University of Zurich

Socioeconomic Institute
Sozialökonomisches Institut

Working Paper No. 0609

Entry in liberalized railway markets: The German experience

Rafael Lalive, Armin Schmutzler

April 2007, revised version

Socioeconomic Institute
University of Zurich

Working Paper No. 0609

Entry in liberalized railway markets: The German experience

April 2007, revised version

Authors' addresses: Rafael Lalive
E-mail: rafael.lalive@unil.ch

Armin Schmutzler
E-mail: arminsch@soi.uzh.ch

Publisher Sozialökonomisches Institut
Bibliothek (Working Paper)
Rämistrasse 71
CH-8006 Zürich
Phone: +41-1-634 21 37
Fax: +41-1-634 49 82
URL: www.soi.uzh.ch
E-mail: soilib@soi.uzh.ch

Entry in liberalized railway markets: The German experience

Rafael Lalive, University of Zürich, CESifo and IZA

Armin Schmutzler*,University of Zürich, CEPR and ENCORE

This Version: 16/03/07

Abstract: In Germany, competitive franchising is increasingly being used to procure passenger railway services that were previously provided by a state monopolist. This paper analyzes the 77 tenders that have taken place since the railway reform in 1994. The tenders differ with respect to the size of the franchise network, the required frequency of service, the duration of the contract and the proximity to other lines that are already run by competitors of DB Regio, a subsidiary of the successor of the former state monopolist. Our analysis shows that larger networks are less likely to be won by the competitors. Also, more recent auctions have been won by competitors more frequently than earlier auctions. Other control variables such as the duration of the contract and the adjacency to other lines run by entrants are insignificant.

Keywords: Competition for the market, liberalization, passenger railways, procurement auctions

JEL Classification: D43,D44,R48

---

*Corresponding author: University of Zürich, Socioeconomic Institute, Blümlisalpstr. 10, CH-8006 Zürich; tel +41-44-634-22-71; fax +41-44-634-49-07.
e-mail: arminsch@soi.unizh.ch.

We are grateful to Ueli Baumgartner for research assistance, to Markus Ksoll (Deutsche Bahn) for help with the data and to Thomas Fischer for useful discussions.

1 Introduction

When state monopolies in railways and other network industries are liberalized, an important issue is how to achieve effective competition. One option is to abolish the former state monopolist altogether, or at least to prevent him from being active in the competitive part of the market. Even though this path has been pursued in the railway industries of Sweden and the United Kingdom, it is not without perils, as economies of scope between the network and operations are potentially important. Not allowing the network operator to run trains may therefore result in efficiency losses.

Guided by such considerations, the German railway reform that became effective on January 1, 1994, attempted to strike a balance between the extremes of a vertically integrated monopoly and a fully separated industry. *DB Netz*, a subsidiary of Deutsche Bahn AG, the successor of the former state monopolist, is the network owner. Other subsidiaries operate trains, namely *DB Cargo* (now *Railion*) for freight, *DB Reise und Touristik* for long-haul passenger services and *DB Regio* for short-haul passenger services. Potentially, however, these companies are subject to competition. The institutions that are supposed to promote competition differ according to the kind of service. For freight and long-haul passenger transportation, there is open access to the infrastructure, so that on-track competition is allowed in principle.[1] For regional passenger transportation, a totally different approach has been pursued. The reforms led to the possibility of using *competition for the market* to procure railway services.[2] Between 1994 and 2005, a total of 77 networks have been procured using competitive bidding, amounting to approximately 20% of the network.

Compared to countries such as the United Kingdom and Sweden that also introduced competitive franchising, the unique feature of the German system is the combination of two aspects:

1. A subsidiary of the former monopolist (*DB Regio*) is allowed to take part in the franchise bidding.

2. Another subsidiary of the former monopolist (*DB Netz*) controls the network.

[1] In practice, competition in the long-haul passenger sector is very limited.

[2] Competition for the passenger market also plays a role in Sweden and the U.K. and to a much lesser extent in the Netherlands.

