

IS THERE ANY EVIDENCE OF EVIDENCE-BASED POLICY? THE CASE OF INFRASTRUCTURE PROJECT ASSESSMENT

First of all, I would like to thank the Productivity Commission for inviting me to present this work, which is a joint paper with my colleague Alex Robson. I should stress that the views we present are our own, and should not be imputed to any of Concept Economics' clients.

(Slide 2) In examining the extent to which evidence actually plays a role in policy decisions, we focus on the selection of major infrastructure projects. I will start by setting out some background to Australian project evaluation, then look first at project selection in telecommunications and second in transport, before concluding by touching on some reform proposals. (Slide 3).

The most striking feature of the recent period is the very substantial increase in infrastructure outlays, including large-scale increases in funding for roads, rail and telecommunications (Slide 4). These increases are being funded from a range of sources, including the Building Australia Fund, a hypothecated fund for infrastructure finance established by the Commonwealth government in 2008.

(Slide 5) Now, as we explain in the paper, proper cost-benefit appraisal, though not without its conceptual difficulties, is an essential element in addressing the principal-agent problems that are pervasive in the public sector. And the Little-Mirrlees rule – that uses a model of the value of information to derive an estimate of the gains from project appraisal – suggests that the social value of project appraisal is in the order of 10% or more of project value. Given that projects worth some \$60 billion have been initiated in the course of twelve months, a saving of \$6 billion sounds worth having. So how rigorous has project appraisal been?

Let's start with **telecommunications** (Slide 6). Here the major development has been the decision to fund a new National Broadband Network (Slide 7), at a cost of up to \$43 billion. That network (Slide 8) will provide 100 mbps broadband to all towns with 1000 people or more – indeed, in Tasmania (maybe the scale is different there) it will cover towns with fewer than 500 people – for total coverage of 90% of the Australian population. The deployment schedule is aggressive (Slide 9), with the network intended to be completed by 2017. Overall, the project is very large, when compared to existing Australian infrastructure assets (Slide 10), and involves a government contribution to broadband deployment that is far greater than that envisaged in any other developed economy (Slide 11).

Now, one might have expected such a mega-project to be subject to careful appraisal of costs and benefits before the decision to proceed was taken – as even the oft-cited Snowy hydro project was. Indeed, in its 2008-09 Budget, the Government committed to “(infrastructure) decision making based on rigorous cost-benefit analysis to ensure the highest economic and social benefits to the nation over the long term .. (and to) transparency at all stages of the decision making process.” As matters turned out, both the Communications Minister and the Finance Minister have said that no CBA was carried out for this project and that none would be. Since then, there has been one appraisal of the project, by Professor Joshua Gans, that claims to find that the project's benefits exceed its costs. However, as we explain in the paper, that appraisal is flawed: it confuses wholesale and retail costs and revenues, also confuses benefits and transfers, and no less important, examines

the total costs and benefits of the project, rather than the incremental costs and benefits compared to the counterfactual world.

(Slide 12) So as to carry out an appraisal, we have used an engineering cost model to estimate incremental costs for a GPON FTTP, i.e. for the project, and for three counterfactual options. These options involve progressive upgrading of the current network, albeit it to lower speeds than those for the NBN (option A), some but more limited upgrading, followed by delayed deployment of the NBN (option B) and in our last option, deployment of a targeted FTTP, along the lines of what is being done by France Telecom and Telecom Italia. In essence, the NBN (Slide 13) offers higher speeds than our counterfactual scenarios A and B, but later in time, as it takes longer to deploy.

As regards consumers' willingness to pay, our view, for reasons explained in the text, is that WTP is concave in speed, although WTP for the higher speeds is rising over time. We have therefore modelled WTP paths for the median consumer, as shown in the slide (Slide 14).

Given our estimates of WTP, the project is never in the money, in that the difference between the WTP for the project and the WTP for the base cases never exceeds the incremental costs of the project (Slide 15). We express these differences in WTP between the NBN world and the counterfactuals in terms of a monthly equivalent: this is broadly the additional rental the NBN Co could charge the median consumer. That amount is maximised under Option C, i.e. the targeted NBN, but even then is not enough to cover NBN incremental costs.

So as to examine the robustness of our estimate, we run a wide range of sensitivities, including testing a variant in which the WTP for higher speeds increases more quickly, so that the curve's slope rises (Slide 16). However, this does not make the project look better (Slide 17). Ultimately, the rankings are not very sensitive to the WTP assumptions, because the results are driven by the fact that demand is concave in speed, coverage and pace of deployment, while costs are convex, and in instances very markedly convex, in each of these.

