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EVALUATION OF THE BENEFITS OF TRANSNATIONAL TRANSPORTATION PROJECTS

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In this paper an analytical framework has been developed to evaluate the primary beneficiaries of cargo traffic generated by transnational transport projects. In the transportation economics literature, the economic impact of infrastructure projects on cargo traffic has not been developed as fully as for passenger traffic. In much of the previous literature it is often assumed that consumers of the traded goods would receive the full benefits from the reduction in logistics and transportation costs. This paper has shown that whether the goods are traded internationally or regionally is a key factor in the allocation of the economic benefits arising from the reduction in the cost of cargo transportation. The analytical framework developed in the paper is applied to the evaluation of the impacts of the proposed Buenos Aires-Colonia binational bridge project.

JEL classification codes: F10, H43, R42
Key words: Argentina, Uruguay, cargo traffic, transnational, transportation benefits

I. Introduction

A transnational transport project brings with it a unique dimension in its evaluation. In addition to the cost of construction, the most important considerations of the project are the volumes of passenger and freight traffic. In the cost benefit analysis, the extent to which each country shares the benefits often dominates the debate over the results of the financial and economic appraisal

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and thus is vital information for each country in its decision whether to implement the project.[1]

Road transportation projects usually result in the reduction of logistics costs, motor vehicle operating costs, and the cost of accidents and congestion. The primary beneficiaries of these projects are the users of passenger cars, buses and trucks. Some of the benefits and costs are clearly defined, straightforward to quantify, and it is easy to identify the stakeholder to whom the benefit or cost accrues. For example, passenger car users would benefit by the additional consumer surplus they receive as reflected by their willingness to pay because of the savings in travel time and operation costs of vehicles. The methodology for quantification has been well developed and widely applied to the evaluation of road transportation projects.[2]

In the case of cargo traffic, the allocation of the benefits is not so transparent because several parties are involved in the process of production, transportation and consumption of the goods items being transported. These parties include producers and shippers of the goods in the exporting country, distributors and consumers of the goods in the importing country, and the trucking companies. The assignment of the benefits and costs between the two or more countries can be a highly contentious issue. The main purpose of this paper is to develop the methodology that will enable us to measure the allocation of the economic benefits arising from the reduction in the costs of cargo transportation.

Section II discusses some issues related to the allocation of the benefits of the project between the transportation companies and the users of transportation services. Section III deals with the economic benefits when goods are internationally traded. Section IV discusses the situation when the goods are regionally traded. Section V presents an empirical estimation of the allocation of the benefits for the case of the proposed Buenos Aires-Colonia bridge. Some concluding remarks are made in the final section.

II. Analytical considerations

Demand for freight transportation services is a derived demand because freight transportation is considered as input in the production process of the commodities

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[1] A transnational transportation project is defined here to refer to an investment whose impact is to lower the cost of either passenger or cargo transport services that take place between two or more countries.

[2] See, e.g., Meyer and Straszheim (1971), Harberger (1972), and Belli, Anderson, Barnum, Dixon, and Tan (2001).

being transported. In the case of a transnational transport project, it involves two or more countries. The total costs of shipping merchandise would include the logistics cost and the transportation cost. The former is made up of the loading and unloading costs, storage cost and the waiting time, including the waiting time lost due to the operation of customs at border crossings. The latter involves the cost of fuel consumption, maintenance, insurance, and wear of the tires and depreciation of the truck itself. After the bridge is implemented, traffic on the road would move faster; as a result, vehicle operating cost and time cost would be lower, and fewer accidents would occur. The greater is the reduction of such costs, the greater the benefits received by the parties involved. The conventional treatment suggests that it is the receiver of the merchandise who is the ultimate decision-maker of the shipment in terms of the size of the shipment and the choice of mode. It is assumed that they try to minimize the overall transportation and storage costs associated with the purchase of the commodity.[3] However, the demand and supply conditions of the particular merchandise as well as the competitiveness of trucking sector will ultimately determine how the benefits of a transportation improvement project will be allocated.

If the freight service providers are made up of a small number of companies and operate as a cartel, they may try to keep transportation charges above their competitive level and hence not pass on the reduction of the transportation cost brought about by the new project to either the producers/shippers or the buyers of the goods. On the other hand, if the trucking companies are competing among themselves or face competition with alternative transportation modes, they may not be able to capture any of the direct benefits of the project as higher profits. They would benefit only from the expansion of business activities with the normal rate of return as a result of the lower transportation costs between the locations.