These features introduce a potentially important asymmetry which could be advantageous for *DB Regio*. First, even though there is some degree of separation between *DB Netz* and *DB Regio*, they both are part of the same holding. As *DB Netz* has considerable discretion with respect to its choice of access charges and other important strategic decisions such as investments into the quality of the network, many observers fear that it uses this potential to discriminate against competitors. Second, even though a few mostly minor railway lines were operated by a small number of typically publicly owned companies, *Deutsche Bahn* was the owner of the vast majority of lines at the outset of the reform. Thus, effectively, *DB Regio* plays the role of an incumbent in most procurement auctions, which could conceivably provide it with an advantage compared to competitors.

Given the incumbency role of the former state monopolist and his control of the network, it is not obvious that competition can be effective. The paper therefore uses the example of regional passenger services to discuss under which circumstances competitive tendering can work iwhen a vertically integrated former state monopolist faces potential entry in the downstream segment of the market, that is, in train operations.

We use a data set consisting of all 77 tendering procedures for operations starting between 1997 and 2007 to analyze under which circumstances competitors of the dominant firm have cast successful bids. Thus, we use entry as a measure of effective competition. This is clearly not ideal – even potential entry might be enough to discipline the incumbent. However, it would at least appear plausible that the conditions fostering potential entry are similar to those fostering actual entry.

Our analysis exploits the heterogeneity in the set of competitively procured networks. For instance, the network length varied between 13 and 369 kilometers. Similarly, the required train services ranged from 200,000 to 6,000,000 train kilometers. The minimal contract length was 2 years, the maximum was 19 years. Some networks were surrounded by lines that were run by *DB Regio* when franchising took place; others were adjacent to lines that were already operated by other companies.

As we lay out in more detail in Section 3, intuition would suggest that these characteristics should influence the success chances of potential entrants vis à vis *DB Regio*. For instance, the former incumbent would appear to have better chances on large networks because it is more experienced at operating complex structures. Our probit analysis reveals that *DB Regio* is indeed much more likely to be the successful bidder when the network is long. Another potentially important determinant of the success chances is the time at which the auction took place. There are at least two

reasons why one might expect potential entrants to become more successful over time. First, there may be learning effects. Increasing experience of entrants is likely to increase their efficiency, so that they can cast more aggressive bids. Second, there may be reputation effects. Most tenders leave the agencies with some discretion as to which bidder they want to choose.[3] Firms that have had a chance to prove their ability to deliver railway services successfully should have better chances to be taken seriously by agencies than relatively unknown operators. Again, our analysis confirms the intuition: In the early auctions *DB Regio* was more likely to win than more recently.

Though the effect is not significant, there also seems to be a tendency for the former state monopolist to win bids for electrified lines more frequently than bids for Diesel lines. This may reflect the fact that electrified lines are likely to involve greater complementarities with both long-distance passenger transport and with the network, which are both controlled by subsidiaries of *Deutsche Bahn*. Even though the electrification of a line is not a design variable for the agency, this result is potentially interesting from a policy perspective. It suggests that the apparent tendency to subject relatively unattractive lines to competition which are typically operated by Diesel trains may make some sense from the point of view of inducing competition. Suppose relatively unexperienced competitors find it hard to compete against the incumbent on electrified lines. Suppose further that, contrary to what happened in Germany, the early franchising competitions would have been for attractive electrified lines rather than for relatively unattractive Diesel lines. Then entrants would have had relatively small chances to win the bid. If instead the first lines to be tendered have characteristics which increase the winning chances of entrants, then these firms can gain expertise and reputation by operating such franchises which, in the long term increases their chances to win franchises with characteristics that are less favorable for them.

The remaining variables, for instance the length of the contract and the adjacency to lines that are already operated by competitors of *DB Regio*, have no significant effect on entrants' winning probabilities.

Understanding the issues that we analyze is potentially important because of their normative implications. If entry is desired, how should competitive procurement be designed? Should large chunks of the network be auctioned off in one piece?

