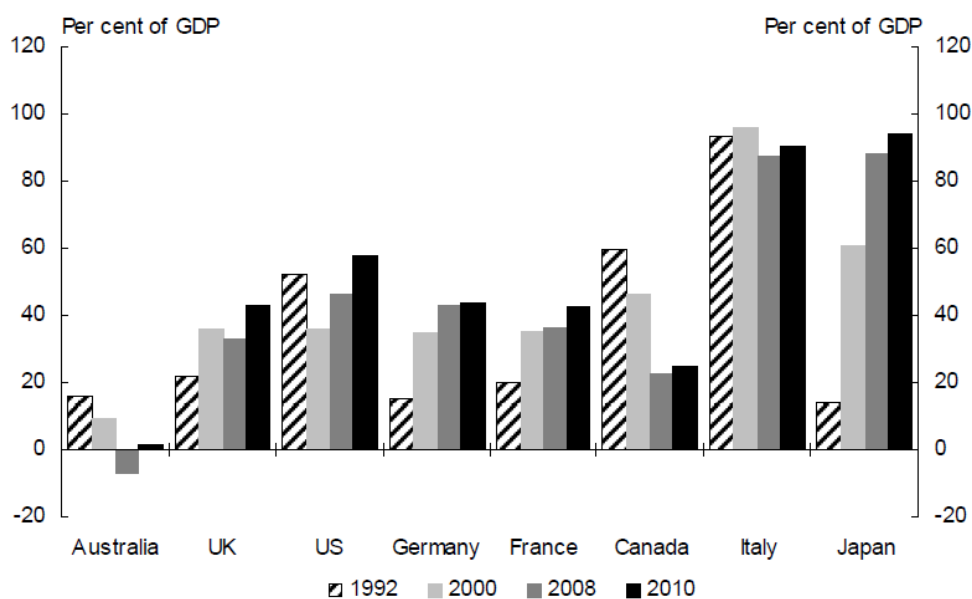
In years to come a range of new infrastructure investment vehicles are likely to emerge. The complexity of these is likely to be substantial and difficult to manage, particularly in relation to the sharing of risk and returns on investment. As such vehicles like PPP’s, while being a source of funding for some projects is not likely to meet the need of the bulk of infrastructure requirements where public good considerations dominate.

3.2 PUBLIC DEBT – THE ISSUES

In recent times there has been a reluctance to utilise debt financing to fund major public works, with the elevation of balanced budgets and the generation of surpluses to a public policy priority. The major concerns that arise with respect to debt include:

- The capacity to pay – interest costs on debt must be met from revenue sources available to the government now and into the future, and the more that is spent on repaying interest the less is available for the ongoing spend of government services. The situation in Europe and counties such as Greece and Spain has reinforced this perspective, and indicated the danger of funding using debt. However a review of the debt situation shows a very different picture in Australia relative to the rest of the world and particularly those countries currently under scrutiny. In 2010, gross public debt in Australia was 22% of GDP relative to a world average of 60%, while in Greece it reached around 160%, with Italy, Portugal and Ireland in excess of 100%. Figure 3 illustrates net public sector debt in Australia relative to the G-7, and indicates our very low debt levels.

