ASSESSING THE VALUE OF PUBLIC INFRASTRUCTURE AT A REGIONAL LEVEL: COST BENEFIT ANALYSIS SUPPLEMENTED BY ECONOMIC IMPACT ANALYSIS

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ABSTRACT Evaluation of regional public infrastructure projects is needed to ensure the effective and efficient use of scarce taxpayer funds. There are several methods used to evaluate public infrastructure projects, including cost benefit analysis (CBA) and economic impact analysis (EIA). CBA is widely used by governments to estimate the real social value of a project. However, CBA does not necessarily account for regional impacts such as the effects on employment and growth and, thus, may not be adequate to properly measure regional impacts against related government policy objectives. Governments can use EIA to capture these impacts as an adjunct to CBA. This paper reviews the pros and cons of both CBA and EIA and presents an empirical analysis of both appraisal approaches. Both approaches are applied to a case study of the proposed South West Illawarra Rail Link (SWIRL), which is a $1.6 billion infrastructure project designed to improve the railway connectivity between Greater Sydney and the Illawarra region.

KEY WORDS: Regional economy, transport, rail network, cost benefit analysis, economic impact analysis.

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1. INTRODUCTION

Public infrastructure, via the quantum and quality of the services that it delivers over the operational life of the asset, can induce significant economic, social and environmental impacts on the local region. At a regional level, the impacts related to the construction phase of these projects are also significant. Of course, public resources are scarce and the economic costs of raising taxation or increasing borrowing need to be balanced against the potential benefits of investing in new infrastructure (Arslanalp *et al*., 2011).

Evaluating regional public investment projects requires the right tool that can consider not only the direct costs and benefits of the project, but also the wider social and economic impacts that the project may bring. This wider lens is necessary because political economy considerations, such as the distribution of wealth and income across geographic areas, are generally much broader than pure economic efficiency considerations.

Cost benefit analysis (CBA) is the most accepted decision making method for large scale public infrastructure investment projects (Nickel *et al*., 2009) and many governments at different levels provide guidelines on the use of CBA (see, for example, NSW Government The Treasury, 2017; Council of Australian Governments, 2007; Department of Finance, 2006).

The main purpose of applying CBA to potential public infrastructure projects is to try to ensure that society's resources are efficiently used. The approach requires estimation of the net social benefit of different proposals or options. Net social benefit is defined as the total discounted benefits minus total discounted costs to the community where discounted future benefits and costs allows for a single dollar value of net benefits in 'today's dollars' to be reported.

Importantly, CBA provides a solid, comparable framework for estimating the strengths and weaknesses of alternatives by comparing the potential changes in society's wealth due to the project with that of the relevant alternatives (which may include doing nothing, deferring or otherwise varying the project, or proceeding with an alternative project).

CBA has been applied widely at the regional level to ensure that infrastructure projects are effective for enhancing regional economies (among others, see Arena *et al*., 2014; Florio, 2006; McKay, 1998). However, as Lichfield (1971) points out, this technique is inadequate to address regional planning issues, which involve wider considerations (for example, how different projects fit together). Although CBA can capture the 'wealth' impacts of a project (usually reported in Gross Regional Product (GRP) terms), it cannot generally describe the full story about the economic impacts of a project on a particular region. This is because GRP measures the production of goods and services, and thus, is not a direct measure of economic and social 'welfare' (Lequiller and Blades, 2014); although they are connected to welfare and generally coincident. Regional welfare has several dimensions that cannot be illustrated only by GRP-type measures. These dimensions include income distribution, social inequality, the security of goods and persons, and the quality of the environment. Hence, a full social welfare assessment of a project requires other metrics such as, for example, the unemployment rate, population growth rate, wage rates, and impacts on house prices.

This issue was recently highlighted in a number of state and federal government assessment frameworks (e.g. Infrastructure Australia, 2017; Department for Transport, 2005) as well as by academic studies (e.g. Weisbrod *et al*., 2016 Jones *et al*., 2014). These frameworks recommend that, in order to capture the full effects of a project, economic impact analysis (EIA) should be applied as an adjunct to CBA.