[3]The description of the service is usually called "constructive" when it is very detailed and "functional" when the requirements are formulated in more abstract terms, so that only broad goals are specified.

What is a reasable choice of contract length? Is competition promoted by focusing the tenders on lines that are already operated by competitors? Should competition be introduced gradually or for the entire network.

Our results suggest some very tentative conclusions, even though the answers to these questions obviously depends on many aspects other than the effects of design on entry, so that a full welfare analysis of the optimal design of railway auctions is beyond the scope of this paper. Nevertheless, we believe that understanding the conditions that are conducive to entry is an important ingredient of such an analysis.[4] Perhaps the most definite conclusion is that large-scale auctions are problematic because they tend to make entry more difficult. This should obviously not be taken as an argument for minimizing network size, because the size of the network influences the extent to which economies of scale can be exploited, no matter whether the operator is *DB Regio* or one of its competitors. Also, transaction-cost considerations may favor relatively large network sizes. Furthermore, our results provide some (limited) support for a gradual introduction of competition, because this may help competitors to gain experience and reputation. However, our results clearly do not imply that there is a good reason why less than one third of the network has been exposed to competition more than ten years after the reform. Finally, our analysis suggests that other aspects of contractual design such as the length of the contract can be chosen without considering their potential effects on entry, because such effects do not seem to be important.

Also, it is cucial to note that our analysis is exclusively concerned with the circumstances that foster entry, given that competitive procurement is used. We do not make any attempt to show that competitive franchising is a desirable method of allocating railway services. However, our empirical analysis in Lalive and Schmutzler (2007) suggests that competitively procured lines indeed perform better than lines where competitive mechanisms are not used.

The paper is organized as follows. Section 2 provides some more institutional details. Section 3 develops the hypotheses. In Section 4, we present the data. Section 5 presents the empirical results. Section 6 concludes.

[4]This is true even if it is not entirely clear how much entry is desirable. In principle, even if entrants never won a procurement auction, this would not necessarily be a bad sign. As long as the bidding is sufficiently aggressive that the incumbent is forced to provide attractive offers to the agencies, competition may already be working. However, the circumstances that induce entry are clearly informative of the circumstances that induce aggressive bidding.

2 Institutional Background

In this Section, we briefly describe the German railway reform, focussing on its implications for regional passenger transportation and on the market development in this sector.

2.1 The Railway Reform

Until the early nineteen nineties, the railway system in the two German states was essentially in the hand of state monopolists.[5] In West Germany, *Deutsche Bundesbahn* owned most of the infrastructure and, at the same time, was the dominant operator for passenger and freight services. In addition, there were several minor railroad companies (*NE-Bahnen*) which were typically also vertically integrated and carried out freight and/or passenger transportation on small networks. In East Germany, *Deutsche Reichsbahn* was the integrated operator of the railway system.

On January 1, 1994, a major railway reform became effective.[6] Apart from creating *Deutsche Bahn AG* as a successor of *Deutsche Bundesbahn* and *Deutsche Reichsbahn*, the reform had several elements that were familiar from other countries. First, though *Deutsche Bahn AG* is generally regarded as a vertically integrated company, distinct sub-organisations were introduced at the upstream level (*DB Netz* for the network and *DB Station & Service* for the stations) and the downstream level (*DB Regio* for regional passenger transportation, *DB Reise und Touristik* for long-distance passenger services and *DB Cargo* for freight). Thus, at least a move into the direction of vertical separation was made.[7] Second, while most of the infrastructure remained in the hands of the former state monopolist, some degree of downstream competition was introduced. For instance, with respect to passenger railway services, the reforms led to the introduction of *competition for the market*.

[5] There is considerable overlap between this section and Section 2 in Lalive and Schmutzler (2007).

[6] A summary of the major elements of the reform is Deutsche Bahn AG (1994).

[7] In 1999, this separation was taken one step further. Deutsche Bahn AG then became a holding company, consisting of five corporations.