Figure 3: Australian and G-7 public sector net debt



Source: Di Marco, Pirie, Au-Yeung, A history of public debt in Australia. 2009

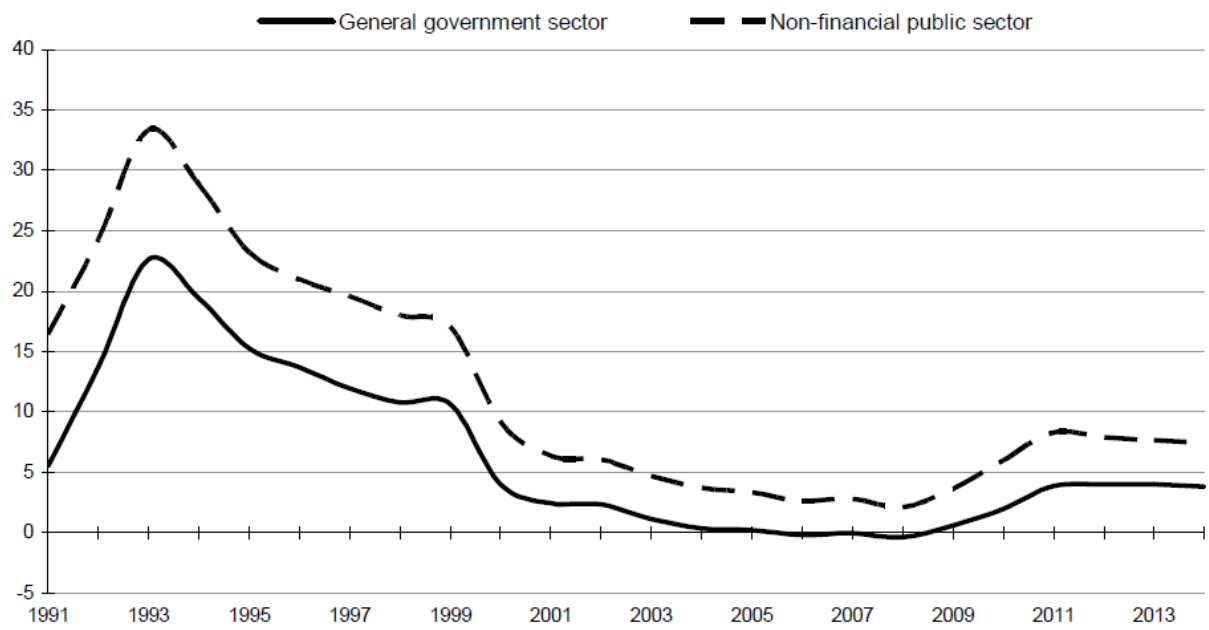
- Risk and variability – the payment of interest commitments represents a fixed commitment not linked to the strength of the economy. While higher levels of debt can be sustained in stronger and more stable periods it is more difficult to sustain during periods of economic weakness and uncertainty.
- Credit ratings – there has been a significant emphasis in past years on the need to avoid debt to maintain credit ratings at Triple A. A poor credit rating is the judgment of a ratings agency that the holder of the debt has some degree of risk in being able to repay the debt (and interest) and as such debt with lower ratings carry higher interest costs, and cause financial and reputational pressure on the holder of the debt. Previous analysis by AISR on this issue notes however that a down grading in itself carries little direct financial penalty with the Reserve Bank concluding that *“the price impacts associated with rating announcements are fairly small, which implies that agencies are not generally viewed as consistently having access to important information that is not already in the public domain (RBA 2004:15), and further that “Looking at a much larger group of Australian bonds, the typical yield differential between A rated and A–(minus) rated bonds is about 9 basis points” (ibid:13)*
- Inter-generational choice - a concern about the level of debt is that it is a commitment that current generations make on behalf of future generations. That is, using debt today requires taxpayers of the future to make payments for that choice. While this would be a valid concern with respect to debt funding of recurrent expenditure, the opposite concern will exist where current taxpayers are required to fund long lasting assets at a level that will benefit future generations.

Di Marco, Pirie, Au-Yeung conclude that “Australia has undergone several periods of debt accumulation, followed by periods of fiscal consolidation. Periods of strong economic growth following episodes of debt accumulation have helped support relatively quick improvements in the public sector’s net debt position. Australia has a low level of net debt both historically and when compared with G-7 economies”.

Future capacity to pay debt liabilities must be the focus of sound debt management strategies. While debt should be cautiously used to fund recurrent spend deficits, its use to fund long infrastructure development has productivity, employment generation, economic and social benefits that are broadly welcomed by communities and credit rating agencies.

Figure 4 confirms that net public sector debt from a South Australian perspective can be considered low in historical and relative terms.