This paper is structured as follows. Section 2 provides a comparison between CBA and EIA as two unique appraisal tools. Section 3 presents the background of our case study, the South West Illawarra Rail Link (SWIRL). We then apply CBA and EIA to evaluate SWIRL in Sections 4 and 5 respectively. Section 6 presents our conclusions.

2. PUBLIC INFRASTRUCTURE APPRIASAL METHODS: COST BENEFIT ANALYSIS AND ECONOMIC IMPACT ANALYSIS

Cost Benefit Analysis

CBA is the most applied economic evaluation tool in transport planning, which is primarily publicly funded in Australia (Dobes, 2008). CBA is based on a fundamental principle of welfare economics that the welfare of a society depends on the aggregated sum of the utility of the individuals in that society (Dobb, 1970). Using the welfare concept of Pareto optimality, the CBA approach assesses a project positively if the implementation of that project makes one individual better off and none worse off, implying that the project increases social welfare. Of course, any project can impose net costs to one or a number of individuals in a society. To overcome this issue, CBA applies the Kaldor–Hicks efficiency concept which defines a project as efficient if the total 'willingness to pay' for the beneficiaries is higher than the total 'willingness to accept compensation' of those who are disadvantaged by the project (Hammitt, 2015).

In other words, if those who are worse off can be compensated by those who are better off, then Kaldor-Hicks efficiency is satisfied. This condition assures that the resource allocation is optimal, i.e. economically efficient. Further, the allocation of public resources is optimal, if the benefit of a marginal dollar of public expenditure is equal to that of private expenditure, and if, at least in theory, the benefits of a marginal dollar of public expenditure is equal across all projects (Ergas and Robson, 2009). Thus, the initial objective of CBA is to check resource allocation efficiency across competing projects.

CBA is a very useful assessment tool not only to ensure the efficiency of resource allocation, but also, potentially, the optimality of three other criteria. First, via estimating and comparing the net social benefit of a project and its alternatives, it can evaluate the project portfolio that the government has for a particular objective and determine if any project should be added or removed from that portfolio. Second, the systematic application of CBA can result in choosing projects which are closer to the social welfare frontier, and thus, improve the credibility of policy choices. Third, it can improve the clarity between the government and the decision-making agencies (and their consultants) who advise governments and decrease the information asymmetry between them. It also decreases the chance that CBA might support the agent's interest or a third party's interest, rather than the interest of the principal (Ergas and Robson, 2009).

The main decision criterion in CBA is the 'benefit-cost ratio' (BCR) for which CBA brings into account all economic costs and benefits of a project in monetary terms. Generally, these economic costs and benefits accrue over a number of years and, therefore, they are calculated using a common base year. If the BCR exceeds one, the project is evaluated as 'net beneficial', implying that society would be better off if the project is implemented.

In order to support robust and comparable project assessment, most Australian jurisdictions have established project assessment frameworks, which include CBA guidelines. In this paper, we follow the guidelines provided by the NSW Government (2016) which specifies 9 key steps for a CBA analysis including identifying the project, estimating costs, benefits and decision criteria, conducting a sensitivity analysis, and presenting decisions and conclusions. These steps are also followed in the evaluation of the SWIRL (see Section 4).

Economic Impact Analysis

As explained in Section 1, CBA does not generally show the broader economic impacts of a project on a particular region such as income and wealth distribution effects or structural change to industries or the labour market. Such additional information can be revealed via an EIA. The EIA method is based on the common system of national accounting and the concept of value-added, which adds up the aggregate value-added across all industry sectors. In this way, the value-added approach avoids double-counting the value of economic activities.

EIA has been used in regional economic analysis since the 1960s (Leistritz, 1994). Many Australian studies have used macroeconomic models to estimate the economic benefits of expanding transportation access such as SGS Economics and Planning (2012) and ACIL Tasman (2010).

Among all EIA approaches, input-output (IO) and computable general equilibrium (CGE) analysis are the most common tools applied. IO models are one of the earliest EIA techniques which are based on input-output tables which present a detailed snapshot of the intermediate transactions in an economy. Using such tables, IO models can estimate so-called 'economic multipliers' to show the economy-wide impacts of, say, an increase in transport investment. IO models are easy to use and transparent. However, they have been criticised since they use fixed coefficients, which implies that a project cannot affect flows of resources between industries via resource scarcity affecting relative prices. Another criticism of IO models is that they are demand-driven and ignore constraints on the supply side such as the availability of capital and labour inputs (Wang and Charles, 2010). These issues were also highlighted by the distinguished IO modeller West (1995) who stated that despite the popularity of IO models, EIA must move towards more sophisticated models, including CGE, which can better account for projects impacting on resource scarcity.

