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Effects of transportation barriers on geographic asymmetries in labour markets☆

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ABSTRACT

The main motivation of this paper is to derive testable predictions on how investments in transport infrastructure might influence spatial wage disparities and commuting flows in a region where a topographical barrier separates the geography into two areas. Wages and commuting flows result from a labour market equilibrium with duopsonistic wage-setting. The results provide important input both for the conduction of cost benefit assessments, and for a discussion of wider impacts of transport investments. The analysis distinguishes between alternative types of equilibrium solutions, according to the direction of commuting flows between central and peripheral areas of the region, and the analysis also derives the conditions under which each type of equilibrium solution will be realized.

1. Introduction

It has long been claimed that traditional cost-benefit analysis is an inadequate tool in evaluating the economic impact of investments in transport infrastructure, and that such cost-benefit assessments may lead to underinvestment in for example the road network. Support for this view can for instance be found in different OECD reports. OECD (2002, page 7) concludes that traditional cb-analysis does not account adequately for regional impacts arising from the investment, and demands analyses which are focusing more on wider impacts, beyond direct user benefits. According to the summary of the discussions in OECD/ITF (2008, page 14), "wider impacts are those not captured in standard cost-benefit analysis, including effects relating to returns to scale, agglomeration, thickening of labour markets and market power, as well as firms' and households' behavioural adaptations to changes in transport costs". OECD/ITF (2008) further concludes, on page 17, that microscopic approaches are scarce, and claims that this is unfortunate, but "not surprising, given that these types of responses are difficult to integrate in microeconomic frameworks that focus on market interactions".

This paper contributes with a theoretical, microeconomic, analysis of how the impact of investments in transportation infrastructure depends the strategic labour market behaviour of firms. As such, the paper conducts a wider impact perspective, focusing on the impact of market power, behavioural adaptions, labour markets, and the spatial dimension. We focus on the outcome of spatial competition for labour in an area with barriers in the road transportation network. One objective of the analysis is to focus on how geographic asymmetries in labour markets can be created or exacerbated by transportation barriers, and on how bridges and ports affect the equilibrium outcome of the competition for labour. The analysis introduces a possible explanation of spatial wage disparities, that has not yet been widely discussed in the literature. It is also an important objective to demonstrate how spatial wage disparities and interarea commuting flows can be simultaneously determined as a result of the spatial competition for labour. This contributes to a wider interpretation of distance deterrence parameters than is usually found in the spatial interaction literature.

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Hence, the primary objective of the analysis is to contribute with plausible explanations for spatial wage disparities and commuting flows, and to identify and guide important issues in empirical research and transportation policy.

There is a rich literature both on spatial wage disparities and on how investments in transport infrastructure affect core/peripheral relations in a geography. Most of this literature employs a relatively macroscopical perspective, however. A dominating part of the recent literature on core/peripheral relations in a geography is based on the New Economic Geography theory, discussing inter-regional competition and integration issues of relatively large regions, see for instance Lafourcade and Thisse (2011). The literature on spatial variation in wages is in general focusing on disparities between rather than within regions. Combes et al. (2008), for instance, document the considerable extent and persistence of wage disparities between employment areas in France. They distinguish between three broad sets of explanations. One is spatial differences in the skill composition of workers, based on the increasing body of evidence that workers with high human capital and productivity tend to be more migratory than lower human capital workers, see for instance Faggian and McCann (2009). Another explanation is interpreting wage disparities as compensations for local amenities variations in an equilibrium explanation, corresponding to the basic idea in the Roback (1982) model. Finally, Combes et al. (2008) introduce interaction-based explanations, stemming from the size of labour markets, matching issues, and other urbanization and/or localization economies.

We do not enter into a general discussion of spatial wage disparities. Employing a microscopical perspective, we are studying wage disparities between areas within a region, considering commuting rather than migration to be the relevant type of spatial interaction response. The literature offers a lot of support for incorporating commuting in explanations and predictions of a regional adjustment process (see for instance Sandow (2008) and Partridge et al. (2009)).

