



Transit investment and economic development

Roger Vickerman

Centre for European Regional and Transport Economics, University of Kent, Canterbury, CT2 7NP, UK

ARTICLE INFO

Article history:

Available online 1 March 2009

Keywords:

Investment
Urban land rents
Economic development
Wider economic benefits

ABSTRACT

This paper describes the development of approaches to analysing the links between investment in transit and economic development. It indicates the need to bring together disparate approaches from urban economics and transportation economics to get a full understanding and uses recent results on agglomeration economies to present a more rigorous model of the wider economic benefits of transit investment. Although the evidence increasingly points towards identifiable benefits over and above those captured in conventional transport cost-benefit analysis, the chapter counsels against the assumption of simple rules.

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1. Introduction

The role of transport in the urban economy has been the subject of much controversy. In this paper we attempt to sort out a coherent story of the role which transit investment can play drawing on both the classic analyses of this subject and more recent research. Whilst there is no denying that improved transportation will make the wider urban economy function more efficiently, there have been significantly different views on the extent to which there are any wider benefits which cannot be captured simply by those benefits accruing directly to users. Thus one argument would be that, whilst transit investment may have significant impacts on urban form and growth, any investment appraisal exercise can safely ignore these wider effects. On the other hand it is argued that the existence of increasing returns to scale in the activities which use transport will lead to agglomeration effects which are not so captured and hence there is a need to measure wider economic benefits separately. The secondary question is whether such effects are consistent between different urban areas and types of investment, such that a simple multiplier or add-on can account for these wider economic benefits, or that all such effects are case specific.

One of the problems for the development of a consistent analytical approach has been the differences in treatment by urban economists and transport economists arising from their different perspectives and objectives. The urban economist's interest has been in transport as a determinant of land use and urban growth and economic development (e.g. Fujita, 1989). Accessibility has been the key to where within the urban area different activities will locate and hence determines urban form. Lower transport costs imply that the city can grow and hence transport investment can be

a determinant of city size. The transport economist's interest is more focused on efficient use of the urban transport infrastructure and the cost which congestion imposes when the infrastructure does not expand with demand (e.g. Small and Verhoef, 2007). Secondly the transport economist has a primary interest in the appraisal of urban transport investments.

Past work by each group has frequently ignored contributions of others leading to a confused view of the interface between the transport system and the urban economy. However there are common elements in their approaches which can provide the basis of a more integrated approach. The key to this is in the evaluation of accessibility. Transport economists have had a long-stranding interest in how transport users value the time savings which arise from transport investment. Urban economists also recognise that the accessibility of a location determines its value, so that as transport improves the implicit rental value of land at any location will rise with consequences for the optimal use of that land. The question is therefore whether transport user benefits are an accurate measure of the wider economic benefits which reflect the use to which the improved transport is put? Or should we use the valuation provided by the changing land values as a better measure of total economic impact. Obviously put this way the two cannot be added together as they will involve double counting. But does either of these measures give a true estimate of any wider economic impacts, except in a world where there is perfect competition in all transport using activities. Once we recognise the existence of increasing returns and imperfect competition, such that prices do not directly reflect marginal costs, changes in transport prices may not pass through smoothly to be reflected in the final prices of activities.

Recent work has improved our understanding of the way in which accessibility affects the performance of firms and, perhaps crucially, of labour markets, enabling us to provide a better account of the way investments in transport will impact on the overall

E-mail address: R.W.Vickerman@kent.ac.uk

urban economy (e.g. Graham, 2007; Patacchini & Rice, 2007; Rice & Venables, 2003; Rice, Venables, & Patacchini, 2006). However, the empirical evidence remains problematic for three main reasons. First, work in this area is plagued with questions of endogeneity and causality, essentially whether improved transport leads to improved economic performance or is a consequence of it (see, for example, the discussion in Banister & Berechman, 2000). Secondly, there are conflicting stories between research based on the macro-economic relationship between flows of investment and aggregate output which tend to demonstrate some fairly strong positive links and micro-based estimates which present a more confused picture of the way the improved transport impacts on behaviour (e.g. Vickerman, 2007b). Thirdly, the interrelationships and spillovers between different areas have to be taken into account, the way in which the improvement of transport in one jurisdiction can have both positive (complementary) impacts on adjacent areas and negative (substitution) impacts (e.g. Boarnet, 1998). Individual urban areas cannot be taken in isolation as transport improvements, even to highly localised transport systems, can have profound influences over a very large geographical area.

This will have policy implications. If there are significant negative effects leading to underinvestment in transport infrastructure this could lead to lower growth and congestion whilst overinvestment could lead to problems for public budgets and negative externalities associated with over expansion.