CGE models, which are founded in microeconomic theory, include explicit supply constraints. CGE models show the optimal solution of a vector of endogenous variables to an exogenous shock, and thus, can show the stream of effects of a policy on different sectors in a region, or national economy, in a systematic way.

The advantages of CGE models are as follows (Charney, 2003). First, these models are flexible as the model builder can make decisions about the functions, closures and parameters used. Second, the model builder can choose from different types of CGE models: short-run or long-run, static or dynamic. Third, CGE models are strongly grounded in microeconomic theory. Fourth, these models can be applied in investigating the impacts of an economic activity on either one or a number of sectors or regions.

CGE models have been increasingly used for public infrastructure evaluations, especially by private sector consulting firms advising federal and state governments (e.g. Deloitte Access Economics Pty Ltd, 2015; Frontier Economics Pty Ltd, 2009). These models have been of interest to academic researchers as well. For instance, Kim *et al*., (2004) applied a multiregional CGE model combined with a transport model to investigate the economic impacts of a highway on regional income disparity and economic growth. Developing different CGE models, Chen *et al*., (2016) studied the economic and environmental effects of high-speed rail investment, and Bröcker *et al*. (2010) investigated the role of transport infrastructure projects on spatial equity and efficiency. In all these studies and in the related literature, the role of public infrastructure in regional growth, equity and employment (the main concerns of regional policies) is clear and given significance in the papers. However, as explained before, this role cannot generally be performed by CBA alone.

Main differences between CBA and EIA

The main differences between CBA and EIA (in particular, CGE) are as follows. First, model output: CBA measures a project's effects on welfare or net social benefits while CGE focuses on macroeconomic impacts such as GRP, employment, budget parameters and consumption. Second, model structure: CGE models are general equilibrium (GE) models which include demand and supply and budget constraints across the different sectors of the economy. CBA, in theory, should be based on GE concepts (Drèze and Stern, 1987). However, CBA is effectively a partial equilibrium analysis (Tisdell, 2013; Forsyth, 2014), which measures all identified and directly related costs and benefits and then applies an assessment criterion such as a BCR. Third, as a partial equilibrium analysis, CBA focuses on the markets which are directly affected by an investment and estimates its direct effects on taxpayers and beneficiaries. In contrast, CGE shows the direct and indirect impacts (including macro, regional or environmental) on the markets and regions that are directly and indirectly affected.

In addition, CGE and CBA have different capabilities in analysing externalities. CGE models can incorporate some types of externalities; particularly those which have a general equilibrium nature. For example, the Monash Multi Regional Forecasting Model (MMRF) is a CGE model which includes scope to measure the costs of greenhouse gas emissions for environmental policy analysis (Adams *et al*., 2000). However, since these models are based on a market system, they are not capable of evaluating many types of externalities and non-market effects that are difficult to value, noise pollution for example. In these cases, CBA is a more appropriate tool for estimating the value of those impacts in monetary terms. These differences are summarised in Table 1.

Table 1. CBA vs CGE Summary.

DIFERENCESS	CBA	CGE
Model outputs	Net social benefit (or welfare), including distributional analysis and sensitivity analysis	Macroeconomic variables such as GRP, employment and consumption
Model structure	Partial equilibrium	General equilibrium
Model objectives	Showing the direct impacts of an investment on those who are directly affected	Showing the indirect impacts of an investment on those who are directly or indirectly affected
Model capability	Partial equilibrium capacity with limitations in assessing non-market externalities	General Equilibrium (whole economy) capability Can incorporate market-based externalities and qualitatively assess non-market based externalities in terms of regional impact

Source: the Authors.