2.2 Competitive Procurement of Passenger Services

More specifically, as a consequence of the railway reform, the *Länder* have created agencies whose task it is to procure local passenger services.[8] These agencies have considerable freedom in the way that they procure services. At one extreme, they can still negotiate directly with the incumbent supplier, without contacting any potential competitors. At the other extreme, they can resort to open competitive bidding for the market. The extent to which this possibility is used varies considerably across agencies. Moreover, individual agencies use different mechanisms to procure services on different lines within their sphere of influence, typically relying on competition in a relatively small number of cases and using direct negotiations with the incumbent more often.

In the simplest type of bidding procedure the agency specifies detailed requirements about the service that it expects. The specifications include the frequency of service, the rolling stock, the prices charged to customers, etc. The contractors' bids are the subsidy levels required to carry out the expected services.[9] The successful bidder receives his required transfer and obtains the franchise for a period of typically 5-15 years. He then becomes the residual claimant for the operating profits of the line (*net contracts*) or at least for any cost savings or overruns relative to the desired transfer (*gross contracts*). It is important to note that the procurement procedure is not always exclusively focused on the required transfer. Quite often, it leaves some scope for the contractors to compete in other dimensions. As the weighting of these dimensions is usually not clear ex ante, the allocation mechanism is closer to a "beauty contest" than to multi-dimensional auction in the sense of Che (1993) and Branco (1997).

2.3 The Firms in the Regional Passenger Market

As a result of the introduction of competition for the market, the market share of *DB Regio*'s competitors has grown substantially though it is still fairly small. Only 24 of the 77 tenders were won by *DB Regio*, the subsidiary of *Deutsche Bahn AG* that is active as a regional passenger train operating company. Thus, even though

[8] In most cases, there is one agency in each state. Some states have more than one agency, however; for instance, there are nine agencies in the state of Nordrhein-Westfalen.

[9] In typical textbook treatments of competition for the market (Viscusi et al. 2000), the procedure is slightly different. Contractors do not bid the required subsidy. Instead, they bid the price they want to charge to consumers and the lowest bid wins (Demsetz 1968).

the fraction of lines which were procured competitively is still fairly small, in those instances where tendering took place, the competitors were successful quite often.

As a prerequisite for developing our hypotheses on the determinants of the entrants' winning probabilities, it is important to recognize that the pool of competitors consists of several types of firms. First, the above-mentioned pre-reform NE-operators play an important role. These firms typically still own their old infrastructure, but they often have expanded their operations onto the network of Deutsche Bahn where they are exclusively responsible for the provision of downstream services.[10] Second, some entirely new companies have been formed, such as the *Prignitzer Eisenbahn-Gesellschaft (PEG)* in the Eastern State of Mecklenburg-Vorpommern. Third, foreign firms have entered the market.[11] Typically, they have taken over independent local operators such as the venerable *Württembergische Eisenbahngesellschaft* in South-West Germany (*Connex*) or the newly founded *Prignitzer Eisenbahn-Gesellschaft* in the Eastern State of Mecklenburg-Vorpommern (*Arriva*). In other cases they entered directly on lines that were previously operated by *DB Regio*. Finally, some lines are operated by joint ventures between other companies, in some cases including *DB Regio*.[12]

3 Hypotheses

We now develop the main hypotheses of the paper. Because of its experience as a former state monopolist, *DB Regio* would appear to have comparative advantages in the operation of relatively large networks.[13] Other things equal, it would also appear plausible that such networks have more interfaces with the remaining *DB Regio* lines. One would therefore expect the ability of *DB Regio* to exploit complementarities between the network under consideration and its remaining operations to be more pronounced when the network is comparatively large. Therefore, the first hypothesis appears plausible.

[10] Important examples of such companies are *Südwestdeutsche Eisenbahngesellschaft* (SWEG), *Hohenzollerische Landeseisenbahn* (HzL) and *Albtalbahn-Verkehrsgesellschaft* (AVG) in Baden-Württemberg or the *Eisenbahn-Aktiengesellschaft Altona-Kaltenkirchen-Neumünster* (AKN) in Schleswig-Holstein.

[11] The main examples are *Abellio*, *Arriva*, *Connex* and *Keolis*.