For reasons set out in the paper, we believe our estimates of project net losses to be conservative. These reasons include the fact that our estimates compare incremental benefits and costs for an assumed median consumer who incurs project average incremental cost, while in fact, WTP and incremental costs are negatively correlated. This is because the high WTP consumers, who typically have substantial human capital, are generally located in cities. This magnifies the net loss incurred from a 'one size fits all' approach.

That said, we know that there have been many claims about how the NBN will boost productivity. These claims often rely on a 2009 consulting report (by Access Economics), which assumes the NBN will give a productivity shock of about 1 percent. What is less frequently cited is that this assumption is made relative to a world in which there is no broadband access at all – not relative to one, as we have at the moment, where 60% of households and the vast majority of businesses have some form of broadband access. Nonetheless, so as to examine these claims (Slide 18) we have used a Solow-Swan model, calibrated to the Australian economy, that allows for temporary increases in government spending to having crowding out effects. While the spending shock is assumed to be transitory, we assume the mere existence of the NBN has permanent positive effects on productivity (Slide 19); however, given that the counterfactual to the NBN is surely not a world in which we force everyone back on to dial-up, we assume a smaller, but still significant,

productivity gain. By and large, particularly if the government spending element is high, the macro effects of the NBN are negative (Slide 20).

Turning now to **transport**, (Slide 21), all Australian jurisdictions mandate the use of CBA for evaluating major transport projects (Slide 22). There is however, a tendency, which has become more pronounced in recent years, to nest the use of CBA within other evaluation approaches, notably the so-called 'Triple Bottom Line'. One effect of this approach is that it allows evaluators to double and treble count particular benefits, especially those associated with the environment. And because the weights placed on the various elements are rarely well specified, it becomes impossible to audit the evaluation, much less undertake a post-completion comparison of expected and actual benefits. As for decision-makers, they can pick and choose among evaluation approaches, muddying the documentary trail associated with major decisions. The evaluation criteria the government has set down for the Building Australia Fund raise concerns in this respect, as they too involve a multiplicity of criteria.

So as to examine these decisions in more detailed, we have looked at the East West Rail project. This project, which aims at improving the rail links between Melbourne, Geelong and the regions to Melbourne's west, and to increase capacity on Melbourne's suburban rail system, was recommended by IA; indeed, taking the project as a whole, it is the largest such project. The Commonwealth Government has since announced that it is making \$3.2 billion available for the regional rail component of the project to proceed. The very extent of that funding makes it a suitable case for closer examination; additionally, it is one of the few recommended projects for which a CBA is publicly available. Before turning to examine this project in greater detail, it is worth emphasising that our discussion of the CBA is not intended to suggest that this CBA is particularly poor; rather, it highlights issues that occur, albeit to differing extents, in Australian CBA more widely.

Now, a first point to note about the CBA is that it does not evaluate the obvious alternative to the project: which is improving governance, management and work practices in the Victorian rail system. Comparisons to benchmarks and to past experience show Melbourne public transit has poor capacity utilisation and should be able to handle significant incremental load. However, the option of decongesting the system without huge capital expenditure was not considered.

Turning now to the project CBA – and it is the public transport component only that is at issue here, as the road component is not proceeding – the CBA concludes that project benefits exceed project costs (Slide 23) but only thanks to what are referred to as 'Wider Economic Benefits' (a term I will explain in a moment). In essence, total benefits are comprised of two elements (Slide 24): the conventional social savings, such as net reductions in travel time and vehicle operating costs; and these wider benefits. Looking to the first, the CBA counts incremental fares as a benefit, and adds them to the other savings. This, of course, double counts vehicle operating cost and travel time savings (which, in essence, are paid for through fares).

As for the wider benefits, CBA has, of course, long taken account of technological externalities (such as project-related changes in noise); 'Wider Economic Benefits' are essentially pecuniary externalities, that is, effects on other parties caused by changes in the prices at which they can transact. In competitive markets, such pecuniary effects are merely transfers of benefits from one party to another. This is not the case, however, when markets

are imperfectly competitive and in particular, when markets are neither perfectly competitive nor completely monopolised (in which case, benefits are internalised by the monopolist).

An example is a transport project that by opening trade between two regions, reduces the extent of monopoly power. When the demand curve in each region is linear, producers are identical and marginal costs are constant, the total benefit from the project is 1.5 times that measured in the conventional CBA. While that has long been known to cost-benefit analysts, the general view has been that in mature economies with well developed transport networks, these effects are likely to be very small and offset by other trade-offs.