Figure 4: Public sector net debt in South Australia



Note: 1991 to 2009 are actual outcomes; 2010 to 2014 are forecasts.

Source: SA Treasury 2010/11 Budget Papers

4 A HIGH LEVEL MODEL OF THE ECONOMIC AND FISCAL IMPACTS OF PUBLIC INVESTMENT

So far we have drawn some simple core conclusions, including:

- Spending on infrastructure is necessary to accommodate, and can even be considered to lead economic growth.
- There is a range of financing options for providing infrastructure, and the appropriate mechanisms will vary depending on the nature of the asset and the time at which it is constructed.
- One of the financing options available is public debt, and linking these items together, if the spend on infrastructure is successful in facilitating positive economic and social outcomes then financing using debt does not create substantial long term issues.

In this section we present a high-level model that incorporates the second round fiscal impacts described in the virtuous circle model illustrated earlier in Figure 1. Clearly, for well targeted infrastructure investment, the second-round effects do exist: productive infrastructure investment leads to increased productivity, improved services and economic growth. The question here is what defines ‘well targeted’?

The core issue here is to develop a set of criteria that enables more accurate and more holistic forecasting of the fiscal effects of a range of infrastructure projects. These criteria will provide guidance about what level of debt-funded infrastructure the community can afford without accumulating unsustainable debt in the long run.

The model is constructed in such a way as to present the break-even point at which infrastructure needs to impact on economic activity for the expenditure to be sustainable into the longer term (ie a budget neutral effect – after allowing for risk).

The logic of the model follows the virtuous cycle as above – and is used to identify the financial implications for the alternative “investing groups”.

Consider \$100 million “average” investment in an infrastructure project in the context of the discussion above. The core investors in the project are assumed to be – government as an equity holder (funded out of tax revenue), private equity investor (eg a PPP) or debt financing (raised through SAFA). Financial returns on the investment are assumed on average to be a combination of user pays – covers operations costs and the balance is directed towards the private equity providers; direct state revenues (GST share and direct taxes) and share of Commonwealth taxes.

The core assumptions for the modelling are as follows (note all these assumptions are broad level and/or preliminary and need some testing and consideration – they can have significant impact on the conclusions):

Model parameter assumptions

Parameter	Assumed parameter value	Comments
User pays (annual proportion of investment)	15%	It is assumed that on average there is a direct return of 5% of the investment annually as a direct user pays contribution. This might come from entry fees or from charges for use. Some assets might have 0 return in user pays (eg road infrastructure), others a more significant amount
Impact on GSP		This is "target" variable of the analysis – ie the model is set to produce this as a result
Proportion of GST take	10%	The proportion of GSP that results in GST revenue to the state.
State Taxation take	10%	A broad level estimate of the proportion of GSP that produces taxation revenue for the state (primarily payroll tax, property tax and gambling taxes)
State Share of Commonwealth Taxes (proportion of GSP)	15%	The Commonwealth tax take on GSP is broadly estimated to incorporate an average tax rate of 22% in the dollar – with the average income tax rate for wage and salary earnings at 19% and the corporate tax rate at 28% (based on national accounts data and data on average weekly earnings). It is assumed however that a proportion of this retained by the Commonwealth for central use, and the remainder would be distributed back to the state linked to implied population growth etc. This also needs to be considered in the context of fiscal equalisation principles, but again this is covered by this adjustment to the share.
Proportion Government debt funded	30%	This is a base assumption - can be tested further to review the implications of alternative debt positions
Proportion Private equity funded	30%	As above
Return required on private equity	12%	Approximate real average return on the share market over the long term, return required will depend on contractual risk allocation
Return required on public equity	9.3%	Real return on government equity relative to financial risk relative to level of debt financing (using weighted average cost of capital formula, relative to 7% real return on average project (as per treasury project assessment guidelines). Note that if the proportion of debt was to go up, this required return would also increase
Maintenance and ops cost - percentage of investment	10%	Base assumption
Government real borrowing cost	3.5%	An indicative assumption of SAFA long term yields adjusted for inflation expectations

It is assumed the average infrastructure project has a 20 year life. It is also assumed the impact on benefits increases from 75% of the base assumption in the Year 1, by 3% per year to a maximum of 100% - in that infrastructure provision should allow for population and real income growth over time and should be built for the longer term.

