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Reconciliation Once and For All: Economic Impact Evaluation and Social Cost Benefit Analysis

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Abstract

This paper makes two contributions to the debate on the compatibility of social cost benefit analysis and economic impact analysis. First we argue that benefits estimated through economic impact analysis are amenable to subsequent analysis in a social cost benefit framework when household utility is used as the measure of welfare. Second, economic impact analysis and social cost benefit analysis of investment loans may be evaluated from the perspective of the multilateral lender and from that of the beneficiary government. While the first is straightforward to implement, this paper develops an approach to evaluating the investment from the perspective of the beneficiary government which internalizes the repayment of the loan within the economic impact model itself. We compare these two perspectives by undertaking an economic impact and social cost benefit analysis of a US$6.25 million tourism investment in Uruguay.

Keywords: ex-ante economic impact analysis; social cost benefit analysis; dynamic computable general equilibrium model; tourism investment analysis; tourism development; Uruguay.

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1.0. Introduction

There is an ongoing debate in the literature on the compatibility of social cost benefit analysis (SCBA) with economic impact analysis. This paper contributes to the literature in two important ways. First we argue that benefits estimated through economic impact analysis, specifically Dynamic Computable General Equilibrium (DCGE) models, are indeed amenable to subsequent analysis in a SCBA framework provided the appropriate measure of welfare is used. Second, economic impact analysis and SCBA of investment loans may be evaluated from two different perspectives: that of the multilateral development bank and from the perspective of the beneficiary government. While the first is relatively straightforward to implement, we develop an approach to evaluating the investment from the perspective of the beneficiary government which internalizes the repayment of the loan within the DCGE model simulation itself. We compare the two perspectives by undertaking an economic impact and SCBA of a US$6.25 million tourism investment (US$5 million loan with US$1.25 million in counterpart funding) in Uruguay.

This paper is organized as follows: the first section provides an overview of the use of DCGE models applied to ex-ante economic impact evaluation. Next, the main principles of DCGE analysis and SCBA are presented. A review of the literature on reconciling SCBA with DCGE follows, outlining the major issues identified, concentrating on tourism sector investments. Next, we evaluate the tourism loan to Uruguay from the perspective of the multi-lateral investor and the government. The final section provides concludes the inquiry and provides an outline of future research directions of tourism investment analysis.

2.0. Dynamic Computable General Equilibrium Analysis

In the analysis of large public investments or policies that are expected to impact multiple sectors and actors in an economy with dynamic effects, a DCGE is a powerful means of capturing important inter-sectoral, backward and forward linkages and direct, indirect and induced benefits (Cattaneo, 2002, Dwyer et al., 2006, Dwyer et al., 2003, Dixon and Rimmer, 2002, Banerjee et al., 2015a). Pearce et al. (2006) suggests that where projects are large and complex, partial equilibrium frameworks are seldom sufficient and that the analytical framework should be capable of considering a wide range of impacts on all sectors that may be impacted. All project spillovers, and indirect costs and benefits should be accounted for. As Pearce et al. (2006) point out, a strength of the DCGE approach is its meticulous detail in appraising spillovers of an intervention (Pearce et al., 2006).

Ex-ante economic impact analysis of public investments that integrates estimates of economic benefits from a DCGE into a SCBA has a history in both the forestry (Banerjee et al., 2016a) and tourism sectors (Banerjee et al., 2015b, Banerjee et al., 2016b, Taylor, 2010, Taylor and Filipski, 2014). Indeed, the approach has the potential for application across sectors where large public investments are concerned and inter-sectoral linkages are likely to be important. Certainly, outside of economic impact analysis of public investments, DCGE models have a long history in applied policy analysis, from fiscal to trade to environmental policy analysis, with DCGE models being distinguished as the 'workhorse' of policy analysis (Jones, 1965, Dixon and Jorgenson, 2012, Dixon et al., 1992).

DCGE models are mathematical models that consist of systems of equations which describe the relationships between sectors, agents and other accounts in the underlying Social Accounting Matrix (SAM). DCGE models are based on SAMs for a country, region, or for all countries linked together through trade as in the GTAP database[1]. A SAM provides a snapshot of all monetary transactions between economic sectors in an economy and its agents, including households, government, enterprises, savings-investments, and the relationships between the modelled economy and other countries or regions of the world (King, 1985). A SAM is typically built primarily based on a country's national accounts, but also draws on integrated economic accounts, fiscal accounts, balance of payment data, and household survey data. Recently, with the publication of the first international standard for environmental statistics, the System of Environmental Economic Accounting (SEEA), it has become possible to integrate detailed environmental data into DCGE models (Banerjee et al., 2016c, Banerjee et al., 2016d). This Integrated Economic-Environmental Modelling (IEEM) framework can have interesting applications to tourism sector investment analysis where tourism demand is a function of environmental quality.