In today's business environment, it is difficult to sustain a monopolistic freight service sector. First, government regulation of the transportation sector has declined significantly around the world, except in the area of security and safety.[4] A great deal of the traditional public transport providers has been privatized over the past two decades. Second, global trade liberalization has accelerated the movement toward deregulation and competition in this sector. This has been taking place in areas, where licensed freight firms from any of the countries can operate in all of

[3] Science Applications International Corporation (1997).

[4] For example, after the events of September 11, 2001 in New York City, security against terrorism requires closer cooperation and scrutiny at borders between the United States and Canada.

the member countries of that area. Third, the trucking industry has to compete with alternative modes in order to continue or expand their business activities. Fourth, many users of transport services have the option of changing the location of their production and method of distribution, thus minimizing their dependence on a particular transportation mode. Due to these effects, it seems realistic to analyze the benefits and costs of a transnational transport project assuming a competitive environment in the transportation sector. In other words, the direct benefits attributable to the reduction of shipping costs are likely to be passed on to either the producers in the regional exporting country or countries, the consumers in the regional importing countries or to both.[5]

In terms of measurement, it is difficult to find a common base for comparing the costs of different transportation modes or between different sizes of the same mode such as large, medium and small trucks. As demand for transportation services is a derived demand, the common base usually used is the cost per unit of goods delivered. Thus, receivers of merchandises tend to minimize the total delivered cost expressed in units of the amount of the product shipped. With this hypothesis, most of the demand models for cargo traffic have been developed at the micro level for the movement of an individual commodity.[6] The important variables determining the total cost include the distance traveled, amount of tolls paid, fuel cost, labor cost of drivers, capital costs for the time the goods are in transit, storage, and waiting to cross borders. It is the cost-minimizing feature of the model that determines the quantity of services demanded from a highway or bridge. The model determining the choice of transportation mode and route usually analyzes a stratified sample of actual cargo shipments and picks the mode and route that will minimize the total delivered cost. The transportation mode will change when the cost of another mode becomes cheaper.

Although the bridge or highway in a binational model appears to be involved by two countries, its impacts go beyond these countries because the bridge services are also provided to the rest of the world. For traded merchandise which involves at least two countries, the extent to which the exporting or importing country is expected to receive the benefits of cargo traffic using a new or improved bridge or highway would depend upon whether the merchandise is traded internationally or

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[5] In the case to which we apply this analysis, three countries are impacted: Argentina, Uruguay and Brazil. On one end of the bridge is Argentina, and on the other end is Uruguay and indirectly Brazil. In our empirical work the benefits and costs accruing to Uruguay and Brazil are evaluated separately.

[6] See, e.g., Roberts (1975) and Bond (2001a).

only regionally. Regionally traded goods are defined as goods that are only traded within a region while internationally traded goods are good traded beyond the region.

III. The case of internationally traded goods

Suppose that a good is internationally traded, the importing country could obtain the item from other countries within the region or outside the region. Let us assume two countries, A and B, are located in the same region. In Figure 1, country A exports a commodity to country B. S_A is the supply curve of the commodity in exporting country A while S_B is the supply curve of the commodity in importing country B. Likewise, D_A and D_B are the demand curve for the commodity in the exporting and the importing country, respectively.[7]