While there are potentially many such pecuniary externalities, the project claims two, enhanced agglomeration economies and the increased tax revenues arising from increases in labour force participation. It is these benefits that result in the project having estimated benefits that exceed costs.

The agglomeration benefits (Slide 25) are Marshallian external economies that arise from collocation of economic entities. Their quantum is estimated in the CBA by applying the results of a UK study of the effect of distance on productivity, which is a concept similar to that used in gravity models of interregional and international trade. Now, (Slide 26) both theory and evidence suggest that agglomeration economies arise largely from spill-over effects in human capital. Moving skilled people from one area to another can increase the extent of these spill-overs, but only if the impacts of those skills differ across areas – resources should, in other words, be pushed to areas that are more productive and where the elasticity of productivity with respect to agglomeration is higher. When this is done, the resulting gain in the new equilibrium is not the gross gain in the destination area (assuming there is such a gain), but the net gain taking account of the loss of agglomeration economies in the origin area. But rather than demonstrating that such rearrangements of skills are likely to occur, the EWR CBA appears to assume as much, as well as assuming that the effects can be assessed by applying summary impact multipliers derived from the UK. Even putting aside the identification issues, these multipliers appear to have all the conventional weaknesses in not adequately distinguishing marginal from average effects and gross from net effects. Moreover, it is quite unclear why the UK estimates would apply to the situation at issue, and no reconciliation is reported between these estimates and estimates for the United States.

Additionally, in the standard model of urban residential location, the welfare benefits of changes in transport costs depend on the extent to which transport infrastructure and other goods subject to congestion (such as schools and hospitals) are appropriately priced. Thus, reductions in transport costs will alter settlement patterns, typically inducing greater decentralisation (as people exercise their preference for larger lots at points further along the initial bid/rent curve). While this leads to a welfare gain (as those moving clearly value the new location at more than the previous location), whether welfare rises overall depends on whether externalities are imposed on existing users of the congestible facilities. Given this, it is incorrect to assume there will be benefits from agglomeration without taking account of any possible offsetting impacts as location patterns change.

Turning to the labour force participation effects (Slide 27), the CBA treats the reduction in travel time as an increase in the net wage and then applies to that a UK estimate of the labour supply elasticity. However, this is completely incorrect. (Slide 28) While an increase in net wages changes the *slope* of the consumption/leisure budget line, a reduction in travel

time *shifts* the budget line out. The effects on labour force participation depend on the impact on hours for those who already work, which depends on the income expansion path, and the extent of the shift into the paid labour force for those who would not work in the counterfactual. There is no reason to expect a conventional elasticity of labour supply to capture these effects (all the more so one estimated for the response of hours to wages in the UK (to which the CBA then gives the wrong sign)). The proper way to undertake this analysis is to use a micro-stimulation model that also adjusts for changes in residential location, as has been done by Elhorst and Oosterhaven for the Dutch regional high speed train project.

As a result, little or no weight can reasonably be placed upon these estimates. If the further error is corrected of treating tax revenues as a benefit, but not adjusting the cost of public funds for the difference in value between private and public income (i.e. for the excess burden of taxation), the cost/benefit ratio (used in the study, but of course the wrong criterion function, for all the well-known problems that bedevil it) falls to well below 1.

What then, can one say by way of conclusion? Ultimately, the quality of evaluation depends on the value governments place upon it. Governments that view project evaluation as merely a nuisance, and believe they can get away with no evaluation or poor quality evaluation, will, over time, invariably succeed in devaluing the project evaluation process. There is certainly reason to fear that this has occurred in Australia in recent years, across all levels of government.

In part, this simply reflects a loosening of government budget constraints due, in the period to 2007, to sustained economic growth and subsequent to that, to a belief that the global financial crisis meant that high levels of government spending were not only feasible, but desirable. However, other factors are also at work.

The first is the blurring of responsibility for infrastructure between the Commonwealth and the States, and the progressive loosening, by the Commonwealth, of budget constraints at a State level. This reduces the electoral accountability of, and electoral pressure on, State governments, while reducing the opportunity cost State governments incur for poor investment decisions. There is also a significant adverse selection effect, as States shift (or try to shift) to the Commonwealth projects that are lemons. To some extent, the Commonwealth has sought to offset the resulting moral hazard by imposing performance obligations on the States – such as the evaluation requirements built into Auslink. However, much as with foreign aid, these requirements typically bear only an indirect link to the outcome being sought (which in this case, is quality decision-making) and readily become ‘tick the box’ constraints, that are often easily gamed (as the quality of compliance is rarely monitored, and when monitored, even more rarely acted upon). Threats of conditionality have little credibility, especially when doing so would impose a significant political cost on the Commonwealth itself. The result is a degradation in institutional quality and in ultimate outcomes.