DCGE models are commonly used to assess economic impact and as such, some of the key indicators reported are GDP or Gross Regional Product (GRP). Reporting of impacts on private

[1] For more details, see: https://www.gtap.agecon.purdue.edu/

consumption is also common and tends to follow trends in GDP. As policy makers are frequently concerned with income and employment effects, these indicators are also commonly reported, as are poverty impacts in developing country contexts. Measures of household welfare changes, as indicated by changes in compensating and equivalent variation, may also be estimated in a DCGE framework (Lofgren et al., 2002). Of course, where trade and fiscal policy shocks are of concern, impacts on exports, imports, the exchange rate and levels of tax revenue become more relevant.

Finally, where integrated economic environmental models are applied to questions that have potentially significant environmental impacts, impacts on stocks of environmental resources and emissions may also be reported. With a robust environmental representation, the IEEM framework enables indicators such as adjusted net savings to be calculated which take into account policy/investment impacts on stocks of underlying resources and emissions and waste arising from productive processes to estimate wealth effects (Banerjee et al., 2016c, Banerjee et al., 2017).

3.0. Social Cost Benefit Analysis

SCBA origins stem from application by US Federal Water Agencies as early as 1808 and was originally applied to evaluating the alternative use of public funds from an economy-wide perspective (Burgan and Mules, 2001, Mishan, 1988). Hanley and Spash (1993) and Pearce et al. (2006) provide a short history of its development for the interested reader (Hanley and Spash, 1993). The theoretical foundations of SCBA are that benefits are defined as increases in wellbeing or utility and costs are defined as reductions in utility. Simply put, for an intervention to be welfare enhancing, the 'with intervention' social benefits must outweigh the social costs within a predefined geographic area. Two main aggregation rules apply to SCBA. The first is the aggregation rule across individuals and social groups by summing willingness to pay (WTP) for benefits or willingness to accept (WTA) compensation for losses. WTP and WTP are at the core of welfare economics and correspond to compensating and equivalent variation. The second aggregation rule considers if higher weights should be placed on the more marginalized groups in society (Pearce et al., 2006).

Following Hanley and Spash (1993) for all SCBA, there are a number of stages to the analysis. The first is in the definition of the project which involves consideration of the resources to be used and for what purpose, and definition of the population affected by the intervention, both those positively and negatively affected. The second stage is the identification of project impacts where all resources used in the project including raw materials, capital, labor, land and other resources are accounted for. The nature of the impacts will differ from project to project, though these impacts can range from impacts on income, output, prices, wages and property value to changes in environmental quality. Two concepts of particular importance in this regard are additionality and displacement. Additionality takes into consideration the marginal impact of the intervention while displacement is concerned with the reallocation of resources to the intervention in question. Both of these concepts are critical in how results of the analysis are presented.

The third stage involves judgement as to which impacts are economically relevant. In reconciling SCBA with DCGE analysis, this stage is critical. With welfare economics underpinning our analysis, the assumption is that we are concerned with maximizing a social welfare function which is the weighted sum of the utility of each individual in the population. Utility is understood as consumption of marketed and non-marketed commodities. A SCBA is in ideal cases intended to provide a decision rule for policy makers, enabling them to select the intervention that provides the greatest social utility. Stage four involves physical quantification of the impacts identified to be relevant while stage five is the monetary valuation of these impacts. Of course for non-market goods, monetary valuation poses its own challenges, though appropriate methods are discussed elsewhere (Champ et al., 2003).

Stage seven of the analysis applies the net present value (NPV) test which assesses whether the sum of discounted benefits exceeds the sum of discounted costs. If the result is positive, the intervention is considered to be an efficient allocation of resources. Calculation of the NPV involves making a decision on the rate of time preference or discount rate and discounting the flow of costs and benefits, converting all values to present value terms. This calculation is shown in equation 1.

$$NPV = -I_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_T}{(1+r)^T} \qquad \text{(eqn' 1)}$$

Where:

NPV = net present value;

I_0 is the initial investment;

t is the year;

T is the final year of the period of analysis;

C is the cash flow, and;

r = discount rate.

In the final stage, sensitivity analysis is undertaken to assess which parameters have a greater effect on NPV. Usually, the parameters tested in the sensitivity analysis are the physical quantities and qualities of inputs and outputs, prices, and in some cases, the discount rate and project time horizon.