In this paper we shall consider these various competing influences in the context of urban transit investments, developing models which allow for increasing returns, imperfect competition and spillovers between areas. The chapter deals in turn with an overview of the links between urban transit and the urban economy, the determinants of land rents and the urban land market, how the urban transport problem relates to this structure before looking in more details at the agglomeration issue. Following the theoretical analysis we shall look for evidence, taken from three broad types of study: macro studies which estimate relationship between macro-economic aggregates; market studies which look for the way transport impacts on individual markets, and particularly the labour market; and micro studies, which focus on examining behaviour within organisations. The chapter concludes with some implications for appraisal methods and for policy.

We face the usual definitional problem of what constitutes urban transit. We have tried to confine the discussion to the consequences of intra-urban travel, or at least travel within a defined urban labour market. However, it is recognised that the growth of mega-cities and the increasing interaction between urban areas makes this a rather fluid concept. Even some international transport has some urban characteristics with the growth of long-distance commuting (weekly migration). To simplify the discussion, however, we will assume in the theoretical sections that we are dealing with a conventional defined and independent urban area and draw primarily on empirical evidence from studies of such areas to illustrate issues.

2. Transport, accessibility and the local economy

Transport has a multiple nature in the urban economy. First and foremost, transport is a derived demand, transport is only required to overcome the spatial separation which is inherent in the urban economy; the level of demand will depend on the level of activity requiring transport. However, transport is also a substitutable input; as transport becomes cheaper firms and households will substitute transport for other (relatively more expensive inputs). Hence both firms and households may move to more peripheral locations (or even right out of a city) to overcome the higher rents of more central locations (and increasingly some of the higher external costs associated with congestion), pollution and crime in

such areas. Or conversely they may use improved transport to enable them to enlarge market areas to enhance profitability to pay for the higher land (and labour) costs associated with central locations. Transport can thus become an engine of growth in the city by which a city with better transport can remain competitive as it attempts to grow relative to other cities in the urban system.

Accessibility is a measure of the price of gaining access to markets; for firms this is the market for both outputs and inputs (including labour); for households this is the access to jobs and to the locations for other activities. The potential accessibility of a location depends on an activity function which measures the activities which are to be reached and an impedance function which measures the cost of reaching them. This is conventionally expressed as:

$$A_i = \sum_j W_j^a \exp(-\beta c_{ij}) \quad (1)$$

where A_i is the accessibility of location i , the W_j are the weights associated with the activities available at a range of destinations j , and the c_{ij} are the generalised costs (including all money and time costs) of travel between i and j . Improvements to transport can have three sorts of effect here. Changes on one link will affect the distribution of trips between different modes on that link and also the distribution of all trips between i and the various j s. However, the reduction of costs on one link will reduce the overall costs of accessing activities and hence raise overall accessibility, which may increase the aggregate demand for transport from i because it is now more accessible. This third impact is often overlooked in the transport model which tends to assume a fixed volume of trips in the system.

This is perhaps the most useful way of measuring accessibility, following the work of Hansen (1959), since it can be clearly related to the concepts of generalised cost included in most transport models. There are, however, alternative ways of representing accessibility such as the concept of daily accessibility (Tornqvist, 1970) which looks at the population accessible to a location within a certain travel time or the time-space mapping developed by Spiekermann and Wegener (1994) (for a discussion and comparison see Vickerman, Spiekermann, & Wegener, 1999).

Considering an urban area as a whole we need to distinguish two forms of accessibility. External accessibility is that which relates an urban area to other cities and regions. Improving accessibility to other areas can enhance a city's export performance by reducing the costs of accessing markets, but at the same time it lowers the cost of access **from** other cities and hence increase competition for local firms. This same process can apply to labour markets in which improved rail access, for example, to the city can enlarge the relevant labour market for local firms which would have the effect of reducing wage pressure. However, it could also increase demand for resident labour from other cities and hence result in bidding up wages. This is sometimes referred to as the 'two-way road' effect illustrating that improved transportation links operate in two directions (SACTRA, 1999). Which direction has the stronger impact will depend on such factors as the scale and scope economies which existing firms can exploit in each city.

Internal accessibility relates to the performance of the city's own transportation networks and the impact which this has on the overall economic efficiency of the city. As we shall argue in more detail later a better transport system can improve labour supply by reducing the time spent commuting thus enlarging relevant labour market areas and enhancing productivity. The way in which the city's internal transportation network relates to the external network is also important; poor connections between the local transit system and inter-city rail or airports can impact on both mode choice and overall transport costs.

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