The second, no less worrying trend, results from the growing involvement of the private sector in major infrastructure projects, especially though not solely through Private-Public Partnerships (PPPs). While they can improve productive efficiency, PPPs’ effects are threefold: they concentrate the gains from the project (as some share of these is now captured by the private participant), and by so doing, increase the payoffs from collusion between the public decision-maker and the project’s private beneficiaries; they allow crucial

aspects of the project to be cloaked in commercial commerciality, thus reducing the transactions costs of rent-seeking; and they relax (or, more properly, are widely but incorrectly claimed to relax) the public sector budget constraint. These effects too induce a deterioration in the efficiency of decisions and overall outcomes.

All of this creates an environment in which low quality evaluation, often undertaken for project sponsors, can drive out better quality assessments. Without wishing to sound too harsh, there is a proliferation of junk economics that merely adds noise to project evaluation, reducing the weight given to appraisal information of any kind.

Reforming CBA alone can do relatively little to combat these trends. But we nonetheless suggest three reforms (Slide 31).

First, transparency – the full disclosure of CBAs – should be mandatory for all major projects. It is unfortunate that the CBAs for most of the projects recommended for funding from the BAF are not publicly available. Evidence involves information that can be tested; in Australian infrastructure decisions, more of that testing would be greatly beneficial.

Second, we need much better audit and post-completion review of CBAs. At the moment, many CBAs are not even properly archived, much less reassessed prior to final project approval and subsequent to project completion. This undermines accountability and prevents what might have otherwise have been valuable learning, for instance, about systematic bias in cost estimates.

Third, we need a centre of excellence that can tackle the many difficult technical issues that evaluators need to confront, and that can help sponsor a greater sense of professionalism in evaluation.

In closing, the paradox of evaluation in infrastructure is that we do a pretty good job of using CBA for trivial decisions – where and when we build roundabouts, how to most cost-effectively enhance a bus service – and a shocking job of using CBA for the really big decisions. The consequences are there for all to see.


Ultimately, infrastructure investment is a cost, not a benefit: a means, not an end. This proposition, which is obvious to economists, is utterly alien to contemporary Australian politicians of all persuasions. For so long as that remains the case, the road to good project appraisal will be a hard one indeed.

Slide 1

Is there any evidence of evidence-based policy?

The case of infrastructure investment

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16 August 2009




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Slide 2


Outline

1. The background to Australian project evaluation
2. Telecommunications
3. Transport
4. Reform proposals



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Slide 3




Background

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Slide 4



.. for the six year period up to 2006-07 total road expenditure by the Commonwealth totalled \$16 billion. In comparison, this Government has committed \$28 billion to road investment over the six years – the biggest road investment program in our nation's history. On top of this, we are spending \$7.9 billion over 6 years on passenger and freight rail .. All up, we are spending more on rail in the next 12 months than the previous government did in 12 years.

Minister for Infrastructure, Transport, Regional Development and Local Government, Anthony Albanese, 18 June 2009.

Plus “up to \$43 billion” for the National Broadband Network

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Slide 5

CBA as an important element in addressing principal/agent problems in the public sector

Mirrlees-Little Rule: the social value of good project appraisal is $\sim >10\%$ of project value

So how well have these projects been appraised?


We consider first telecommunications and then transport



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Slide 6

Telecommunications



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Slide 7

NBN announcement – 7 April 2009

- Formation of an Australian government company to build and operate a fibre to the home network
- Government will be the majority shareholder (at least 51%) of this new entity, being termed 'the NBN Company'
- Total network to cost up to \$43 billion, with private sector investment
- Government will sell down initial ownership interest



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Slide 8

Proposed network

- Fibre to the premises providing broadband to urban and regional towns with speeds of 100Mbps
 - Extends to towns of around 1000 or more people
 - Equates to 90% coverage versus 98% of previous 'fibre to the node' proposal
- 'Next generation' wireless and satellite to deliver 12 Mbps to remaining 10%
- "Initial advice" is that 90% is achievable but implementation study will review this
- Simultaneous deployment in urban, regional and rural areas