On the basis of the assumption above, it is modelled that the required impact on GSP, for government such that the infrastructure project would be budget neutral would be for the project to result in an annual increment to GSP of 0.022% - or reaching by the middle of the life of the project, around \$20 million per year impact on GSP – around one fifth of the project spend. This conclusion provides a core signal for public choice in terms of assets to be invested in however funded, but very critical in the context of using debt funding.

Budget Cash Flows

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	
Spend	100000	10000	10000	10000	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	10000	10000	10000
User pays		11250	11475	11705	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	15000	15000	15000
GSP created		14598	14890	15188	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	19464	19464	19464
GST Revenue		1460	1489	1519	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	1946	1946	1946
State Taxation (Payroll etc)		1460	1489	1519	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	1946	1946	1946
Share of Commw Tax Revenue		2248	2293	2339	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	2997	2997	2997
Private Equity Cash Flows	-30000	2700	2754	2809	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	3600	3600	3600
Debt/Interest Cost	-30000	1050	1050	1050	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	1050	1050	1050
Net Budget Impact	-40000	2668	2942	3222	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	7240	7240	7240

An increase in the proportion of debt, changes the overall cash flows, but does alter significantly the required impact on GDP as the required return on public equity would increase due to the greater risk.

What we need to understand more about is the linkages between infrastructure investment and economic and social outcomes for a given project. For example in the case of a transport project, what are the links between consumer welfare and impact on GSP? How do travel time savings and accident reduction translate to economic growth outcomes?

In summary, there is a need to put in place a more sophisticated model to guide infrastructure investment in South Australia. This report provides a preliminary contribution to achieving this objective.

5.1 GENERAL INFRASTRUCTURE AND LINKS TO ECONOMIC DEVELOPMENT

The primary purpose of infrastructure development is to improve productivity. Improving productivity increases competitiveness and therefore stimulates economic growth and generates higher incomes and so is critical in economic development. It is important to keep this causal chain in focus when considering infrastructure development by government – from increased productivity the benefits of economic growth will flow. This perspective is sometime lost when the focus is on the number of job created in the infrastructure building phase – real sustainable economic benefit come through the use of infrastructure, not through its construction.

Notwithstanding the fact that well targeted investment in physical infrastructure generates economic benefits, in the short run, public investment has a negative impact on the government’s fiscal position. In the long term, however, the consequent economic growth increases the tax base and this positive fiscal impact needs to be factored into the long term fiscal impact of investments.

There has been a significant amount of empirical research undertaken regarding the importance of infrastructure investment in economic development. The evidence is generally supportive of a positive relationship, although there are some ambiguities in the results. The complications in clearly identifying the relationship include (Button 1998):

- The direction of causality – does infrastructure investment cause growth or does growth enable spending on infrastructure? The literature includes some evidence of both directions of causality
- What is the appropriate definition of infrastructure – there is significant variability in what constitutes infrastructure in the studies
- How to ensure that infrastructure spending is as effective as possible – poorly targeted spending is less effective at stimulating economic development. Targeting spending is critical, as is effective management and pricing.
- Timing – the full benefits from investing in infrastructure today may well not be seen for a significant period of time.

Calderon and Servén (2004) use a variety of econometric methodologies, applied to a large data set of infrastructure quantity and quality indicators covering over 100 countries for the period 1960-2000 for what they describe as an encompassing assessment of the role of infrastructure in economic development report results using both disaggregated and synthetic measures of infrastructure quantity and quality. They describe the two core outcomes as “robust results” as follows: “(1) growth is positively affected by the stock of infrastructure assets, and (2) income inequality declines with higher infrastructure quantity and quality”. This study conforms with a broad range of econometric studies that conclude that effective infrastructure provision is positively linked to economic growth and income generation.