[12] For instance, the *Breisgau S-Bahn* was founded jointly by SWEG and the *Freiburger Verkehrs AG,* the municipal transportation firm in Freiburg. The *Oberpfalzbahn* in Northern Bavaria is a cooperation between *DB Regio* and the *Länderbahn*.

[13] Here, we think of the size of a network as its length in terms of track kilometers.

Hypothesis 1 *Large networks are more likely to be won by DB Regio than small networks.*

Another potentially important source of variation in the franchise contracts concerns their duration. Here, however, the argument is much less clear-cut. On the one hand, agencies might be reluctant to give long-term contracts to firms with which they have little experience, which would suggest a negative relation between contract length and agency's winning probabilities. On the other hand, *DB Regio* has much less need to worry about the specificity of its investments into rolling stock for short-term contracts. If it loses a line that it won in an earlier auction, it has plenty of opportunities to use the rolling stock elsewhere in its network.[14] The following hypothesis should therefore be taken with a grain of salt:

Hypothesis 2 *DB Regio is more likely to win contracts with a long duration.*

Even though observers of the industry do not necessarily argue that the operation of electrified lines requires much more technical know-how than for Diesel lines, there are some conceivable reasons why DB Regio might be more likely to win on electrified lines. First, complementarities between a regional network and the long-distance network which is mostly electrified and operated by Deutsche Bahn are likely to be larger if the regional network is electrified. Second, thanks to its close ties to *DB Netz*, the greater infrastructure intensity of electrified lines should put *DB Regio* into a more favorable position than its competitors. Again, there are conceivable countereffects. For instance, to the extent that regional passenger trains and long-distance trains are substitutes, *DB Regio* might be concerned about cannibalizing the demand of *DB Fernverkehr*, the long-distance operator. This would suggest that *Deutsche Bahn* as a whole might gain less from obtaining the franchise than an independent operator would.

Thus, again, the following hypothesis is more tentative:

Hypothesis 3 *Franchises with electrified lines are more likely to be won by DB Regio than Diesel lines.*

As the competitors of Deutsche Bahn had, at best, very limited experience in the operation of passenger trains in the early post-reform years, one would expect that

[14] In states like Lower Saxony, where operators are obliged to use rolling stock from a pool provided by the agency this argument is obviously less palatable. Also, there are auctions where contractors are explicitly required to use new material; this obviously reduces the scope for re-using rolling stock elsewhere.

their chances of winning were initially very small. Over the years, the efficiency of small firms relative to *DB Regio* is likely to have increased due to learning effects. Also, the new entrants have had a chance to build up a reputation as reliable partners, so that agencies should be more willing to choose them. This leads to the next hypothesis:

Hypothesis 4 *Auctions that took place shortly after the reform were more likely to be won by DB Regio than auctions that took place more recently.*

Finally, there would appear to be complementarities in the operation of adjacent railway lines. For instance, if an operator is already present in the neighborhood of the network that is put up for tender, he can easily run trains beyond the network itself, which is likely to be regarded as an improvement in service quality. Also, the exchange of vehicles between the network under consideration and the adjacent lines is simplified. This, leads to the next hypothesis.

Hypothesis 5 *Competitors of DB Regio are more likely to win an auction if they are already operating trains on adjacent lines.*

Finally, Figure 1 shows that there are great differences in the extent to which the different states use competitive procurement mechanisms. While Schleswig-Holstein has procured about 50% of the services competitively, there are several states where this share is below 10%. These differences presumably reflect differences in state politics to some extent. As one might expect, there is a weak positive correlation between the percentage of competitively procured lines and the percentage of votes for the liberal party (FDP) in the most recent state election. It would appear possible that states that are more open for competitive procurement also tend to favor the competitors of *DB Regio*.

