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## Market dynamics in on-rail competition

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### Abstract

On-rail competition is perhaps the most far-reaching form of deregulation of the railways, giving travellers several options on a single line. It aims to lower fares and raise quality of service, thereby boosting demand and social welfare. Concerns have been raised, however, regarding if effective competition is possible on such a market, allowing two or more operators to be profitable and eliminating through incentives or regulation the purchase by one operator of the others' access rights, thus restoring monopoly. In addition, the effect of competition on total welfare is unclear. The issue of how to regulate the market and conduct capacity allocation in order to maximise welfare is also as yet unanswered.

Addressing these issues, the present paper studies a duopoly market through simulations. It builds on the hypothesis that competition occurs between trains with close departure times. Results indicate that total welfare increases significantly when going from profit-maximising monopoly to competition, as consumers make large gains while operators' profits fall. The way the regulator allocates departure slots has significant importance for market outcomes, including prices, frequencies and total welfare. In particular, it is possible to improve welfare by regulating the succession of departures. If trading in access rights is allowed, a would-be monopolist has incentives to buy its competitors' slots for a price they would accept. A monopolist that uses high frequency of departures as a deterrence strategy against competition increases frequency a lot compared to the profit-maximising level.

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## 1. Introduction

On-the-track competition is a new phenomenon on the railway market, where operators compete on the same line for passengers. Similar reforms on the bus market have in some situations unleashed fierce, unsustainable competition and eventual return to monopoly; concerns have thus been raised over how prices, frequencies, travel-volumes and overall social welfare will develop. In particular, the existence of stable equilibrium with more than one player is questioned.

The regulator plays a crucial role in this respect. Because of capacity constraints, it is by necessity involved in decisions regarding departure times and frequencies of service. Tweaks to regulatory proceedings alter the optimal strategies of market participants, and in turn social welfare and other outcomes. Assuming that the regulator strives to achieve a stable market equilibrium and high social welfare through the means of on-rail competition, what policies should be adopted?

We suggest a simulation model with realistic parameters where operators compete on frequency and price. The model is built to facilitate comparison between different regulatory settings, including a duopoly market where the regulator allocates departure times; a profit-maximising monopoly; a large number of competitors; and others. It also includes bench-mark scenarios, such as welfare maximisation with a no subsidies constraint.

The model allows for individual prices to be set for each departure, and it takes account of each departure's relative position in time. In this way it builds explicitly on the hypothesis that competition occurs not only between operators but between departures that are close in time. This makes it possible to study how prices vary over the day, depending on the relative intensity of competition at certain times. Possible operator strategies to lessen the pressure of price competition are explored.

The results indicate that total welfare is higher under competition compared to profit-maximising monopoly. Also, a competitive situation with two service providers is sustainable under certain assumptions. There are good prospects for a new entrant to reach profitability in a market dominated by a former monopolist. The combined profit of two competing firms is substantially lower than the monopoly profit however, possibly implying incentives to merge operations into a single unit, or for one operator to buy the other's departure slots. This would go against the intentions of the reform of course.

## 2. Background

Deregulation of the railways is an international trend. It began in 1989 in Sweden with the separation of operations from infrastructure management. The UK has come far in this respect, with public tenders for all lines. In one way or another, the deregulation trend has spread throughout Europe and beyond.

A few countries are now taking this one step further, through introducing competition not just for the tracks but on the tracks. Since 2001 the Swedish freight market is completely deregulated, and since 2010, all profitable passenger lines in the country are also open for competition (Alexandersson & Hultén, 2009). (Unprofitable lines are for the most part allocated through a public tendering process.) Other countries that are experimenting with on-rail competition include Austria, the Czech Republic, Italy and the UK (Beria, Redondi, & Malighetti, 2014). The result has in most cases been a monopoly situation, sometimes complemented by smaller niche actors.

This opens up new possibilities, but also raises many questions. Supposedly, competition should lead to better services and lower prices for passengers. Competition is widely believed to have positive welfare effects compared to profit-maximising monopoly. This is in spite of the fact that the dynamics of such a market is as yet poorly understood.

More is known about deregulation of other modes. When the British bus market was deregulated in the 1980s, a new entrant emerged to compete with the incumbent on only a small share of submarkets. Where they did, this led to a short period of fierce competition on price as well as frequency. Profitability for both competitors rapidly sank well into the negative and within a year or so one of them closed shop. At that point ticket prices increased again and departure frequencies decreased; although prices remained lower and frequencies higher compared to before deregulation. This may indicate that operators behaved so as to dissuade others from taking up competition. (Evans, 1990)

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