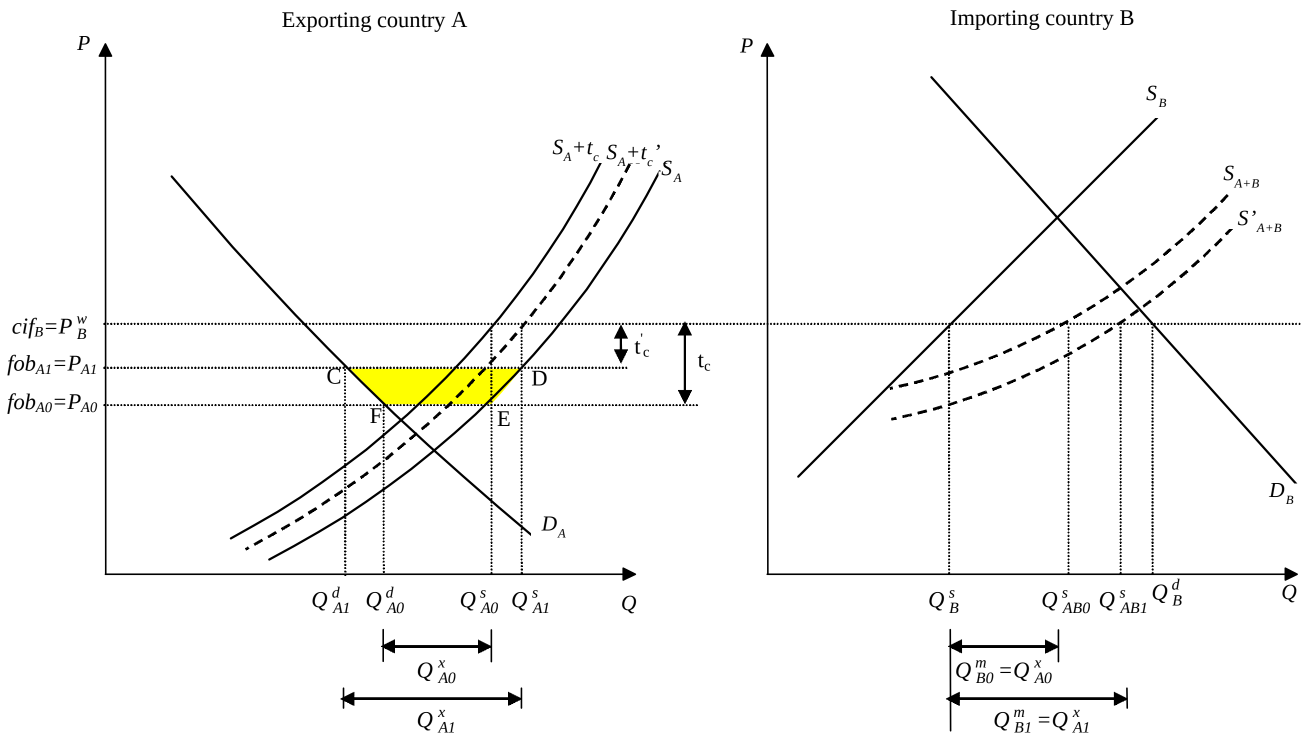
Prior to the opening of the bridge or highway, country B imports (Q^S_{AB0} - Q^S_B) of the good at the cif price of (P^W_B) from its neighbor country A and imports from the rest of the world an amount of (Q^d_B - Q^S_{AB0}), as indicated in the right panel of Figure 1. Suppose the countries involved are small in the sense that they are all price takers. Let P_{A0} denote the fob price of the goods in the specific exporting country A in the left panel of Figure 1. The difference between the cif price of the goods in the importing country and the fob price of the goods in the exporting country represents the transportation and logistics costs (t_c) between the two countries prior to the implementation of the bridge or highway project. Thus, S_A+t_c stands for the supply curve of the goods gross of the transportation and logistics cost in the exporting country.[8]

The project is expected to result in a reduction of transportation and logistics costs from t_c to $t_c^{'}$ thus (t_c - $t_c^{'}$) will represent cost savings per unit of exported goods delivered. Because the international transportation sector is assumed to be a competitive sector, buyers of the goods in the importing country will now have an incentive to shift their demand for imports from the rest of the world to imports

[7] It is possible that the region can contain more than two countries that will benefit from the transnational transportation project. Countries in one zone transport from their countries through one end of the new bridge or highway and the set in the other zone transport goods through the other end.

[8] In the discussion that follows we set aside the impact that the reduced transportation costs will have on the taxes or subsidies on the commodities in the countries affected. However, in the empirical investigation contained in the evaluation of the Buenos-Aires-Colonia bridge project, see International Institute of Advanced Studies (1998), the taxes and subsidies present in the production of transportation services, and on the trade flows were considered in detail.

Figure 1: Impact of transportation cost reduction on internationally traded goods



Net gains in exporting country: **CDEF**
Net gains in importing country: **Nil**

from the specific neighboring country. The neighboring exporting country will now increase their sales of the goods to the importing country by the amount of (Q^S_{AB1} - Q^S_{AB0}). As a result, exporters in the neighboring country will expand their production along their upward sloping supply curve, $S_A + t_c^{'}$. With a higher price, consumers of this commodity in the exporting country will cut back their consumption. In the end, both the increase in supply and the decrease in demand should serve to increase exports from FE to CD, as indicated in the left panel of Figure 1. In the new equilibrium, $Q^X_{A1} = Q^m_{B1}$.