4.0. Integration of DCGE Estimates and SCBA- Main Findings

Burgan and Mules (2001) provide an overview of some of the issues in reconciling SCBA with economic impact analysis (EIA) when assessing special events. To motivate the study, the authors state that the use of public resources for supporting special events is justified where market failure exists. Specifically, the allocation of public resources is justified where individual tourism sector firms are unable to capture the share of tourist expenditure that is commensurate with their promotional and organizational efforts.

In a partial equilibrium framework, specific events are often demonstrated to contribute positively to well-being through a SCBA. Where special events are part of an economic or regional development strategy, increasingly economic impact assessments of the special events are undertaken to show the event's contribution to the development of the region through new tourist expenditure. The benefits from the perspective of economic impact are often reported through indicators such as gross national or regional product (GNP or GRP, respectively).

Partial equilibrium frameworks for estimating benefits focus on consumer or producer surplus. In the case of tourism, however, and particularly when foreign tourists are the target market, consumer surplus is not an appropriate indicator since the consumer in this instance is a foreign visitor. A SCBA will typically be more concerned with the benefits that accrue to residents of the area of analysis. Thus, in a partial equilibrium framework and in the case of tourism interventions, producer surplus is the appropriate measure where the benefit to the economy is assessed as a function of increases in local production (Burgan and Mules, 2001). In a general equilibrium framework such as a DCGE, household welfare or utility is the appropriate measure (Hanley and Spash, 1993, Pearce et al., 2006). Household welfare as captured through EV in a general equilibrium framework is able to account for the second and subsequent round of effects generated by an intervention. A partial equilibrium framework on the other hand underestimates benefits by only considering a 'once-off' benefit or costs.

One area of contention in reconciling EIA and SCBA is with regard to the employment of the factors of production, specifically, labor and capital. If labor and capital are simply diverted as a result of an intervention to increase local production, no benefit is necessarily generated as a result. Let us consider labor, for example, where unemployment exists since employment generation is often an important motivation for investment loans in tourism. When the opportunity cost of labor is equal to zero, the social benefit of an additional job is the wage paid to the new salaried worker. Where unemployment exists and the opportunity cost (i.e. the unemployed workers reservation price) is somewhere below the minimum wage, the benefit of the additional job is the difference between the minimum wage and the worker's reservation price (Bartik, 2012). In a DCGE framework, where labor is mobile between sectors and regions, in areas with high unemployment and few social safety nets, it may be reasonable to assume that the opportunity cost of the unemployed worker is very close to zero.

A DCGE approach has begun to take the place of the use of input-output (I-O) multipliers. The use of I-O multipliers have various well-known shortcomings including double counting of benefits, no consideration of opportunity cost of project funding, the absence of factor and resource constraints, fixed prices and exogenous demand (Layman, 2004). SAM multiplier analysis is a marginal improvement over I-O multiplier analysis, though many of the limitations remain the same. Movement toward a DCGE approach is indeed a positive development since the use of GDP or GRP calculated in I-O analysis as a measure of benefits from a SCBA perspective can be problematic (Dwyer et al., 2006, Dwyer et al., 2016).

As an example, consider an intervention that results in higher GDP growth. Given the structure of production of a particular sector, this increase in GDP may be the result of increased payments to foreign capital. In this case, it is the foreign owners of capital that are deriving benefit from the intervention, rather than the local population which would typically be the focus of the SCBA. Certainly, economic impact in this case is not equivalent to an increase in welfare from an SCBA perspective; Dwyer et al. (2016) investigate this question in detail. In a partial equilibrium framework, while GDP and value added are consistent with the national accounts, it is inconsistent with SCBA. Using producer surplus as the indicator of benefits, changes in value added will exceed producer surplus by the amount paid in wages and thus exaggerated results (Russell, 2001).

Layman (2004) argues that it is necessary for a recognized set of methods, assumptions and required results to be agreed upon for the results of DCGE analysis to provide meaningful information to policy makers. It is necessary, as indicated by Hanley and Spash (1993) that any additional resources used are accounted for in the analysis and that these costs should be deducted from gross product (Layman, 2004). Indeed, one of the strengths of the DCGE approach is that it is an internally consistent framework providing a strict accounting of all market costs and benefits generated by an intervention. The approach presented in the section that follows further addresses a potential point of contention in reconciling SCBA with DCGE analysis. Specifically, as opposed to most previous analysis where benefits estimated with a DCGE are then used in a SCBA, the approach developed here considers the repayment of the investment within the DCGE framework. For the first time, this framework considers first and subsequent rounds of benefits, as well as the implications of follow-on costs that may arise from repayment of the investment.

