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Title **The social value of commuting travel time savings**

Track General Papers

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Abstract Standard cost-benefit analyses of transport investments and policies do not capture benefits of increased accessibility that are external to the traveler. For example, the presence of income tax wedges and agglomeration effects on productivity (e.g. through knowledge spillovers) will mean that an increase in accessibility may cause benefits in the form of increased tax revenues and higher average wages that cause benefits that are not captured by standard cost-benefit analyses. While this has been recognized for a long time, the potential problems this causes for transport project evaluation have been receiving increased attention the last few years. There is an extensive literature attempting to quantify how accessibility affects productivity, wage rates etc., and some of the results from this stream of research are being used in applied project evaluation (in particular in the UK). However, less attention has been given to the nature and extent of the overlap between standard CBA and the benefits calculated in such accessibility/productivity relationships.

This paper discusses this issue, illustrating certain mechanisms and exploring their magnitude in a stylized microeconomic simulation model. Each worker in the stylized city maximizes a utility function taking leisure time, time spent traveling, residential lot size and consumption as arguments, subject to monetary and time budget constraints. In addition, each worker has idiosyncratic preferences for each potential workplace and residential location. Workers choose residential zone, workplace zone, working hours and lot size, taking the land price and the wage rate in each zone as given. Land prices are determined so demand for residential land equals the (fixed) supply of land in each zone. Travel times and travel costs between zones are constant. By including time spent traveling in the utility function, we can model the effects of changing the comfort of traveling.

Each worker is offered an hourly wage rate in each workplace zone, with wage rate offers varying idiosyncratically between workers. Workers pay income tax on their salary. The mean wage rate increases with the number of workers employed in the zone, mimicking agglomeration effects on productivity in each workplace zone (e.g. through knowledge spillovers or economies of scale). This means that the model includes three potential sources of agglomeration effects, or more specifically, three mechanisms that cause aggregate production per worker to increase with accessibility. First, a decrease in generalized travel costs will improve matching between workers and workplaces: workers will commute longer distances to find high-paid jobs. Second, if more workers choose to work in the most dense workplace zones, average wage rate offers will increase. This may not necessarily happen, however. Third, a decrease in travel times frees up more hours that can be spent working, increasing aggregate production in the city. All of these mechanisms contribute to generate the well-known relation between high accessibility/density and high wages/productivity. The term “agglomeration effects” is often used somewhat loosely for all of these mechanisms. In this context, it should be emphasized that the different sources of increases in production are captured to different extents in a standard CBA.

The parameters of the model are calibrated to replicate realistic location and commuting patterns, and typical elasticities of variables such as travel time and travel cost. The parameters are then varied over various ranges to check the robustness of our general conclusions.

We use the model to explore how much of the total benefits of a transport improvement are captured in standard CBA under various circumstances. In other words, we study the nature and extent of the overlap between standard CBA and the so-called "wider economic benefits" (WEB). The WEBs are in this case restricted to imperfections on the labour market (income taxes, agglomeration benefits): we do not model, for example, imperfect competition between firms or in transport operator markets. We study several different kinds of improvements, such as shorter travel times, decreased travel costs, and improved comfort during trips, and also various kinds of transport-related policies, such as a simple variant of congestion pricing (trading a tax on travel costs for lower travel times) and tax deductibility of travel costs.

The first contribution of the paper is the discussion of the exact nature of the overlap between the WEBs and standard CBA. The main theme of the paper is then showing how this overlap will be different depending on the type of transport project (say, reductions of travel times versus increased travel comfort) and the relative contribution of the different sources of "agglomeration effects" (here interpreted as the relationship between accessibility and production per worker that is observed at the aggregate level). In other words, an observer that only has access to aggregate data about the transport improvement, and aggregate observations about the relationship between accessibility and production per worker, will not be able to determine how large the overlap between WEBs and CBA is, or in other words, how large share of total benefits that are captured by standard CBA. To solve this condundrum, one needs to take into account exactly what the underlying sources of WEB are; aggregate observations of the relationship between accessibility and productivity will not suffice.