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Slide 9

Timetable

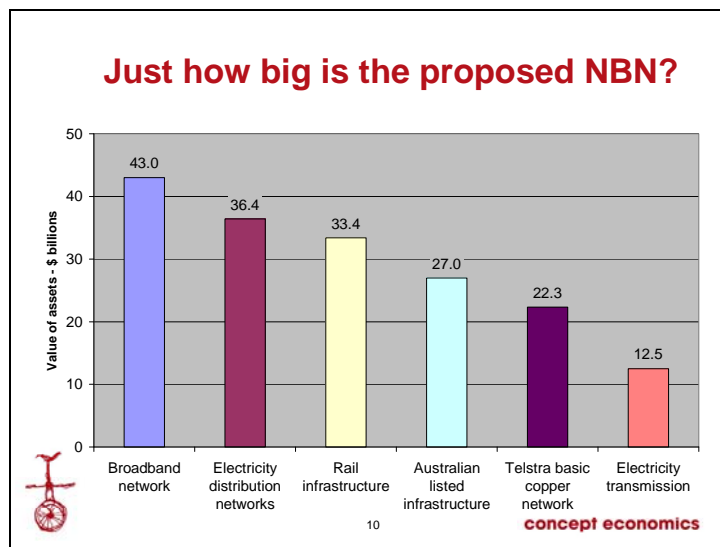
<u>Phase</u>	<u>Timing</u>
Formation of NBN Co.	Underway
Implementation study	To commence shortly
Network rollout begins	"early 2010"
Network construction phase	2010-2017
Government-private operation	2017-22
Government sell down of 51%	2022 onwards



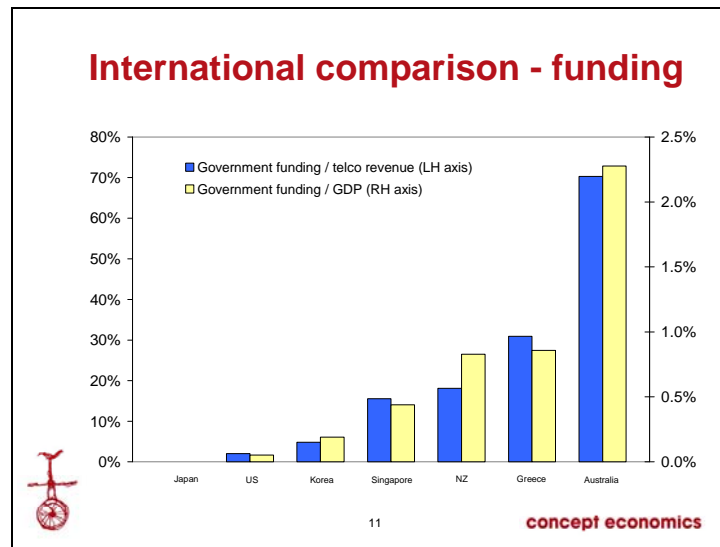
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Slide 10



Slide 11



Slide 12

Using an engineering model that builds costs up from exchange areas, distinguished by population density, we model the deployment, operations and maintenance costs of a GPON FTTP, offering 100 Mbps connectivity to 90% of the Australian population.

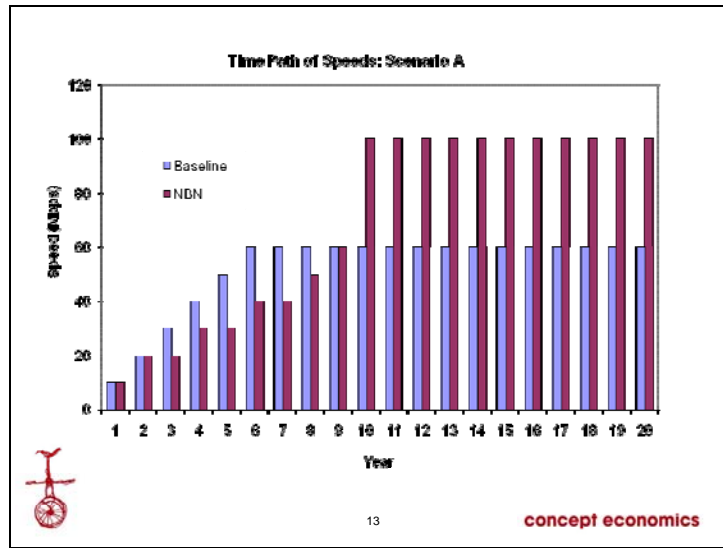
We then construct three counterfactuals:

- (A) *Progressive upgrading of the current network, including upgrading of the HFC to Docsis 3 capability;*
- (B) *Progressive upgrading of the current network, followed in 5 years time by deployment of an FTTP (i.e. delayed start);*
- (C) *Deployment of a 'targeted' FTTP, that provides 100+ Mbps to the right hand tail of the distribution of WTP;*

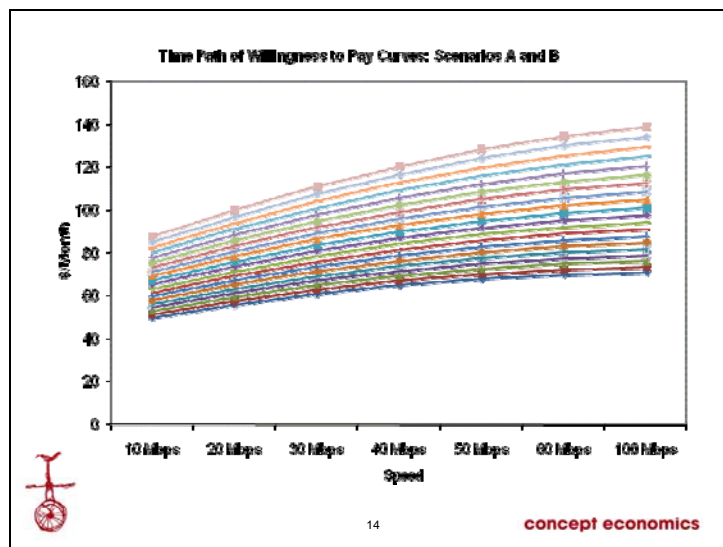
And estimate the incremental costs of each scenario.

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Slide 13




Slide 14



Slide 15

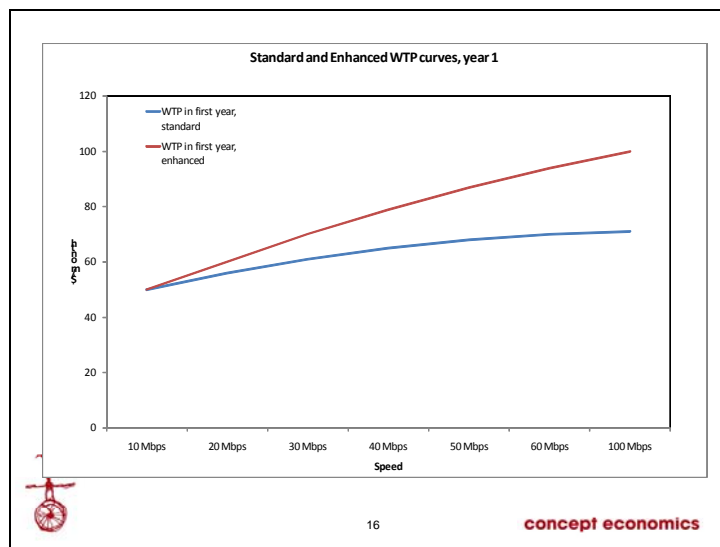
Table 1: Incremental Benefits Under Various Scenarios

	Discount Rate	NPV of per month Benefits			Monthly Equivalent		
		Baseline	NBN	Increment	Baseline	NBN	Increment
Scenario A	4%	1,237	1,228	-9	91	90	-1
	8%	846	834	-13	86	85	-1
	12%	612	599	-13	82	80	-2
Scenario B	4%	1,237	1,249	11	91	92	1
	8%	846	852	6	86	87	1
	12%	612	615	3	82	82	0
Scenario C	4%	1,237	1,540	303	91	113	22
	8%	846	1,002	156	86	102	16
	12%	612	695	83	82	93	11



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Table 2: Incremental Benefits Under Various Scenarios, Enhanced WTP

	Discount Rate	NPV of per month Benefits		Monthly Equivalent		Increment
		Baseline	NBN	Baseline	NBN	
Scenario A	4%	1,608	1,609	118	118	0
	8%	1,087	1,070	111	109	-2
	12%	776	753	104	101	-3
Scenario B	4%	1,608	1,648	118	121	3
	8%	1,087	1,108	111	113	2
	12%	776	787	104	105	1
Scenario C	4%	1,608	1,918	118	141	23
	8%	1,087	1,247	111	127	16
	12%	776	861	104	115	11

Rankings are not especially sensitive to assumptions as WTP is concave in speed, coverage and pace of deployment, but incremental costs are convex in each of these




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Slide 18

Macroeconomic Effects of the NBN

- An alternative modeling strategy is to use a “top-down” macroeconomic approach.
- Use a Solow-Swan neoclassical growth model, calibrated to the main macroeconomic parameters of the Australian economy.
- Incorporate exogenous technological progress, government spending and distortionary taxation.
- On the cost side, the NBN is modeled as a temporary shock to government spending, which under a balanced budget assumption leads to an increase in taxation, a reduction in saving and investment (“crowding out”), and a lower capital stock.