Finally, as previously mentioned, the DCGE framework provides an internally consistent accounting of all market costs and benefits of an intervention. What a DCGE approach does not do well, however, is capture non-market benefits and costs. For example, the economic and welfare impact of increases in traffic congestion arising from an investment are difficult to routinely capture in a DCGE, unless the model is designed specifically with this intent. Advances are being made in this regard with Integrated Economic-Environmental Modelling (IEEM; Banerjee et al. 2016 and 2017), though a considerable scope of work remains before such approaches begin replacing standard DCGE approaches as DCGE models are doing with input-output modelling. In some cases, where non-market benefits and costs are a priori considered to be the most relevant, analysis in a partial equilibrium framework may be the most appropriate. Certainly, there will remain a role for both general and partial equilibrium frameworks in SCBA.

5.0. Integration of DCGE and SCBA: An Application to Uruguay

The purpose of this section is to compare two different perspectives in evaluating a tourism investment loan. The first is that of the multi-lateral development bank. On the cost side, what is of concern is the disbursement schedule made by the lender, while on the benefit side, the development bank is concerned with generating benefits for the borrowing country. The second perspective taken is that of the beneficiary government receiving the investment loan. In this case, on the cost side, the Government is concerned with the repayment of the investment and the follow-on costs; on the benefit side, the Government is also concerned with the benefits accruing to its citizens. Based on the discussion above, equivalent variation is the appropriate measure of welfare.

The DCGE model developed in Banerjee et al. (2016, 2015) is calibrated to a new SAM for Uruguay with a base year of 2013 (Cicowiez, 2016) and is applied to the ex-ante economic analysis of a US$5 million loan with US$1.25 million in counterpart funding. This investment is supporting tourism development in the river corridor of the Uruguay River to create employment and income in emerging destinations, and consolidate tourism opportunities to improve regional equity. The three main components of the investment are: (i) the creation and consolidation of tourism infrastructure (US$3.555 million); (ii) to catalyze private sector investment in the corridor (US$950,000, and; (iii) to strengthen subnational tourism governance (US$900,000). Operations and maintenance of new infrastructure is charged on an annual basis at a rate of 3% while the management costs of the tourism program are equal to US$845,000. Figure 2 (see section 5 below) describes the distribution of the investment and operations and maintenance costs until 2045 which is the time horizon used in this analysis.

A SAM for 2013 was developed for Uruguay which is the most recent year for which complete national accounts data were available (Cicowiez, 2016). This SAM was extended to single out foreign tourism demand/expenditure. Table 1 describes the accounts in the Uruguay SAM.

Table 1. Main accounts in the Uruguay SAM.

Category	Item	Category	Item
Sectors	Agriculture, forestry and fishing		Land
(12)	Processed food		Timber resources
	Manufacturing		Fisheries resources
	Utilities		Mining resources
	Mining, petroleum, chemicals	**Institutions**	Unskilled labor factor tax
	Construction	**(4)**	Skilled labor factor tax
	Commerce		Capital factor tax
	Hotel and restaurant		Natural resources factor tax
	Transportation		
	Communications	**Taxes**	Import and export duties
	Public administration	**(5)**	Direct taxes
	Other services		Activity taxes
Factors	Salaried labor, low skill		Other taxes
(11)	Salaried labor, mid skill		Social security contribution
	Salaried labor, high skill		
	Non-salaried labor, low skill	**Investment**	Private investment
	Non-salaried labor, mid skill	**(3)**	Gov transp infra investment
	Non-salaried labor, high skill		Other gov investment
	Capital		

Source: Authors' own elaboration; Uruguay SAM.

According to the SAM, Uruguay's GDP reached 1,140,989 million pesos in 2013. Uruguay imported 75,958 million pesos more than it exported, while foreign tourism demand directly contributed to almost 3.4% of GDP (table 2).