Hypothesis 6 *Competitors of DB Regio are more likely to win auctions in states which have a higher inclination to use competitive procurement.*

Even though this hypotheses seems plausible at first glance, a cautionary remark is again in order. Suppose that states first expose those lines to competition where they expect entrants to have particularly good chances. Then states that rely more on competition will typically also put more unsuitable lines up for tender.[15]

[15] Also, it should be noted that there are several states with more than one agency, so that there could we within-state heterogeneity in the propensity to expose lines to competition.

4 Data

To test the hypotheses, we required information on all networks that have been put up for tender since the railway reform took place. At the time we finished the data collection, 77 such networks had been contracted out.

Apart from the obvious requirement that we have to know who won each auction, we also needed information on the independent variables. Several of these variables concern the contract itself. We compiled information on the total network length, that is, the combined length of the lines in the package, the amount of services required (measured in total train kilometers), the starting point of the contract and its duration. We also used various geographical control variables, including the population of the two largest cities in the network, the minimal distance from a city with at least 100,000 inhabitants and the state in which the network lies. Also, we needed information on whether the lines in the package are electrified. Finally, we needed information about the total number of train kilometers procured (competitively or not) in the different states, so that we can construct a measure of the intensity of competition in the respective state.

To our knowledge, there is no systematic collection of data on the liberalized German railway sector that is publicly available. We therefore had to collect the required information ourselves. Most of the information came from the homepages of the agencies who carried out the franchising, supplemented in some cases by direct inquiries.[16] The information on the electrification status can be inferred easily from maps that belong to railway timetables. The geographical information came from official sources (Bundesamt für Statistik).

The most difficult variables to construct was the "intensity of competition" in the different states, that is, the willingness to use competitive mechanisms. The difficulties arose because a considerable number of franchise networks lie in more than one state. While we have data on the total amount of services (train kilometers) required on each franchise network, the exact share of this amount for each state is unknown to us. We could, however, calculate each state's share of the length of each franchise network (measured in kilometers). To calculate the intensity of competition in each state, we then worked with the assumption that the share of each state of the total services in the franchise area equals its share of the network length. Using this approach and adding over all franchise areas, we could calculate the total amount of services procured competitively in each state up to and including 2005.

[16] In addition, we used publications by Deutsche Bahn (2003, 2005).

We divided this number by the total amount of services procured in the respective state (competitively or non-competitively).

5 Empirical Evidence

5.1 Overview

In the following, we present our empirical results, both in the form of descriptive statistics and of simple econometrics. The descriptive results are summarized in Table 1. Table 2 presents the results of four variants of a probit estimation.

Model 1 contains only the variables relating directly to contractual design: the frequency of service, the length of the network and the duration of the contracts. The remaining models add further controls. Model 2 introduces controls concerning the circumstances of the tendering procedure. Apart from time dummies for the periods 2000-2003 and 2004-2007, we added an adjacency dummy ("Neighbor") which takes on a value of one whenever an NE-operator was present on a railway line that borders the franchise area. Model 3 adds controls concerning the lines under consideration and geography: Electrification, distance to the nearest city above 100,000 inhabitants, size of the two largest cities and a dummy variable for West Germany. Model 4 adds the intensity of competition in the state under consideration.

Before we address the hypotheses directly, we point to some general observations concerning the data set. Table 1 reveals that the procurement auctions display considerable variation concerning important variables. The average contract duration is 8.69 years, ranging from two to nineteen years. The average total network length is 138.87 kilometers, ranging from 13 to 369 kilometers. The total number of train kilometers per line kilometer provided during a year varies from 3,352 to 36,364 train kilometers, with a mean of 13,071. The average distance from the next city with at least 100,000 kilometers is 9.7 kilometers. 16% of the contracts began in the years 1997 to 1999; 45% in the years 2000 to 2003; the remaining 39% have starting years 2004 to 2007.

Figure 2 provides separate information on the geographical distribution of competitive procurement. This information gives the percentage of the entire network within a state that has been procured competitively. The figure shows substantial differences in the inclination of the agencies in the willingness to use competitive franchising.