The total net benefits associated with the increased shipment of this merchandise via the new facility accrue to the producers in the exporting country, and are shown as the area CDEF in Figure 1. It can be segregated between diverted (Q^x_{A0}) and induced or generated traffic (Q^x_{A1} - Q^x_{A0}).[9] There will also be a transfer from consumers to producers in the exporting country of an amount equal to $P_{A0}P_{A1}$CF. For the traffic diverted from the existing modes, the benefits are estimated by the savings in transportation and logistics costs times the volume of diverted traffic. That is, (Q^x_{A0}) [t_c - $t_c^{'}$]. In the case of the induced and generated traffic, the benefits are estimated by one half of the product of the savings in transportation and logistics costs by the volume of the induced and generated traffic. This can be expressed as ½ (Q^x_{A1} - Q^x_{A0}) [t_c - $t_c^{'}$].[10]

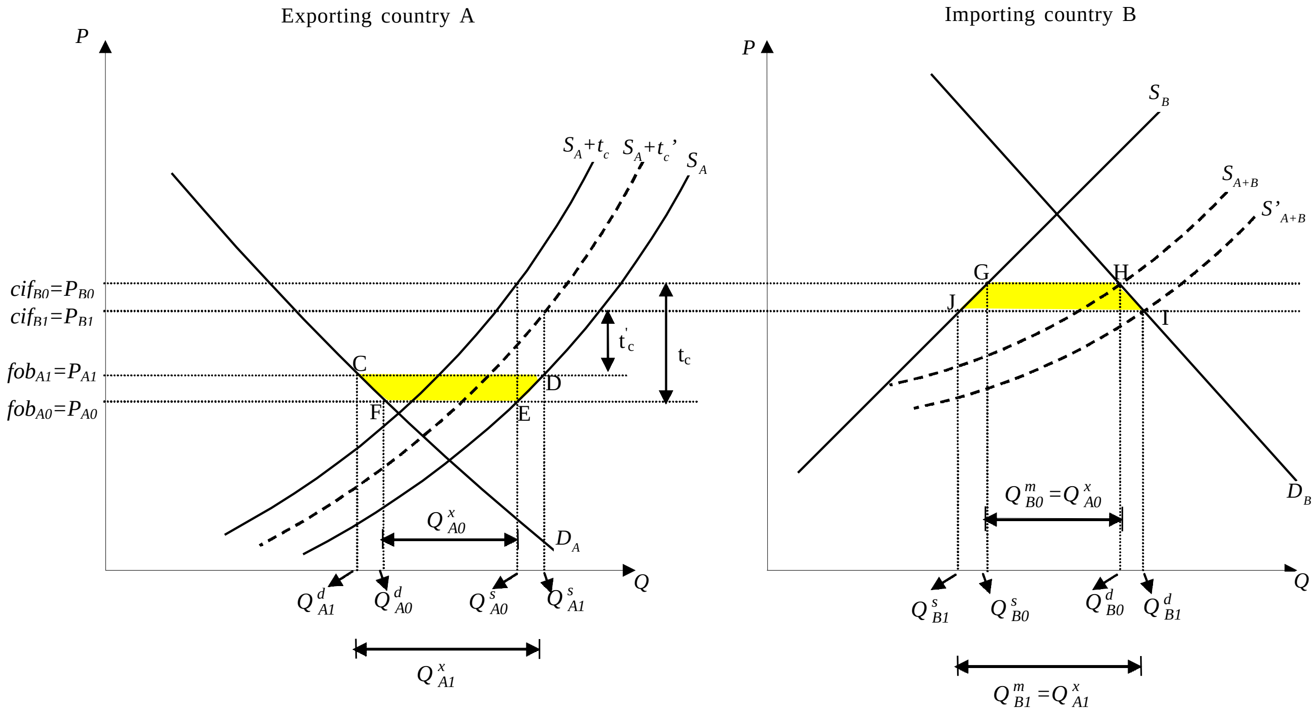
IV. The case of regionally traded goods

Regionally traded goods refer to items that are imported only from the neighboring country within the same region. That is, the amount of exports from the exporting country A, (FE), to the importing country B equals the latter's total amount of imports of the commodity (GH), as indicated in Figure 2. Prior to construction of the bridge or highway, the price differential between the cif price of the goods in the importing country and the fob price in the exporting country is shown as t_c.

[9] The induced traffic is defined as the additional traffic that uses the bridge or highway as a result of reduction in transportation cost caused by the project, while the generated traffic is due to economic developments at both ends of the bridge or highway.

[10] This benefit is equivalent to the consumer surplus enjoyed by the new users of the bridge services because of the reduction of transportation cost and logistics cost. Due to the assumption of linear demand curves, the benefits can be estimated as one half of the product of the savings in transportation and logistics costs multiplied by the volume of the induced and generated traffic. The fundamental principles to measure the benefits and costs are based on the demand and supply curves of a good or service. See, e.g., Harberger (1971).

