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Applications of transport economics and imperfect competition

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ABSTRACT

The great majority of analyses made in transport economics use, explicitly or, more often, implicitly, the common assumption of perfect competition. This is the case, for instance, when infrastructure projects are evaluated using the mere sum of the surpluses of transport users and providers. Even when putting aside the question of externalities such as noise, safety or environmental quality, the real chain of economic interactions that takes place in transport provision or downstream of transport provision is not taken into account. Surely enough, describing and simulating this chain could be quite complex. Nevertheless, it is not uninteresting to try to estimate if it does make a big difference or not to make this approximation. The paper makes such an attempt for two broad kinds of applications of transport economics:

Transport pricing: building on a generic formulation of imperfect competition pricing behaviour that encompasses a broad range of competition situations, and taking the railway case as a benchmark, simulation results give an idea of the order of magnitude of optimal tariff variation when perfect competition is assumed as compared to "real" competition situation. These results are completed and somewhat mitigated by observations on the final welfare impact of this discrepancy.

Project assessment: the consequences of imperfect competition situations are analysed, first, for transport provision, discussing the diverse levels of representation of economic interactions that are used in usual project assessment. Second, we use both theoretical and heuristic formulations of the interactions that take place within simple chains of economic actors downstream of transport provision. Besides pure "short sighted" profit maximisation and the base case of perfect competition, the more general imperfect competition modelling mentioned above is completed with simple "surplus sharing" behaviours.

As a whole, imperfect competition effects seem to be high within the transport sector and should be treated, both for project assessment and for infrastructure pricing. The case is less clear as regards imperfect competition downstream of transport but still deserves attention. The numerous simulations and the economic analyses performed lead us to give hints for improving some of the current practices of economic assessment concerning infrastructure pricing and project assessment.

1. Introduction

The great majority of transport infrastructure decision-making recommendations use, explicitly or more often implicitly, the general assumption of perfect competition. This is the case of the marginal cost pricing principle or, in the case of project appraisal, when infrastructure projects are evaluated using the mere sum of the surpluses of transport users and providers. The chain of economic interactions that takes place downstream of transport provision is generally assumed to be in a classical first best situation, run by perfect competition, with perfect taxes, no externalities and constant returns to scale. This assumption is necessary for the validity of the usual partial equilibrium analysis which underlies both usual pricing doctrines and cost-benefit analyses (see for instance Lesourne, 1960 quoted by Quinet, 1998 and Quinet & Vickerman, 2004). As soon as these assumptions are not fulfilled, the formulae and criteria become much more complicated. This point is exemplified by a rich literature, reviewed for instance by Vickerman (2007).

The sources of imperfection are manifold and each of them is a cause of departure from the usual practices. A first type of imperfection is related to equity concerns which undermine the usual assumption of optimal distribution obtained by transfers through non distorting taxes; for instance Mayeres and Proost (2001) and Mayeres, Proost, Quinet, Schwartz, and Sessa (2001) have taken into account the consequences of imperfect taxes on equity and environmental externalities. Other imperfections are

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linked to the so-called agglomeration externalities, which lead to a lot of recent developments both on the theoretical and on the practical sides (for instance Graham, 2007). Increasing returns to scale in the whole economy are another source of imperfection which can lead to two different developments; first, along with spatial consideration, these increasing returns to scale are the core of the new economic geography and have consequences on locations and relocations, with consequences on welfare calculation (see for instance Behrens, Gaigné, & Thisse, 2009 for a recent contribution in this field); second, even without spatial consideration, increasing returns to scale induce market imperfections such as the emergence of monopolies or oligopolies leading to departures from the competitive assumption and the first best results it implies.

This text considers neither spatial consequences nor agglomeration externalities as a lot of attention has already been paid to these effects, both on the theoretical and on the applied sides.

It addresses the consequences of imperfect competition in the economy, and this choice is motivated by several reasons; first, it has not been so extensively addressed; second, it is possible to design simple models which allow taking a view of the magnitude of these effects; third, market imperfections of that kind are widespread, especially in the transport sector; fourth, competition may vary a lot among the modes and, if these differences are not taken into account, it may lead to large distortions between modes and errors in practical decisions.

This text concentrates on two issues, infrastructure pricing and project assessment. The second section explains the sources and kinds of market imperfection under consideration, and presents hypotheses about firm behaviours. The third section addresses the consequences of market imperfection on infrastructure pricing. The fourth section analyses the consequences of market imperfections on project assessment, again in the transport sector, while the fifth one deals with market imperfections outside the transport sector and their effects on project assessment.