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Macroeconomic Effects of the NBN (cont)

- This shock temporarily moves the economy onto a new transition path towards a lower steady state level of GDP per person.
- But because the shock is only temporary, these effects are all reversed once the shock passes.
- Nevertheless, the shock has costs – GDP per person is lower as the economy recovers back towards its original steady state.
- On the benefit side, the NBN is assumed to permanently increase the level of total factor productivity. This increase in the level of TFP occurs gradually, over the life of the project.



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Macroeconomic Effects of the NBN (cont)

		\$21.5 billion spend					
Increase in Productivity Level	Degree of Crowding Out						
	0.5	0.6	0.7	0.8	0.9	1	
0.3	0.6	-1.9	-4.4	-7	-9.5	-12	
0.4	5	2.5	0.03	-2.6	-5.1	-7.6	
0.5	9.4	6.9	4.3	1.8	-0.7	-3.2	

		\$43billion spend					
Increase in Productivity Level	Degree of Crowding Out						
	0.5	0.6	0.7	0.8	0.9	1	
0.3	-12	-17.1	-22.2	-27.3	-32.4	-37.5	
0.4	-7.6	-12.7	-17.8	-22.9	-28	-33	
0.5	-3.2	-8.3	-13.4	-18.5	-21	-23.6	




Numbers are present value of the cumulative change in GDP over the first 12 years of the project, using a discount rate of 7 per cent.

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Transport

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Slide 22

Commonwealth, States and Territories all mandate CBA for all major transport projects


However, tendency to 'nest' CBA within multi-criteria evaluation approaches, such as 'Triple Bottom Line' that are both inherently confused and give great discretion to the evaluator (as scores and weights are largely arbitrary) and to the ultimate decision-maker (who can pick and choose among evaluation approaches)

The 'Evaluation Criteria' for the BAF are consistent with this tendency, as they emphasise CBA but also list wide range of other evaluative factors

Case Study: East West Rail Evaluation (Victoria and IA)

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Largest single project recommended by IA and funded by the BAF (\$3.2B provided in Budget)




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Slide 23

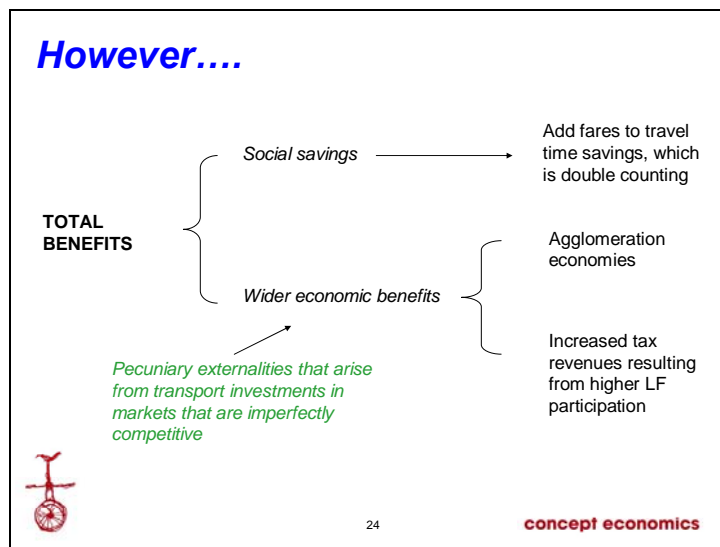
	Combined Road and Public Transport Solution	Public Transport Only Solution
<i>Present Value of Costs</i>	\$15.0 billion	\$7.9 billion
<i>Present Value of Benefits</i>	\$11.1 billion	\$7.9 billion
<i>Wider Economic Benefits (WEB)</i>	\$3.3 billion	\$1.3 billion
<i>Present Value of all Benefits (incorporating WEB)</i>	\$14.4 billion	\$9.2 billion
<i>Benefit Cost Ratio incorporating WEB</i>	1.0	1.2