Figure 2: Impact of transportation cost reduction on regionally traded goods

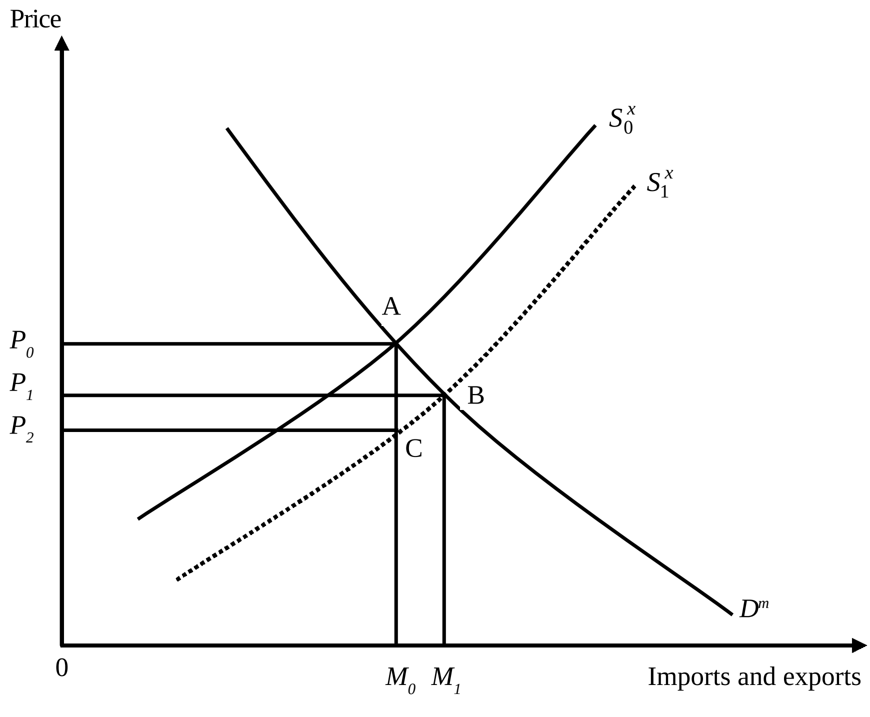


Net gains in exporting country: **CDEF**
Net gains in importing country: **GHIJ**

When the transportation and logistics costs decrease from t_c to $t_c^{'}$, the supply curve of the exported goods shifts to the right from (S_A+ t_c) to (S_A+ $t_c^{'}$) in the exporting country. Accordingly, the initial supply of the goods in the importing country also increases by the same amount, moving from S_{A+B} to $S^{'}_{A+B}$. The excess supply of exports in the exporting country and the excess demand for imports in the importing country both determine the final equilibrium price of the goods in both countries. At equilibrium, the amount of exports increases from FE to CD, while the amount of imports also increases from GH to JI. That is, $Q^X_{A1} = Q^m_{B1}$. In this case, both countries share the savings from the reduction in transportation and logistics cost, based upon the relative size of the exporter's elasticity of supply of the item and the other country's importer's elasticity of demand for the same item. The net benefits received by the exporting country are shown by the area of CDEF and received by the importing country by the area of GHIJ.

One can integrate the excess supply of goods in the exporting country and the excess demand for the same goods in the importing country in one diagram, as shown in Figure 3. The supply curve (S_0^X) is expressed as the supply of exports

Figure 3: Impact of transportation cost reduction on regionally traded goods



from the exporting country, which is derived from the domestic supply of exportable goods (S_A) in excess of the domestic demand (D_A) as shown in the left panel of Figure 2. Similarly, the demand curve (D^m) denotes the demand for imports in the importing country. The intersection of the supply and demand curves determines the international equilibrium prices of the goods at A, namely, P_0. This is equivalent, as shown in Figure 2, as the fob price in the exporting country (fob_{A0}) is the cif price in the importing country (cif_{B0}) adjusted for the price differential that is essentially the transportation and logistics costs (t_c) of the good between two countries.

After the implementation of the project, the total transportation and logistics costs between the two countries are reduced from t_c to t'_c, causing the supply curve of exports to shift downward from S_0^X to S_1^X. The cif price of the goods will initially be reduced to P_2. With a lower input cost for the exported good, exports will expand. The incremental amount of exports in fact comes from the expansion in domestic production as well as a cut back in consumption in the exporting country. Since the good is regionally traded, the lower prices will result in the additional quantity of exports supplied by the exporting country being equal to the additional quantity of imports demanded by the importing country. A new equilibrium price will be established at P_1, where the new equilibrium fob price in the exporting country (fob_{A1}) will be adjusted upward by amount P_1-P_2, and the cif price in the importing country (cif_{B1}) will be adjusted downward by amount P_0-P_1. The total amount of the good traded in equilibrium will now be M_1. The gains resulting from the reduction in transportation cost will be shared by producers of the exporting country as shown by the area P_1P_2CB and consumers in the importing country by the area of P_0P_1BA.