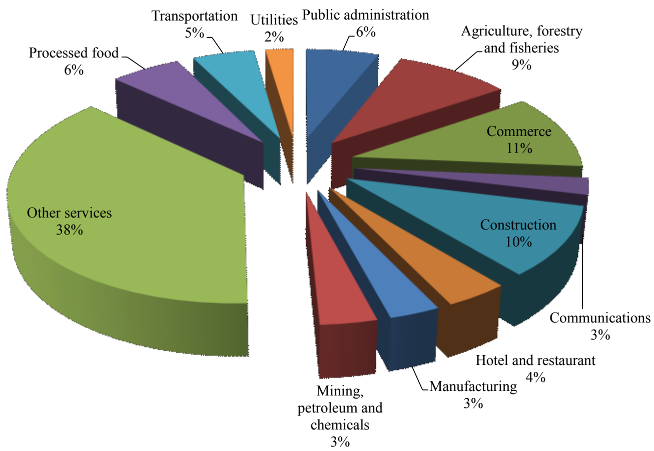
Table 2. Uruguay, 2013, total supply and demand.

Item		Millions of pesos
Demand		
Private consumption	$	751,198
Government consumption	$	157,987
Fixed investment	$	261,421
Exports	$	235,238
Tourism demand	$	38,642
Total demand	$	1,444,487
Supply		
GDP	$	1,140,989
Imports	$	311,197
Stock change	$	(7,698)
Total supply	$	1,444,487

Source: Authors' own elaboration; Uruguay SAM.

The sectoral structure of Uruguay's economy is depicted in Figure 1. The Other services sector is the largest sector accounting for 38% of the economy's value added. Commerce is a far second followed by Construction and Agriculture, forestry and fisheries. While not shown here, Processed food and Agriculture/forestry/fisheries lead Uruguay's exports (35% and 28%, respectively) while Manufacturing and Mining/petroleum/chemicals account for the greatest share of imports.

Figure 1. Sector structure in 2013, value added shares.



Source: author's own elaboration.

5.1. Scenario Design

This section presents the simulations and analyzes model results. The following five scenarios were conducted: (i) the baseline scenario, which is the *without program* scenario; (ii) an investment scenario where the government investment in tourism infrastructure, institutional strengthening, and capacity building is implemented; (iii) a demand scenario which simulates the projected increase in foreign overnight leisure tourism expenditure arising from the investment; (iv) a combination scenario where scenarios *(ii)* and *(iii)* are implemented jointly, and; (v) a combination scenario which includes within the DCGE model, the repayment of the US$6.25 investment. Details of each scenario follow:

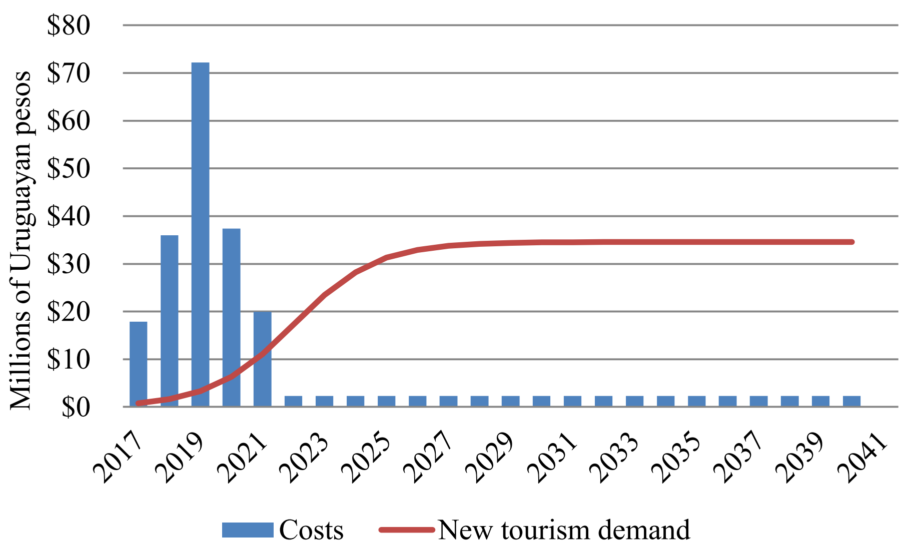
Baseline scenario: this first simulation assumes that average past trends will continue from 2014 to 2045. The non-base simulations that follow only deviate from the baseline scenario beginning in 2017.

Invest scenario: this simulation imposes increased government investment in tourism infrastructure, institutional strengthening and capacity building financed through the investment. The structure and sequencing of the investment are shown in figure 2. The year 2017 is considered the first year of the investment which continues until the year 2021, inclusive.

Demand scenario: in this simulation, foreign leisure tourist overnight arrivals and expenditure are projected to increase due to the investment. With program tourism demand was estimated in Eugenio-Martin and Inchausti-Sintes (2016) with a simple econometric regression analysis. In this regression, the value of the presence of an additional tourism product or attraction was estimated using tourism expenditure as the independent variable (Eugenio-Martin and Inchausti-Sintes, 2016). Tourism products were differentiated as nautical, ecotourism and cultural tourism products.