2. Market imperfection and firm behaviour

2.1. Situations of market imperfection are frequent, especially in transport

Market imperfection can be assessed either from a theoretical point of view through the number of competitors or from an empirical point of view through the Lerner index.

From a theoretical point of view, transport markets are generally characterised by the small number of competitors. Let us consider the rail markets: for long distance passenger traffic, there is in general just one rail operator (RO), the competition is intermodal, the competitor being air transport, and it often happens that there is just one or a few air competitors on each origin–destination relation. For medium and short distance passenger traffic, there are in general just one or very few competing rail operators, and the main competition comes from road transport. Road transport is generally regarded as being operated under approximately pure competition conditions between road hauliers, having no strategic behaviour[1]: then, in the case where one RO is competing only with road transport, everything looks as if the RO were a monopoly. On-track competition is more frequent in freight transport, but here again, the competitors are just a few on each single relation.

From an empirical point of view, imperfect competition is characterised by the fact that the Lerner index (the relative difference between price and marginal cost) is different from zero. This fact is well acknowledged for all sectors. Among the most recent studies let us quote Christopoulou and Vermeulen (2008) whose international survey displays notable mark-up levels in the Euro area and the US over the period 1981–2004. Still, one may argue that the deregulation of many sectors may have lead to much lower mark-ups in a more recent period. Bouis (2008) does cover a more recent period on several OECD countries, and obtains average mark-ups in the (rounded) range 1.1 to 1.2, which corresponds to Lerner indexes of about 0.1 to 0.2; sectoral mark-ups may go up to 1.5 and above. The difference between prices and costs is also well documented in transport, for instance in the case of air or rail (Ivaldi & Vibes, 2008 for instance).

2.2. How far is the market power exerted?

It is then highly plausible that market power does exist. The problem is, then, to estimate to which extent this power is exerted.

What is especially important for our concerns, pricing and project assessment, is the firms' pricing reaction to a variation in costs. The literature on this topic has been developing, among other fields, for international trade and notably, closer to our transport field, for the automotive industry. What comes out of the empirical analyses is that, as Gron and Swenson (2000) tell: "empirical research on cost pass-through documents that firms in imperfectly competitive markets often pass-through less than 100% of the cost shocks they experience". This is backed also by observations in the transport industry (Rolin & Sauvant, 2005). Classical results of such studies display a cost pass-through between 0.5 and 1, that takes several months or even 1 or 2 years to accomplish. We will come back to this point in sections 4 and 5. This result is often thoroughly explained by the classical formulae. When the market power is fully exerted, the Lerner index should obey the following well-known formula:

$$L \equiv \frac{p-c}{p} = -\frac{1}{\varepsilon} \tag{1}$$

Where ε is the elasticity of the firm (equal to the elasticity of the market in case of monopoly).

It often happens that these classical formulae do not fit the facts. It is the case for instance when, in situation of monopoly, the Lerner index is lower than the inverse of the market elasticity. There is some evidence that this situation can happen, especially in the case of transport. DIFFERENT (2008) and Meunier and Quinet (2009) make the case for such situations in France, as well as Clark, Jorgensen, and Pedersen (2009) building on the Norwegian transport context. Similarly, there are situations, found for instance in the results of traffic models, where observed elasticities are lower than 1 in absolute value.

These considerations led us then to look for a more general behaviour than what we could call "classical profit maximisation behaviour" or "blunt profit maximisation behaviour" so as to introduce a theoretical formulation that would be more consistent with such observations, and that could be backed by economic interpretations explaining firms' attitudes, possibly by introducing a broader range of concerns than systematic short-term individual segment-level profit maximisation (Quinet and Meunier in DIFFERENT (2008)).

We use a general formulation which covers not only the two extreme competition situations of perfect competition and usual profit maximisation with price competition, but also mixed attitudes where the operator is assumed to aim partly to maximise its profit and partly to maximise "market welfare" ie welfare without

[1] This statement may be challenged by observation of data, though. For instance, data on road haulage costs in France allow to estimate the evolution of proxies of Lerner indexes, which display values that were around 0.4 to 0.5 25 years ago and went sharply down but are still staying around non-negligible values about 0.15 to 0.2 nowadays.