5.2 THE EXAMPLE OF TRANSPORT AND ROAD INFRASTRUCTURE

Whilst The World Bank has a focus on the role of infrastructure investment in developing economies, its views in this area are equally applicable to developed economies:

Transport is central to development. Without physical access to jobs, health, education and other amenities, the quality of life suffers without physical access to resource and markets, growth stagnates, and poverty reduction cannot be sustained” (World Bank, 1996). The World Bank also makes it clear that it is not just a matter of investing, but investing well in that “Inappropriately designed transport strategies and programs however, can result in networks and services that aggravate the condition of the poor, harm the environment, ignore the changing needs of users and exceed the capacity of public finances (World Bank 1996).

Canning and Bennathan (2000: p2) note that “Transportation infrastructure may have a profound impact on the extent of the market and the ability of producers to exploit economies of scale and specialization. Widening the market then brings benefits in terms of increased competition and contestability in markets. Transportation infrastructure also allows greater dissemination of knowledge and technology”. They also point out that “The average economic rate of return for World Bank projects evaluated over the period 1983-1992 was 11 per cent for electricity projects, and 29 per cent for road building (World Bank 1994:2) suggesting that these rates are based on conservative methodology.

Bannister and Berechman (2000: p232) develop a theoretical model about the impacts of transport development and local economic growth, and conclude that “accessibility costs, which are a function of the capacity of the transportation system do matter in affecting labour market decisions”, and the impact is significantly greater for regions or areas with lower starting capacity (p 231)

Bougheasa Demetriadesb and Morgenroth (1999) investigate the role of infrastructure in a bilateral trade model with transport costs. Their model is based on an assumption that transport costs are assumed to depend inversely on the level of infrastructure, but that infrastructure accumulation comes at a cost. They conclude that “depending on geography and endowments, equilibria with or without infrastructure can be obtained. For pairs of countries for which investment in infrastructure is optimal, the model predicts a positive relationship between the level of infrastructure and the volume of trade.” The paper offers empirical evidence, utilising an augmented gravity model and data from European countries, which strongly supports this prediction of the theory.

There has been a significant emphasis in the recent literature on the ‘weaknesses’ of traditional cost benefit models in transport projects. These models emphasise travel time savings and accident reduction etc. The literature suggests, however, that the economic benefits of improved road infrastructure are significantly more widespread throughout economies. Stroomborgen (2007: p2) concludes “if a selection of roading infrastructure projects in various parts of New Zealand are evaluated using general equilibrium analysis, standard benefit-cost ratios are often considerably understated. The main reason for this is that general equilibrium analysis incorporates welfare benefits derived from allocative efficiency effects, not just those stemming from productive efficiency”. Cohen (2007: p18) comments that “it is clear that incorporating measures of “wider benefits” has enhanced the precision of the effects of the infrastructure relative to the state of the art in the early 1990’s. Thus innovation in the tool set of spatial econometrics have contributed to understanding in this field”.

Plessis-Fraisasard (2007) confirms from a global perspective “new research has shown the importance of rural roads in stimulating both global economic growth and social development”. She also notes that assessment criteria need to be revised to fully recognise the combination of social and economic benefits that are possible.

As for the general provision of infrastructure, there is the question of the direction of causality between economic growth and infrastructure spending. Llanto (2005) provides statistical modelling (using Granger causality tests) that confirms the direction is indeed two way, but is weighted towards infrastructure spend stimulating economic growth rather than the opposite.

5.3 THE EXAMPLE OF COMMUNICATIONS INFRASTRUCTURE

Telecommunications infrastructure is widely understood to have important productivity benefits and a positive influence on economic growth. This is the fundamental rationale for the Federal Government National Broadband Network project – Australia’s largest ever infrastructure project.