Based on the characteristics and number of new products to be developed through the investment, the total additional tourism expenditure was estimated at US$5,894,561. This increased tourism demand was distributed according to a logistical functional form following Banerjee et al., (2016) over a 10 year period, such that 2.5% of the increase was applied in the first year, 6% in the second year, 14% in the third year, 28% in the fourth year, 50%, in the fifth year, 72% in the sixth year, 87% in the seventh year, 94% in the eighth year, 98% in the ninth year and 100% in the tenth year (figure 2).

Figure 2. Distribution of investment costs and projected tourism demand increase.



Source: Authors' own elaboration.

Combi scenario: this scenario models the *invest* and *demand* scenarios combined.

Combi-pay scenario: this scenario models the *invest* and *demand* scenarios combined, and; internalizes the repayment of the US$6.25 million investment in the DCGE model. According to conditions applied to similar multi-lateral loans, repayment begins in year 7 which is year 2023 in this analysis. Interest owing and the principle payment are made annually with the final payment made in 2039. The interest rate used is 1.58% and is based on the US Dollar LIBOR[2]. To finance repayment of the loan, direct tax rates are adjusted to generate the necessary funds.

5.2. DCGE Model Results

Figure 3 illustrates impacts on equivalent variation, the measure of household welfare, in millions of pesos. This represents the change in household income at current prices that a change in prices would have on household welfare if income were held constant. In other words, where an intervention does not occur, EV is the amount of income an individual would have to be given to make them as well off if the intervention did take place. With the invest scenario, EV spikes with the disbursements of the loan, declining back to baseline levels at around 2023 and then growing more quickly than baseline thereafter once the investment's medium-run positive impacts on capital stocks begin to materialize. The impact on EV in the demand scenario naturally follows the increase in projected demand arising from the creation of new tourism attractions and opportunities. While not reported here, the DCGE model also reports results related employment levels, sectoral output, exports and imports, among other indicators, all of which are taken into account when calculating EV.

The combi scenario represents essentially the sum of the invest and demand scenarios, reaching over an additional 60 million pesos by 2045 compared with the baseline. Finally, the combi-pay scenario follows a similar trend as the combi scenario, though the combi-pay trend is between 5 and 15 million pesos lower than the combi scenario during the loan repayment period. There is also an upward jump in household welfare in 2039 once the loan is repaid; at this point, the impact on EV rises close to the level of the demand scenario in 2045 and the rate of growth of the combi scenario in the same year. In 2045, the difference between the combi and the combi-pay scenario is 5.3 million pesos. The cumulative difference between the combi and combi-pay scenario by 2045 is almost 289 million pesos.

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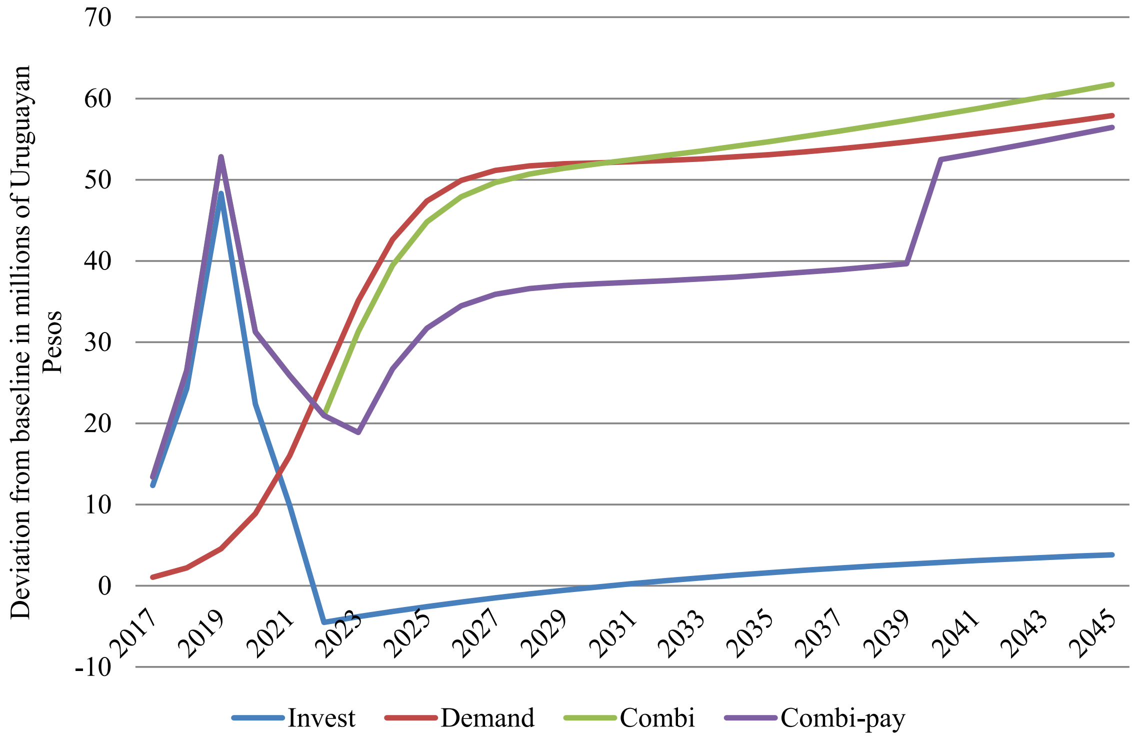
[2] LIBOR rate retrieved on October 28, 2016.