Due to these differences, the CBA and EIA approaches may result in different outcomes. For instance, the low population of regional economies may cause the economy-wide net benefits of a project to be marginal for a regional infrastructure project, while the EIA shows that the project has considerable positive effects on the region's employment. In such cases, ultimately, it is up to the decision maker to weigh up projects and alternatives based on both the net benefits estimated by CBA and the net impacts estimated by EIA.

The synergy between CBA and EIA is well-defined by Campbell and Brown (2003):

> "*An economic impact analysis is a different procedure from a cost-benefit analysis in that it attempts to predict, but not evaluate, the effects of a project. Since the data assembled in the course of a cost-benefit analysis are often used as inputs to an economic impact analysis the two types of analyses tend to become related in the minds of decision makers and may be undertaken by the same group of analysts*".

Although CBA and EIA are mostly used separately to investigate different aspects of an investment decision, we can incorporate them at two other levels (Forsyth, 2014): First, we can use both models as complements to answer the same question: is the economy made better off by a particular investment? This is not a common way of using the two models but technically, it is feasible. Second, and in principle, both methods can be aggregated to one single evaluation tool.

We recommend that public infrastructure investment decisions at the regional level utilise both methods (at least at the first assessment level) to assess whether (i) taxpayers funds are efficiently used (via CBA), and (ii) to evaluate if the project can be effective in achieving regional economic policy objectives (via EIA – in particular, via CGE). In this paper, we use both methods to study the direct and indirect effects of our case study, SWIRL. For the EIA, we use a CGE model.

3. CASE STUDY: SOUTH WEST ILLAWARRA RAIL LINK

The Illawarra is in New South Wales, Australia which is located between 40-200 km south of Sydney's CBD and comprising the local government areas of Shellharbour, Wollongong, Kiama, Shoalhaven and Wingecarribee. The population of the Illawarra (local government area level) is around 450 000 (ABS, 2017a). The Illawarra region, despite its geographic proximity to Australia's largest city, has historically suffered from relatively higher unemployment in part due to poor transport connectivity to Sydney and a lack of industrial diversification.

The SWIRL has been proposed to better connect the Illawarra and Greater Sydney via an additional passenger and freight connection between

Wollongong and south-west Sydney. Sydney and the Illawarra are currently connected by the South Coast Line, a rail link which is at times heavily congested.

The proposed dual track rail line would run north-west of Wollongong through Dombarton and connect to the Sydney Train Network at Maldon, near Picton. Figure 1 presents a schematic of SWIRL and the current rail network between Wollongong and Sydney.