5.2 Testing the Hypotheses

We now move towards Hypothesis 1 that concerns the role of network size. Table 1 suggests a clear result in this respect. The average length of networks won by *DB Regio* was 171 kilometers, whereas the corresponding figure for the remaining networks was 124 kilometers. The probit analysis confirms this impression. In all four models, the length of the network size has a significant negative effect. For instance, an increase in the length of the line by one standard deviation (93.2 kilometers) reduces the probability that the entrant wins by approximately 0.14. This is clearly a substantial effect.

Result 1 *DB Regio tended to win auctions of relatively long networks.*

The evidence concerning contract length (Hypothesis 2) is much less clear-cut. Table 1 shows that the average contract duration in the two subsamples is almost identical, at 8.6 for the networks won by *DB Regio* and 8.7 for the lines won by the competitors. Unsurprisingly therefore, the contractual length has no significant positive effect in any of the probit models.

Result 2 *The duration of the contracts won by DB Regio was approximately identical to the duration of the contracts won by entrants.*

In view of the theoretical ambiguities concerning the relation between contract length and the relative success chances of the incumbent and the entrants, this observation is not terribly disturbing. Nevertheless, it is possible that our approach underestimates the tendency for DB Regio to win long-term contracts, because it focuses exclusively on competitive procurement. The majority of services operated by *DB Regio* are based on direct negotiations with the agencies. The resulting contracts are typically of a long-term nature, with a duration of at least 10 years.[17]

Next, we consider the electrification variable. Though the theoretical arguments were not entirely clear-cut, the arguments suggested a tendency for DB Regio to have better chances on electrified lines. The descriptive analysis appears to support the claim. 29% of the lines won by *DB Regio* were electrified whereas the corresponding figure in the rest of the sample is only 22%, which confirms our expectations. However, the result is not significant in any of the two models with an electrification dummy.

[17] These long-term contracts have been criticized as preventing the introduction of competition, and they are also being regarded with suspicion by the European Commission (Stuttgarter Nachrichten, 15.7.03).

Result 3 *DB Regio tended to win auctions of electrified lines more often than auctions of non-electrified lines, but the effect is not significant.*

Next, we consider the role of time. Our earlier discussion suggested that more recent auctions are more likely to be won by entrants. The evidence is consistent with this conjecture. To see this, first consider Figure 2, which gives an overview over the franchising process, providing both the total number of tenders and the number of cases in which competitors of *DB Regio* won the auction for each year between 1997 and 2007.[18] The data suggest that the total number of auctions has not changed in any systematic manner over the last years. There is however some evidence that the share of franchises won by *DB Regio* was higher in early years than it has been more recently. The probit estimation clearly supports this impression. Compared to the earlier auctions, the probability that an entrant wins is higher for contracts beginning between 2000 and 2003 and for contracts beginning 2004-2007. Interestingly, however, the coefficient for 2000-2003 is higher than for 2004-2007, suggesting that whatever learning and reputation effects might have improved the position of entrants, these effects are no longer relevant. Even so, there is clear evidence for the following statement.

Result 4 *DB Regio tended to win early auctions more often than in more recent years*

We also expected that the adjacency of the network to other lines operated by competitors of *DB Regio* should have a clear positive effect on the entrants' chances of winning, because the firms that operate these lines should be able to exploit complementarities if they win the network. However, there is, at best, a weak tendency in this direction. The probability that an entrant wins is 0.547 when an adjacent line is already operated by a competitor as opposed to 0.5 when this is not the case; but the econometric analysis does not confirm this tendency. The adjacency variable is insignificant in all models.

Result 5 *The chances of entrants to win networks that were adjacent to lines already operated by competitors of DB Regio are only slightly higher than the chances of winning other networks.*

[18] Here the year obviously refers to the start of the franchise, not to the time at which the auction took place.

Finally, we move to the Hypothesis that pro-competition states are also likely to favor entrants under competitive procurement. Figure 3 plots the intensity of competition in each state, measured as described in Section 4, against the percentage of franchises won by entrants.[19] To repeat, we essentially chose the percentage of lines that had been procured competitively by 2005 to measure a state's inclination to use competitive mechanisms. The results do not suggest a positive relation between the two variables, thus casting doubt on the hypothesis that states who use competitive franchising a lot tend to favor competitors of *DB Regio*, and vice versa. The probit analysis (Model 4) does not change this impression, suggesting if anything a negative relationship between the propensity to put lines to tender and the entrants' winning chances.