Figure 3. Impact on equivalent variation, deviation from baseline; millions of pesos.



Source: Authors' own elaboration.

Table 3 provides an overview of key macro-indicators and their deviation from their baseline values in year 2021, which is the final year of the investment, 2030, and 2045. Both exports and imports decline in all scenarios. The trend with fixed investment in the case of the demand, combi and combi-pay scenarios is to decline, generally in later years of the analysis. GDP impacts are positive in all scenarios and years. The government consumes more goods and services in all scenarios but the demand scenario which is a function of its allocation of resources toward the development of new tourism attractions. Private consumption generally follows GDP trends, while private investment tends toward decline. This is often a characteristic result of this type of simulation as the sudden increase in government investment temporarily crowds out private investment during the disbursement period (Banerjee et al., 2016b, Dwyer et al., 2006).

Table 3. Key macro-indicators, difference from baseline for select years.

	Invest			Demand			Combi			Combi-pay		
	2021	2030	2045	2021	2030	2045	2021	2030	2045	2021	2030	2045
Absorption	$ 23,776,888	$ 22,544,796	$ 1,511,127	$ 6,123,212	$ 1,097,552	$ 16,441,985	$ 51,949,193	$ 51,990,462	$ 24,874,406	$ 38,986,637	$ 53,459,075	$ 58,111,859
Private consumption	$ 12,335,328	$ 9,874,528	$ (128,827)	$ 3,825,857	$ 1,064,894	$ 16,014,234	$ 52,094,158	$ 57,909,887	$ 13,400,210	$ 25,888,854	$ 51,964,250	$ 61,734,233
Government consumption	$ 10,379,263	$ 11,436,345	$ 1,174,536	$ 1,174,536	$ -	$ -	$ -	$ -	$ 10,379,263	$ 11,436,345	$ 1,174,536	$ 1,174,536
GDP market prices	$ 5,983,982	$ 2,608,372	$ 1,482,741	$ 6,261,819	$ 1,016,903	$ 15,271,118	$ 49,053,846	$ 50,736,926	$ 7,000,722	$ 17,877,840	$ 50,535,886	$ 56,997,094
Tourism demand	$ -	$ -	$ -	$ -	$ 4,311,381	$ 67,829,186	$ 275,874,934	$ 432,689,976	$ 4,311,381	$ 67,829,186	$ 275,874,934	$ 432,689,976
Exports	$(11,209,913)	$(14,915,115)	$ (356,782)	$ 1,350,535	$ (2,204,359)	$(35,233,022)	$(152,497,564)	$(252,644,471)	$ (13,414,305)	$ (50,148,185)	$(152,854,491)	$(251,294,414)
Imports	$ (6,582,993)	$ (5,021,309)	$ 328,395	$ (1,211,927)	$ (2,187,670)	$(33,767,032)	$(126,272,717)	$(181,299,040)	$ (8,770,761)	$ (38,789,798)	$(125,943,632)	$(182,510,326)
Fixed investment	$ 1,062,298	$ 1,233,923	$ 465,419	$ 1,122,819	$ 32,658	$ 427,751	$ (144,965)	$ (5,919,426)	$ 1,094,933	$ 1,661,438	$ 320,289	$ (4,796,910)
Private fixed investment	$ (6,906,731)	$ (7,795,026)	$ (712,270)	$ (54,870)	$ 32,658	$ 427,751	$ (144,965)	$ (5,919,426)	$ (6,874,095)	$ (7,367,511)	$ (857,400)	$ (5,974,599)
Government fixed investmen	$ 7,969,029	$ 9,028,949	$ 1,177,689	$ 1,177,689	$ -	$ -	$ -	$ -	$ 7,969,029	$ 9,028,949	$ 1,177,689	$ 1,177,689

Source: Authors' own elaboration.