There is a large amount of evidence on the impact of telecommunications infrastructure on economic growth. A pioneering study by Roller and Waverman (2001) found that the penetration of landlines had a significant positive effect on economic growth. Penetration was measured in landline per capita and the authors estimate that a universal service (where access is available to the majority of the population) level of penetration is at about 40 per cent. Their initial results found that each one per cent increase in penetration causes a 0.15 per cent increase in economic growth. It needs to be pointed out that these results are for OECD data between 1971 and 1990. In considering the impact of telecommunications on economic growth in the twenty-first century, this coverage is deficient in three ways: it is pre-mobile telephony, pre-Internet and conditions between particular countries are significantly different from OECD averages.

More recently, a list of more than a 100 global broadband cost/benefit studies was compiled by the International Telecommunications Union (ITU) for the Report “Broadband a Platform for Progress”. The papers collected in this report provide voluminous evidence of the positive links between broadband infrastructure and economic growth.

The general conclusions of this literature are that the economic benefits of telecommunications are greatest where penetration rates are high and, moreover, that the benefits are greatest at near universal service levels of penetration is important. The conclusion is suggestive of network externalities at work and indicates that they indeed significant at the national level. In addition, this conclusion provides an efficiency based rationale to maximise telecommunications penetration that complements the social inclusion argument. This brings the universal service objective into the strategic economic development framework as well as the social justice framework and therefore provides policy makers with new imperatives to increase telecommunications penetration and use.

5.4 THE IMPORTANCE OF SOCIAL INFRASTRUCTURE

There are a number of studies which emphasise the contribution of the creative and cultural sector to a more dynamic society (the idea that culture is a significant underpinning for an innovative economy, and that innovation is critical for income growth). This has been most commonly discussed in what has become called the Florida effect (see Florida 2002), and it is this aspect of creativity that is of interest. Florida and others have advocated that investment in cultural and creative infrastructure is important because it can be seen be linked to improved economic growth in the long term. With respect to the arts and culture, Potts (2007) says it this way: “Yet the arts I argue have their greatest value in the process of economic and cultural change” and “the arts industries are critically connected to the evolution of economic systems by the way of the market for new ideas and the process of change”. He further reinforces the validity of these two alternative perspectives in that “In this view, the arts are still an industry that produces cultural and public goods, but they are also, and more significantly, a social technology for the origination, adoption and retention of new ideas” (p 11). Potts

and Cunningham (2008) investigate four models for looking at the link between the economy and the cultural sector, with the models based on welfare, competition, growth and innovation. They find the relationship is best explained by the growth model approach – emphasising this dynamic link.

In emphasising the economic role of culture, arts and design in the modern economy, it is also worth pointing out one of the most profound and persuasive events of the 21st century commercial world: in 2011 a design company, Apple Inc, became the largest company in the world by market capitalisation displacing an oil company, Exxon-Mobil. Economies that wish to part of the arts media technology convergence future need to ensure that the associated industries flourish.

5.5 CONCLUSIONS

A broad review of the linkages between infrastructure and economic development leads to the following conclusions:

- spending on infrastructure is necessary to facilitate productivity growth, improve economic outcomes and foster economic development and insufficient spending on infrastructure will retard economic development
- spending on infrastructure per se is, however, not sufficient; the spending needs to be on infrastructure that has the greatest economic and social impact, and, in order to ensure that this occurs the expenditure must be:
 - spent on infrastructure projects that are positively linked to other development drivers
 - subject to effective selection criteria with clear methods for defining which projects are selected and which aren't and why
 - operationalized by using delivery mechanisms that are as effective and efficient as possible so as to maximise the effectiveness of the expenditure
 - incorporate a long run view with appropriate asset management to ensure that the infrastructure is effectively employed over the maximum possible lifespan.

In summary the above section demonstrates that a sometimes under-valued component of infrastructure spend is the wider economic and social benefits associated with the services provided by the infrastructure. Standard evaluation techniques have not in the past recognised this aspect, though this increasingly being considered. When such aspects are considered there are an additional set of decision factors that need to be considered when making the asset choice and its ongoing management.

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