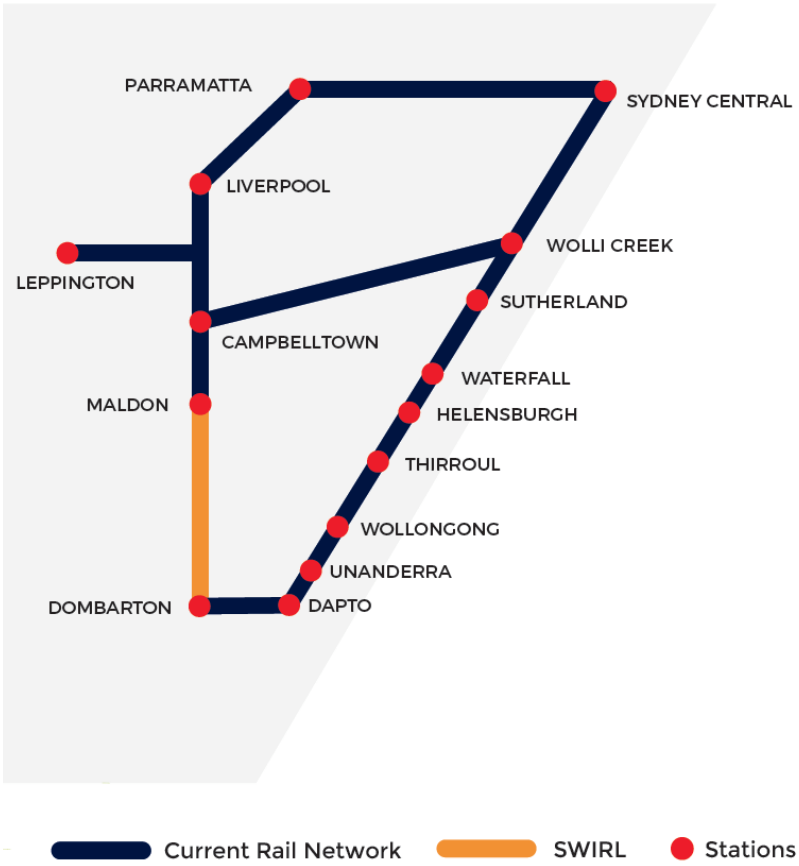

Figure 1. The South Coast Illawarra Rail Link (SWIRL) Map.
Source: the Authors

4. SWIRL CBA

Following the NSW Government (2016) guidelines we undertook a CBA in relation to completing the SWIRL as both a passenger and freight service. Below we summarise the steps taken in the analysis.

Step 1: Statement of objectives and problem definition: The main objective of SWIRL is to improve rail transport connectivity between the Illawarra and southwest Sydney by providing more freight and passenger services. The problem is that the South Coast Line does not provide an adequate or efficient freight and passenger service due to slow speeds, geological risk and congestion at peak times.

Step 2: Project definition and project scope: We defined the project based on previous engineering and economic assessments for the Maldon-Dombarton Line, which we then augmented with a dual track and additional passenger service.

Step 3: Specify the base case and alternative options: We compared SWIRL to a ‘business as usual’ or ‘do nothing’ case.

Step 4: Determine the level of evaluation: We considered the potential geographic ‘footprint’ or impact of the project in order to specify and calibrate the regional analysis. We applied a regional lens to the analysis and calculated the impacts on the Illawarra, Sydney, the ‘Rest of NSW’ and ‘Rest of Australia’.

Step 5: Identify and calculate quantifiable costs and benefits for the base case and each option: The financial costs of the SWIRL can be categorised into infrastructure costs and operating costs. The former includes the costs of line completion, electrification, additional train sets, new signalling technology and labour. The latter includes running costs such as diesel, electricity and labour costs, maintenance costs and depreciation. We also estimate economic costs including the costs of disruption and environmental costs. The cost estimates have been derived from several sources, including ACIL Tasman and Hyder (2011) and also discussions with industry experts.

We considered and estimated five potential benefits of completing the SWIRL. First, the project would improve freight productivity. Second, it would reduce passenger commute times between the Illawarra (Wollongong) and southwest Sydney (between 15-60 minutes). Third, it would reduce road congestion between the Illawarra and Sydney. Fourth, it would expand the labour supply and demand in both regions; and fifth, it would increase education, business, trade, housing and tourism choices for both regions.

Step 6: Discount costs and benefits and calculate the decision criteria: We use the discount rate of seven per cent which is recommended by the various Australian guidelines to discount the costs and benefits of SWIRL and calculate the net present value (NPV) of the project's benefits. NPV is obtained by discounting the stream of net benefits back to its value in the chosen base period, in this case 2016-17. A positive dollar value (in NPV terms) represents a benefit, while a negative dollar amount represents a cost.

The general NPV formula is depicted in equation 1.

$$NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+r)^t} \qquad \textbf{Eq. (1)}$$

where Bt and Ct are the benefits and expenditure from the project in period t respectively, r is the social discount rate (here is seven per cent), n is the number of years the benefits and costs from projects are accrued (which we assume to be 50, reflecting the life of the asset). Using the above formula, we calculate total private and social benefits and total private and social costs of SWIRL are AUD$1 776 million and AUD$1 572 million respectively, that is a net benefit of AUD$204 million

Then we measure the BCR. The breakeven point for the BCR is 1, in that a BCR between 0 and 1 represents a net cost, while a BCR above 1 represents a net benefit. The calculated BCR for SWIRL is equal to 1.13 which implies that SWIRL is a beneficial investment.

Step 7: Risk and sensitivity tests: For the sensitivity analysis, we considered an upper case and a lower case in addition to our central case estimation. The estimated benefits can be ten per cent higher or ten per cent lower than the central case, with estimated costs (which already include a cost escalation buffer) remaining constant. We also repeated the analysis using a discount rate of four per cent. It is arguable that the discount rate of seven per cent is high in the post-GFC world; for instance, a recent estimation by the Independent Pricing and Regulatory Tribunal New South Wales (2017) indicates an Australian nominal discount rate of 4.3 per cent. A discount rate of four per cent is also suggested by the NSW Government CBA guidelines that we are following for the purpose of sensitivity analysis.