To quantify the relative gains, one can begin with the equality of the incremental exports and imports as a result of the implementation of a transnational transportation project. That is, for a pair of countries and each commodity we have:

$$\Delta Q_x = \Delta Q_m \,. \tag{1}$$

Let ε_x^S and η_m^D stand for the elasticities of supply of exports and demand for imports, respectively. Equation (1) can be written as follows:

$$\varepsilon_x^S\, Q_x\, (\Delta P_{fob}/P_{fob}) = \eta_m^D\, Q_m\, (\Delta P_{cif}/P_{cif}) \,.$$

Prior to the implementation of the project, $Q_x = Q_m$ and $P_{fob} = P_{cif}$ in equilibrium if the transportation and logistics costs between the two countries is ignored. Equation (1) can now be simplified below:

$$\varepsilon_x^S \ \Delta P_{fob} = \eta_m^D \ \Delta P_{cif} \ . \tag{2}$$

Since the reduction of the transportation and logistics costs (ΔT) equals the sum of the price reduction of imported goods and the price increase of the exported goods, that is,

$$\Delta T = \Delta P_{cif} - \Delta P_{fob} \ . \tag{3}$$

Substituting (3) in equation (2) yields the ratio of $\Delta P_{cif} / \Delta T$, which is the ratio of the price reduction to consumers in the importing country to the total transportation and logistics cost reduction. This ratio (λ_m) stands for the share of the total benefits received by consumers of the imported goods in the importing country:

$$\lambda_m = \Delta P_{cif} / \Delta T = \frac{\varepsilon_x^S}{\varepsilon_x^S - \eta_m^D} \ . \tag{4}$$

The quantification of this share has to be measured by the supply elasticity of exports in the exporting country and the demand elasticity for imports in the importing country. The larger the price elasticity of demand for imports, the smaller is the share of the benefits accruing to the importing country. On the other hand, the greater the elasticity of supply of exports the larger is the share of the benefits that would be received by the importing country.

Estimates of these elasticities are usually derived indirectly in the following manner. The elasticity of demand for imports in the importing country (η_m^D) can be expressed as follows:

$$\eta_m^D = \eta_I^D \frac{Q_T^D}{Q_m} - \varepsilon_I^S \frac{Q_T^S}{Q_m} , \tag{5}$$

where η_I^D: Demand elasticity for importable goods in importing country; ε_I^S: Supply elasticity of importable goods in importing country; Q_T^D: Total demand for importable goods in importing country; Q_T^S: Domestic supply of importable goods in importing country; and Q_m: Quantity of imports.

The elasticity of supply of exports from an exporting country (ε_x^S) can be derived below:

$$\varepsilon_x^S = \varepsilon_E^S \frac{Q_T^S}{Q_x} - \eta_E^D \frac{Q_T^D}{Q_x} , \tag{6}$$

where ε_E^S: Supply elasticity of exportable goods in exporting country; η_E^D:

Domestic demand elasticity for exportable goods in exporting country; Q_T^S : Total supply of exportable goods in exporting country; Q_T^D : Domestic demand for exportable goods in exporting country; Q_x : Quantity of exports.

For illustrative purposes, the respective demand and supply elasticities of a particular good and the respective ratios of total demand and supply to imports and exports in the importing and the exporting countries are assumed as follows:

$$\eta_I^D = -0.8,\ \varepsilon_I^S = 1.2,\ Q_T^D / Q_m = 2.0,\ Q_T^S / Q_m = 1.0$$

$$\varepsilon_E^S = 2.0,\ \eta_E^D = -0.9,\ Q_T^S / Q_x = 3.0,\ Q_T^D / Q_x = 2.0.$$

Substituting these parameters into equations (5) and (6), one would obtain: $\eta_m^D = -2.8$ and $\varepsilon_x^S = 7.8$. Thus, the share of benefits received by consumers of the importing country would be approximately 73.6% of the total reduction in transportation and logistics costs and producers in the exporting country would receive the remaining 26.4%.

V. An application to the Buenos Aires-Colonia bridge project

There is no highway or bridge directly linking Buenos Aires, Argentina, and Montevideo, Uruguay, because of the de la Plata River running between the two nations. At the present time, the only ways for passengers to go between these two big cities are by air, ferry or to derive a long route across a bridge far in the north. In the case of trucks, they also have to travel longer routes between Buenos Aires, Montevideo, and Sao Paulo in Brazil.