5.3. Social Cost-Benefit Analysis

In this section, the investment is considered from what may be argued as the perspective of the multilateral development bank and then from the perspective of the beneficiary government. From the perspective of the lender, the NPV of the investment is calculated by: (i) calculating the EV; (ii) comparing this deviation from baseline in EV alongside the cost of the loan as it is disbursed in the first 5 years of project implementation. In this case, all costs are assessed in the first 5 years which of course has significant implications for the NPV of the investment, particularly if the discount rate is high. A 12% discount rate is used in this analysis, and; (iii) NPV is then calculated as indicated in equation 1. From the perspective of the beneficiary government, the government only begins incurring the direct costs of the investment once repayment begins which is in year 2023. Loan repayments occur annually until the entire investment is repaid in 2039.

Table 4. NPV in UY pesos and IRR from development bank and beneficiary perspective.

Scenario		NPV	IRR
Combi Development Bank	$	182,904,636	40%
Combi-pay Beneficiary	$	251,592,563	N/A

Source: Owners' own elaboration.

Table 4 shows the results of the analysis from both the development bank and the beneficiary's perspective. With all direct costs incurred in the first 5 years of the period of analysis, the NPV from the bank's perspective is $182.9 million pesos. This is lower than the NPV of $251.6 million pesos estimated from the beneficiary's perspective. While the analysis undertaken from the beneficiary's perspective results in a higher NPV than from the development bank's perspective, it does take into account follow-on costs that may arise from the repayment of the loan. Specifically, modelled in this way, just as the DCGE model accounts for first, second and subsequent round impacts of increased economic activity, this approach also considers first, second and subsequent rounds of impacts of costs being incurred and forgone economic activity that could arise through the repayment of the loan.

From the development bank's perspective, the investment results in an internal rate of return (IRR) of 40%. From the beneficiary's perspective, it is not possible to calculate an IRR. The reason for this is that since no costs are incurred until 2023, there is no negative cash flow in the initial years of the investment as in the case of the first approach. In addition, by 2023, the benefits outweigh the annual (repayment) costs. The absence of a negative cash flow renders it impossible to calculate an IRR for the investment. This may not be an issue, however, since in practice, once an investment loan has been formulated, the SCBA is often used to validate the economic viability of the loan rather than compare among investment opportunities.

6.0. Conclusions and Future Directions

This paper explores the compatibility between SCBA and economic impact analysis, concluding that the two are indeed compatible provided the correct measure for changes in welfare is used. Where estimates of benefits are generated with DCGE models, household welfare measured through changes in EV is the appropriate indicator. There are a number of strengths of the DCGE approach for estimating benefits; the first is its ability to capture first and subsequent round impacts on household welfare. On the cost side, the approach developed in this paper enables the first and subsequent round impacts of repayment costs to be captured as well. Thirdly, a DCGE model's internally consistent accounting framework renders double counting of benefits (and costs) impossible.

The analysis of a US$6.25 million tourism investment in Uruguay is undertaken from the development bank perspective and the beneficiary government perspective. Viewed from the perspective of the development bank, despite the fact that the repayment of the investment and the opportunity cost of these funds are internalized in the modelling exercise, the NPV is higher than when compared with the NPV estimated from the perspective of the beneficiary Government. This result, however, is more telling about the discount rate used in the analysis, rather than the nature of the investment itself.

Internalizing the repayment of the investment as undertaken in the analysis from the beneficiary's perspective is arguably more defensible than considering investment costs outside of the modelling framework. In this way, benefits estimated with the model are treated the same as costs, enabling the consideration of any dynamic, second and subsequent round impacts of both costs and benefits to be accounted for.

One potential drawback of the approach is that, given the repayment schedule of the investment examined in this study, it was not possible to calculate an IRR. This of course is a function of the repayment schedule and magnitude of benefits. If there is no negative cash flow as is the case with the Uruguayan example, it is not possible to calculate an IRR. This would also be the case from the development bank's perspective, if the magnitude of benefits generated were to outweigh costs in all years of the analysis. This, however, should only be a real issue if the SCBA is used to compare alternative investments, rather than explore and demonstrate the economic viability of a specific investment.

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