Concerning our objective on the impact of geographic asymmetries, Combes et al. (2008) mention bridges and ports as examples of non-human endowments that may affect wages. We focus on how topographical characteristics and the road infrastructure affect wages through the local competition for labour. While a lot of the literature on spatial wage disparities is formulated for competitive labour markets, the motivation of this paper is to make evident how such asymmetries may follow from a scenario with local market power. As discussed by for example Bhaskar et al. (2002), employers in many cases have market power in the setting of wages, and wage dispersion among similar workers is a real phenomenon. Workers are spread throughout a variety of residential locations, with different commuting costs to the alternative work destinations. This represents sources of market power for employers. The spatial dimension contributes to justify the assumption of duopsonistic rather than competitive wage-setting. As another justification, the number of firms could be restricted by resource ownership. Relocations and/or entries of new firms may for instance be deterred by costs of procuring suitable land.

In some respects the analysis to follow corresponds to the Hotelling-tradition in the literature on spatial competition (Hotelling, 1929). One kind of extension would be to allow for competition in both prices/wages and locations, like, e.g., in Anderson and de Palma (1992), and in Tabuchi (1994), who also allow for a two-dimensional space. Kaas and Madden (2006) offer an example of a Hotelling duopsony model in which firms choose their location at stage 1 and wages at stage 2. It would be interesting to study wage sub-game equilibria in a setting with endogenous firm locations, but this is beyond the scope of this paper. The possibility is also ignored that the two firms can collude to reduce wages through a monopsonistic market solution.

A theoretical analysis of how wages and commuting flows are simultaneously determined from the competition for labour, ideally should be supported by references to empirical evidence. Unfortunately, the literature of relevant empirical studies is scarce. Based on a cross-section study from the Baltic countries, Hazans (2004) finds that commuting reduces urban-rural wage disparities. This study refers to relatively large regions with complex transportation infrastructure, however. The theoretical study to follow employs a more microscopic perspective, calling for studies focusing on how wages and commuting flows respond to changes in the terms of transportation in areas with a topographical barrier. Numerous scenarios like this can for instance be identified in coastal areas of Norway, see McArthur et al. (2010, 2012).

Different characteristics of the geography and the transportation network are represented by separate parameters in our analysis. This involves distances between the firms, distances to and from the topographical barrier, traveling expenses, etc. We aim at discussing the impact of such parameters, and also at offering an interpretation of the distance deterrence parameter in commuting. This parameter is usually interpreted in terms of individual travel decisions in the spatial interaction literature. The analysis to follow aims at demonstrating that it also reflects effects of wage-setting in a labour market equilibrium.

Finally, an objective of the analysis is to contribute with useful qualitative input to the evaluation of transportation investment programmes. It is, for instance, demonstrated how the economic evaluation of different projects are interdependent. The analysis points at the need for coordinating interdependent investments in road infrastructure. The analysis further demonstrates that the introduction of road prices may reduce benefits resulting from a better integrated labour market. In general, the analysis covers labour market effects of road pricing, also in geographies with no barriers and asymmetries. According to the analysis, however, there is also a possibility that a topographical barrier and/or a toll charge may promote a market solution with two firms rather than a monopsony.

The modeling framework is presented in Section 2. Section 3 focuses on two alternative types of stationary points, defined by the direction of commuting flows across a barrier. A third type of solution corresponds to a situation with no interarea commuting. In Section 4, we derive the conditions under which different types of equilibria are realized, while Section 5 offers comparative static results for equilibrium solutions involving interarea commuting. The analysis demonstrates how equilibrium solutions reflect characteristics of the geography and the transportation network, and Section 6 focuses on how investments in transportation infrastructure affect spatial wage disparities and interarea commuting flows. Section 7 addresses theoretical issues, policy implications, and modeling aspects. Finally, Section 8 offers concluding remarks.

2. Model formulation and labour supply functions

In the analysis to follow, two firms are assumed to demand a specific category (profession) of workers. The locations of the firms are assumed to be predetermined, on separate sides of a topographical barrier, for instance a fjord or a lake. The firms are competitive, price-takers, in the market for their products, while production, employment, and profit result from the wages offered. Each firm's management is assumed to have full information on labour supply, transportation costs, and the production functions of both firms. In addition, both firms know that this information is available for all market participants. Wages net of commuting costs are assumed to be high enough to prevent voluntary unemployment.

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