In 1998, a feasibility study was completed to evaluate the financial and economic implications of providing a permanent river crossing under all weather conditions between Punta Lara, Argentina, located about 40 km from Buenos Aires, and Colonia, Uruguay. The length of the proposed bridge is about 41 kilometers. The construction of the bridge and viaducts was proposed to begin in 1999 and to last four years. The project is estimated to cost approximately US$831 million in 1997 prices. Its overall economic net present value evaluated as of 1998 was in excess of US$500 million.[11] Once the bridge was built, a substantial amount of merchandise would be moved not only between Argentina and Uruguay but also between Argentina and Brazil via the bridge instead of the current modes of truck transport via longer routes or by marine or air. The volumes of passenger and cargo traffic

[11] International Institute for Advanced Studies, Inc. (1998).

are key determinants of the financial viability of the project. In the cost benefit analysis, an important question is who would benefit from the increase in cargo traffic as the result of the transportation and logistics cost reductions between Argentina, Uruguay and Brazil.

In order to quantify the potential economic benefits received by the importing or the exporting country, one has to first determine whether the goods being transported are internationally or regionally traded where the region is defined here as the Mercosur region.[12] It is difficult to find a particular good that is completely imported from a specific country. The question then becomes the extent to which the good imported from a country in the region should be considered a regionally traded good. This may also be influenced by the degree to which detailed commodity trade data can be obtained for analysis.[13]

For this analysis, we examined the detailed trade statistics by commodity for imports by Argentina from Brazil for 1995 and their percentage share in total imports and vice versa. In total, Argentina imported slightly more than 20 percent of its imported goods from Brazil in 1995. In terms of individual commodities, more than 50 percent of imports coming from Brazil included coffee, sugar/candy, other textile products, iron and steel and other metal products. For a conservative estimate, we assume that 75 percent of the imports must come from a single country to be considered as a regionally traded commodity in the Mercosur region. Using this criterion, only coffee and other metals are considered to be regionally traded because more than 80 percent of their imports came from Brazil. Thus the benefits of the reduction in transportation costs should be shared between consumers in Argentina and producers in Brazil.

Brazil is a relatively large country with a volume of imports equal to about one and a half times that of Argentina. About 10 percent of Brazil's imports are from Argentina. For individual commodities, more than 50 percent of the Brazilian imports coming from Argentina are meat, cereals, and furs and leathers. For none of these commodities is the share being imported from Argentina greater than 60 percent, hence, no single good is regarded as being regionally traded. For Uruguay no single commodity is primarily imported from Argentina and therefore, all commodities imported by Uruguay from Argentina are considered internationally traded.

To quantify the benefits of regionally traded goods, one has to estimate (λ_m) in

[12] The Mercosur region includes Argentina, Uruguay, Brazil and Paraguay.

[13] In their recent paper, Ferra and Botteon have examined this issue under a variety of conditions. Details can be found and Ferra y Botteon (2001).

equation (4). Few satisfactory estimates of the elasticities of demand and supply of particular goods are available in the literature. A range of elasticities is therefore assumed. Using the information available to us on domestic production and trade statistics we made estimates of the ratios of the total demand and domestic supply of importable goods to the amount of imports of these items into the importing country. In a similar fashion estimates were made about the ratios of total supply and domestic demand of the exportable commodities to the amount of exports of these commodities made by the exporting country.[14]

The shares of benefits accruing to the importing countries for different combinations of market parameters in the importing and exporting countries are simulated and presented in Table 1. The results indicate that the share of benefits received by the importing country is likely to range from 57% to 81% of the total benefits. For the purpose of this analysis, we assume that the benefits resulting from savings in transportation and logistics costs for regionally traded goods will be shared by the importing and exporting countries in the ratio of 70 to 30.

In terms of measurement, the benefits for diverted traffic are calculated as the amount of savings in transportation and logistics costs times the traffic. For induced and generated traffic, the benefits are estimated by the multiplication of one half of the transportation and logistics cost reduction by the increase in incremental traffic.

The volume of traffic and the size of the benefits accruing to producers and consumers are also influenced by the amount of toll charged for trucks. In the base case, it is set at US$225 per truck because the traffic demand model reveals that toll revenues from cargo are maximized at this level, with the increase in the toll being offset by a corresponding decline in traffic captured by the bridge.[15]

The net benefits for this base case are presented in Table 2. As was presented in Sections II and IV, these benefits are equal to the sum of the benefits received by

[14] A large amount of the detail in terms of market and economic exchange rates, and discount rates have been omitted from this study but can be found in the original feasibility study completed by the authors. See International Institute for Advanced Studies (1998).