Step 8: Present quantified and non-quantified results: Table 2 shows the results of our CBA. Our sensitivity analysis shows that total private and social benefits of building the SWIRL range between AU$1 599 million and AU$1 954 million (NPV seven per cent, 50 years). With estimated costs slightly below estimated benefits, our calculated Benefit Cost Ratio is between 1.02 (low case) and 1.24 (high case), with 1.13 being the central case result as noted above. The table also shows that about one-half of the total private and social benefits of the SWIRL are derived from passenger travel time savings, both by commuters using the SWIRL and also those remaining in cars who will drive on less congested roads. At a four per cent discount rate over 50 years, which is the standard lower-bound estimate and in our view a more appropriate discount rate in the post-GFC world, our BCR central estimate is 1.56, which leaves considerable room for possible errors in our assumptions.

Table 2. Indicative CBA for the SWIRL.

DESCRIPTION (2016-17 DOLLARS)	LOW CASE $ MILLIONS	CENTRAL CASE $ MILLIONS	HIGH CASE $ MILLIONS
Freight travel time savings	111.786	124.207	136.627
Freight operating cost savings	296.233	329.148	362.063
Avoided externalities	169.294	188.104	206.915
Option value of South Coast Line failure	186.310	207.011	227.712
Passenger travel time savings and other benefits	835.223	928.025	1 020.828
Total private and social benefits	1 598.846	1 776.495	1 954.145
(NPV, 7%, 50 years)			
Total private and social costs	1 572.097	1 572.097	1 572.097
(NPV 7%, 50 years)			
(Central estimate)			
BCR (7%, 50 years)	1.02	1.13	1.24
BCR (4%, 50 years)	1.40	1.56	1.71

Source: the Authors

Step 9: Recommend the preferred option: Based on the BCR estimations, even in the low case scenario, we found that the Illawarra region is better off with SWIRL and investment in completion of SWIRL will be a beneficial allocation of taxpayers' funds.

5. ECONOMIC IMPACT ANALYSIS OF SWIRL

We use a CGE model to conduct our EIA and show the potential economic impacts of SWIRL on the Illawarra region.

The general features of CGE models include: first, as the name implies the focus of the model is on equilibrium resource allocation. Second, CGE models usually assume perfectly competitive markets. Third, the production side is represented by a profit maximising producer, subject to technology constraints, who chooses the optimal supply of a product and demand for production factors. Fourth, the consumption side is shown by a representative utility maximising household who chooses the optimal supply of production factors and demand for a product (Pezzey and Lambie, 2001).

For this project, we used the Cadence Economics General Equilibrium Model (CEGEM). CEGEM is a multi-commodity, multi-region, dynamic model. The version of CEGEM model used in this study consists of five regions (like the CBA model): Illawarra region, Sydney, Rest of NSW, Rest of Australia, and Rest of the World; and four transacting sectors: households, firms, the government and foreign sector. There are 16 industries and 4 production inputs in the model.

We have modelled the economic impact of completing the SWIRL as a freight and electrified passenger service over 4 years at a cost of $1 689 million. The estimation includes constructing a dual track line, electrification and other modifications, which are estimated by SMART rail logistics experts. This significant infrastructure investment is expected to provide a stream of benefits to the Illawarra and Sydney communities by expanding the supply of passenger and freight transport services to the region. The completion of the SWIRL could increase overall network capacity and passenger and freight demand for rail services. Thus, we estimate the improvement of the rail transport productivity industry in Illawarra to be one per cent, equivalent to $20 million per year. Our estimate of the size of the freight industry in the Illawarra is based on ABS National Accounts Input-Output tables and the NSW Ports report (NSW Ports, 2015).

Improving the connectivity between Wollongong and Sydney will provide incentives (such as greater access to jobs, education and leisure opportunities) for residents of Sydney or other parts of Australia to move to Wollongong. We estimated that this improved connectivity will increase the current regional population growth rate slightly from 1.1 per cent (ABS, 2017b) to 1.3 per cent. Considering the current population of about

450 000 people, this will result in a population increase of around 900 people per year. Two primary reasons that people move between regions are job opportunities and housing costs. If people can find lower cost housing in the Illawarra and work in potentially higher wage jobs in Sydney, then we could expect the population growth rate to increase beyond its current annual average.