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Slide 25


Agglomeration economies

↑

Marshallian external economies that arise from colocation of economic entities

→

Estimated using UK estimates of impact of 'effective economic distance' on productivity



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Slide 26


Both theory and empirical analysis suggests that a substantial share of agglomeration economies arise from spill-over effects in human capital

But moving skilled people from one area to another is **only advantageous if the impacts of those skills differ across areas** – resources should, in other words, be pushed to areas that are more productive and where the elasticity of productivity with respect to agglomeration is higher

The resulting gain in the new equilibrium is not the gross gain in the destination area (assuming there is such a gain), but rather the net gain taking account of the loss of agglomeration economies in the origin area

Also, over the long run, locational choices adjust in ways that re-equilibrate the bid/rent curve and that – if there are unpriced local public goods subject to congestion – can impose negative externalities

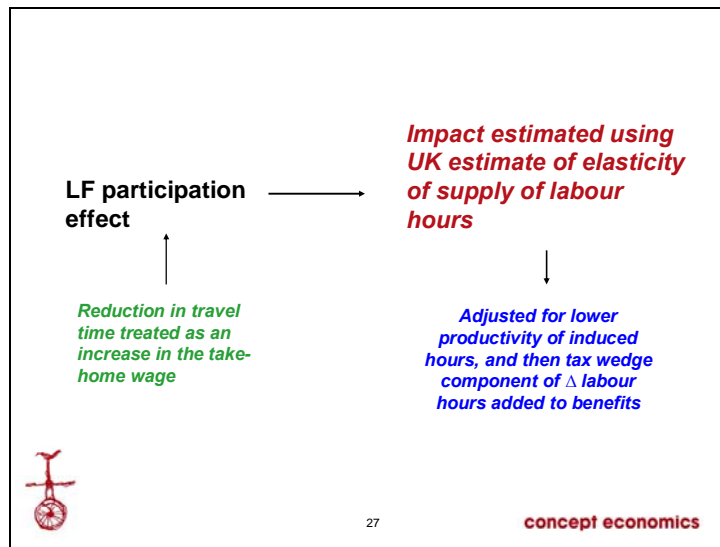
The estimated gains are overstated and in any event, very unreliable



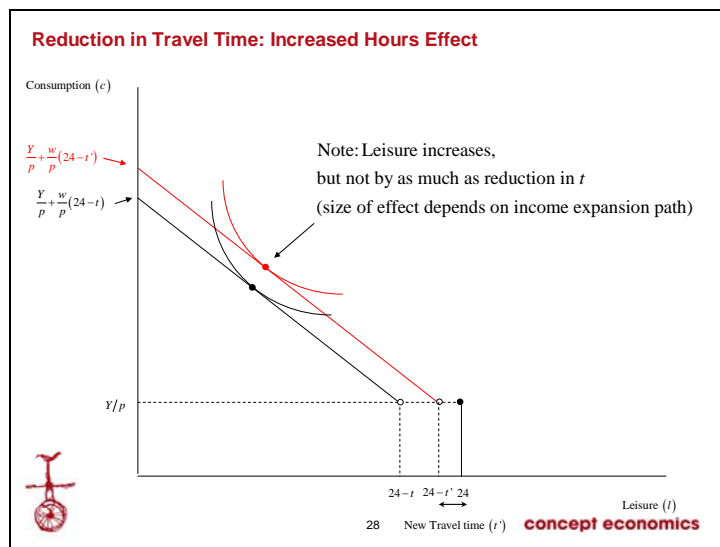
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Conclusions



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Slide 30

Project evaluation is only as good as the governments for which it is done: it is only sustained if governments see value in it

Factors that have driven a reduction in the value Australian governments see in good quality project evaluation


Strong revenue growth

Perception that in recession, anything goes

Ever more blurred funding responsibilities, State/Commonwealth

Cofinancing with private sector, often on opaque terms

Have all reduced perceived budget constraints and increased value of non-transparent processes





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Slide 31

Gresham's Law in which low quality evaluation, often undertaken by project sponsors, drives out good

Difficult to prevent, but elements that could help

(1) ***Make full disclosure mandatory***  (2) ***Require independent audit, both prior to decision and post-completion***  (3) ***Address remaining technical weaknesses and create a centre in an entity such as the PC to act as champion of good project evaluation***

So long as governments believe that infrastructure spending is a benefit, not a cost, and an ends, rather than a means, reform will be a very hard road



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