[15] The base case refers to the scenario that over the life of the project, annual GDP growth rates for Argentina, Uruguay and Brazil are 4%, the bridge tolls are set at US$60 for passenger car, US$360 for passenger bus and US$225 for truck, and the ferry response to the project is assumed that the ferry operators operate only two routes between Buenos Aires and Montevideo and between Buenos Aires and Colonia. The tolls are indexed for domestic inflation in the respective countries. It may be noted that the toll revenues for cargo are virtually unchanged within a range of toll between US$200 and US$250. Simulations of cargo traffic can be found in Science Applications International Corporation (1997).

Table 1. Estimation of the shares of gains from the transportation cost reduction for regionally traded goods

A. Exporting country

Cases	Parameters				Estimates
	ε_E^S	η_E^D	Q_T^S / Q_x	Q_T^D / Q_x	ε_x^S
A_1	2	-1	3	2	8
A_2	5	-1	3	2	17

B. Importing country

Cases	Parameters				Estimates
	ε_I^S	η_I^D	Q_T^S / Q_m	Q_T^D / Q_m	η_m^D
B_1	2	-1	1	2	-4
B_2	2	-2	1	2	-6

C. Share of benefits received by importing country

Cases	Share percentages
A_1B_1	66.67%
A_1B_2	57.14%
A_2B_1	80.95%
A_2B_2	73.91%

diverted and generated traffic as the result of the reduction of transportation and logistics costs.[16] Since most of the shifted goods are traded internationally, producers in Argentina and Uruguay would receive benefits with a present value as of 1998 of approximately US$47.0 million and US$41.8 million, respectively, as a result of freight traffic cost savings.[17] These savings are over and above the amounts paid as bridge tolls. For the regionally traded goods such as coffee and

[16] The benefit may include the value of the tolls due to the fact that the marginal cost of the bridge is close to zero. However, if the investors are foreigner, the tolls paid to the foreign concessionaire should be netted out of benefits in order to arrive at the net economic benefits to the respective country.

[17] The project's life is considered 30 years after the bridge opens to traffic in 2003. The real exchange rates and the trade patterns among countries involved are assumed to remain unchanged over the life of the project. As a result, the expected traffic and the associated benefits and

Table 2. Present value of economic benefits received by various countries (thousands of 1998 US dollars)

	Internationally traded goods	Regionally traded goods	Total
Argentina	46,952	227	47,179
Uruguay	41,767	0	41,767
Brazil	73,835	97	73,932

metals imported by Argentina from Brazil, the importing and exporting countries would share the modest benefits in the amount of US$0.2 million and US$0.1 million, respectively. Finally, producers in Brazil will also benefit with a present value of US$73.7 million for internationally traded goods because of increased shipments of these commodities from Brazil to Argentina via the bridge.

VI. Concluding remarks

This paper has developed an analytical framework to evaluate the primary beneficiaries of cargo traffic generated by transnational transport projects. In the transportation economics literature, the economic impact of infrastructure projects on cargo traffic has not been developed as fully as for passenger traffic. In much of the previous literature it is often assumed that consumers of the traded goods would receive the full benefits from the reduction in logistics and transportation cost. However, this paper has shown that whether the goods are traded internationally or regionally is a key factor in the allocation of the economic benefits arising from the reduction in the cost of cargo transportation.

When the goods are internationally traded, producers of the exporting country within the region would benefit from the savings in transportation or logistics cost between the two neighboring countries. In the case of regionally traded goods, producers in the exporting country and consumers in the importing country will share the benefits. The distribution of the benefits depends upon the elasticities of supply of exports in the exporting country and the elasticities of demand for imports in the importing country.

In reality, there are few satisfactory estimates in the literature of the demand

costs for future years are calculated accordingly. Moreover, the economic discount rates used to discount the net economic benefits over the life of the project are 11.0 percent real for Argentina and Brazil and 10.5 percent real for Uruguay. Details of these estimates can be found in International Institute for Advanced Studies, Inc. (1998).

and supply elasticities. We have constructed a range of cases in order to test the sensitivity of the share of economic benefits received by the respective parties. The case of the Buenos Aires – Colonia Bridge project is an application of this methodology. The total benefits net of toll charges from cargo are equal to approximately 18 percent of the present value of the investment costs of the bridge. These estimates address some of the most debated questions surrounding the decision whether or not to implement this project. It is important to point out that Brazilian producers are a major beneficiary group of the Buenos Aires-Colonia Bridge. A mechanism should be found that would enable Brazil also to participate in the financing and implementation of the bridge.

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