As a result of this increased movement, we also assumed a lowering of the natural rate of unemployment in the Illawarra (proxied by the long-run average unemployment rate) of 1 000 workers. In other words, the increased access to job opportunities is assumed to ‘pull’ 1 000 people into the labour force that would otherwise not be in the labour force. This is a key assumption that is not included in the CBA. Increasing the supply of labour stimulates economic activity as new workers enter the workforce at lower wage rates.

Finally, based on existing workforce trends, we modelled an income repatriation effect whereby residents of the Illawarra work in Sydney and spend their income in the Illawarra region (where they live). We assumed an additional 2 500 people travelled to Sydney to work at an average salary of $50 000 per year. Again, this assumption is not included in the CBA.

Results

We estimated the NPV of the total economic impact of SWIRL to be $2 579 million in the Illawarra region, which translates into a $1.84 benefit to the Illawarra region for each dollar invested in SWIRL (at the standard seven per cent discount rate). The total economic impact for Greater Sydney is $97 million. Most of the impact occurs in the Illawarra because most of the capital investment and the assumed stream of net benefits occurs in the Illawarra. Conceptually, the total economic impact for NSW is the sum of the impacts for the Illawarra, Greater Sydney and the rest of NSW, which is equal to $2 635 million in NPV terms.

In terms of employment impacts, we estimate that the average annual additional employment over the construction and operating period (2018-2037) is 1 119 FTEs in the Illawarra, 14 FTEs in Sydney and 1 135 in NSW. Peak employment occurs in 2022, at 1 367 FTEs in the Illawarra and at 1 387 in NSW, and 41 FTEs in Sydney in 2019.

Table 3 summarises the overall results of the EIA for SWIRL.

Table 3: Summary of Economic Impacts by Region.

ECONOMIC IMPACT ON… OVER THE PERIOD 2018 TO 2037	$ MILLIONS, REAL GRP 2016-17 DOLLARS (NPV, 7%)	EMPLOYMENT (ANNUAL AVERAGE 2018-2037)	EMPLOYMENT (AT PEAK)
Illawarra Region	2 579	1 119	1 367
Sydney Region	97	14	41
NSW	2 635	1 135	1 387

Note: We conducted sensitivity analysis for EIA by considering a low and a high case scenario, as well as the discount rate of 4%. The sensitivity analysis results are not presented here to avoid repetition, but are available upon request. Source: the Authors.

6. CONCLUSION

This paper reviewed the application of the two most common public infrastructure assessment tools, being CBA and EIA, in regional public infrastructure investment. The CBA approach derives the net social benefits of infrastructure projects while EIA 'predicts' the medium to long-term effects of the proposed project on key indicators of regional economic development. We recommended that public infrastructure proposals in regional economies should be assessed via both CBA and EIA. While from a purely economic perspective, CBA remains the central project assessment tool, to satisfy political economy goals, EIA is being increasingly used. Conceivably, the two methods may result in different policy implications since they shed light on different aspects of a public infrastructure investment. This is particularly in relation to regional development where a CBA might prove to be negative or marginally positive at best, but the EIA might reveal a strong case for public investment because it aligns with government regional economic development objectives. The final decision in such cases highly depends on the policy makers' priorities.

For our case study we applied both appraisal methods. In this case, both the CBA and EIA were positive. The CBA results showed that establishing SWIRL is efficient as the BCR was greater than one which implies that the Illawarra region will be better off with SWIRL. Using a CGE model, we considered a broader set of regional and national economic impacts and found that the regional economic impacts associated with this investment are potentially substantial and include an increase in GRP as well as a permanent increase of employment in the Illawarra. This implies that the government can consider SWIRL as a worthwhile public infrastructure project, because, based on the CBA results it can get value for money in the taxpayer-funded infrastructure investments. In addition, based on the EIA results, the project can help the government pursue economic and social objectives such as regional economic development or addressing relatively high regional unemployment rates in the Illawarra.

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