The Challenges of Cost-Benefit Analysis (CBA): A Search for the Transmission Mechanism of Transport Effects

Guiding Notes

Fred Amonya
English-Speaking Secretary
PIARC TC 1.4
Fred.Amonya@lyciar.com

The CBA framework weighs social surplus of a public facility against the capital expenditure (public investment). Its appeal is the apparent simplicity and intuition. However, inputs to CBA are often unclear – leaving the analysis open to the abuse of heuristics (practices are transferred from one project to the next without deep examination).

For a generic case of infrastructure managed by the public sector, with users paying fees at point of service, the CBA framework hinges on Equation 1.0.

\[ SS = CS + R - G - \alpha G \]  

Where SS is social surplus, CS consumer surplus, R revenue to government, G is public sector cost (capital expenditure and subsidies), and \( \alpha G \) is financing cost of G.

Consumer surplus is a derivative of the demand function. Assuming constant price (fare) elasticity [of demand] – that is, power demand function:

\[ CS = \lim_{\eta \to 0} \int_{P_0}^{P_0 + \eta P_0} Q_0 \left( \frac{P}{P_0} \right)^{-\varepsilon} dP \]  

Where:
Under variable elasticity and exponential demand function:

\[
\begin{cases}
Q = \kappa P^{-\varepsilon} \\
\kappa, \varepsilon > 0 \\
\frac{\partial Q}{\partial P} = -\varepsilon \kappa P^{-(1+\varepsilon)}
\end{cases}
\]

Equations 1.1 and 1.2 highlight the need to establish an appropriate demand function and elasticity regime. Often (and particularly in developing countries), this challenge is made worse by a lack of appropriate data on user behaviour. Consequently, practitioners resort to heuristics.

More pertinently, CBA above ring-fences the immediate infrastructure environment (corridor) then it attempts to compute effects arising from an investment. In other words, it bases on partial equilibrium. A move towards general equilibrium has prompted the meso models, which aim to capture network effects. However, the macro models are even closer to general equilibrium. They seek to compute the effects of transport (and infrastructure in general) on the entire economy.

However, the macro models do not attempt to trace the primary effects (i.e. CBA effects) of transport through the economy. Instead, they use aggregate data from input-output tables for the economy, at the finest, but more often cross-country data. This gap (a failure to trace transport effects) seems more a lack of data than analytical frames or computing prowess. As the body of data improves, greater attention should be paid to the transmission effects of transport, yielding new theoretical frames.

Are we part of the refinement process?
Bibliography