Result 6 *The entrants' chances of winning franchises were not higher in states with a high competitive intensity than elsewhere.*

Without presenting the numerical results, we note that the conclusion is unaffected if we use the share of liberal votes rather than the percentage share of competitively procured lines as an explanatory variables. If anything, there is a tendency towards entrants winning less frequently in states with a high percentage of FDP votes.

The remaining control variables that are of less direct economic interest seem to be of mixed importance. The largest city on the lines where competitors won was larger than in the group where *DB Regio* won, but on the other hand the lines in the latter group tended to be less remote than those in the former group. None of the effects was significant, however, suggesting that states that use competitive mechanisms a lot are not necessarily biased against *DB Regio*.

6 Summary

This paper analyzes under which circumstances entrants are likely to win bids to operate regional passenger train services against *DB Regio*, a subsidiary of the former state monopolist. In summary, the results confirm the hypothesis that *DB Regio* is

[19] For franchises procured by more than one state, the winning probabilitites at the state level were calculated using the weights described in Section 4. Thus, suppose in some state A their were five tenders, one of which was carried out jointly with state B. Suppose entrants won one of the auctions carried out only by state A and the auction that was carried out together with state B. Suppose further that state A's weight in the joint auction, calculated as above was 0.6. Then the entrants' probability of winning was $\frac{1.6}{4.6} = 0.348$.

more likely to win large franchise areas quite convincingly. Also, the time effects are as expected, supporting the idea that learning and reputation play an important role. Other plausible hypotheses are not confirmed. In particular, the length of the contract, the adjacency to other NE-lines and the electrification variable do not have significant effects.

One possible reason for the fairly small number of clear results could be unobserved heterogeneity. It is well known that there is substantial freedom in the design of auctions that goes beyond the rudimentary distinctions captured by our variables network size, network length and contract duration. We have already mentioned that some auctions prescribe the requirements much more restrictively than others, but the difference is not merely a matter of the extent of discretion for the firms. Rather, the dimensions in which firms face flexibility vary between the different auctions. In some cases, operators can vary the service level above a certain minimal bound; in other cases they can supply their own rolling stocks (possibly, but not necessarily, including used material). In addition, there are other important distinctions betweeen different contractual arrangements, including, for instance, whether net or gross contracts are used.[20] Our data set does not contain information on these potentially important variables; but exploring them would be interesting for future research.

[20] With net contracts, the operator receives fare revenue, whereas with gross contracts this is not the case.

7 References

Affuso, L., and Newbery, D. (2000), "Investment, Re-Procurement and Franchise Contract Length in the British Railway Industry", CEPR Working Paper No. 2619

Branco, F. (1997), "The Design of Multidimensional Auctions", RAND Journal of Economics 28, 63-81.

Che, Y.-K. (1993), Design Competition through Multidimensional Auctions, RAND Journal of Economics 24, 668-680.

Demsetz, H. (1968): "Why Regulate Utilities?", Journal of Law and Economics 11, 55-65.

Deutsche Bahn AG (1994), Die Bahnreform, Frankfurt a.M.

Deutsche Bahn AG (2003), Wettbewerbsbericht, Frankfurt a.M.

Deutsche Bahn AG (2005), Wettbewerbsbericht, Frankfurt a.M.

Lalive, R., and Armin Schmutzler (2007), "Exploring the effects of Competition for Railway Markets", International Journal of Industrial Organisation, forthcoming.

Stuttgarter Nachrichten, 15.7.03, "Baden-Württemberg hebelt den Wettbewerb aus".

Viscusi, K., Vernon, J. and Harrington, J.E. (2000): Economics of Regulation and Antitrust. MIT-Press, Cambridge/MA.

Figure 1: Competition Intensity Across German States

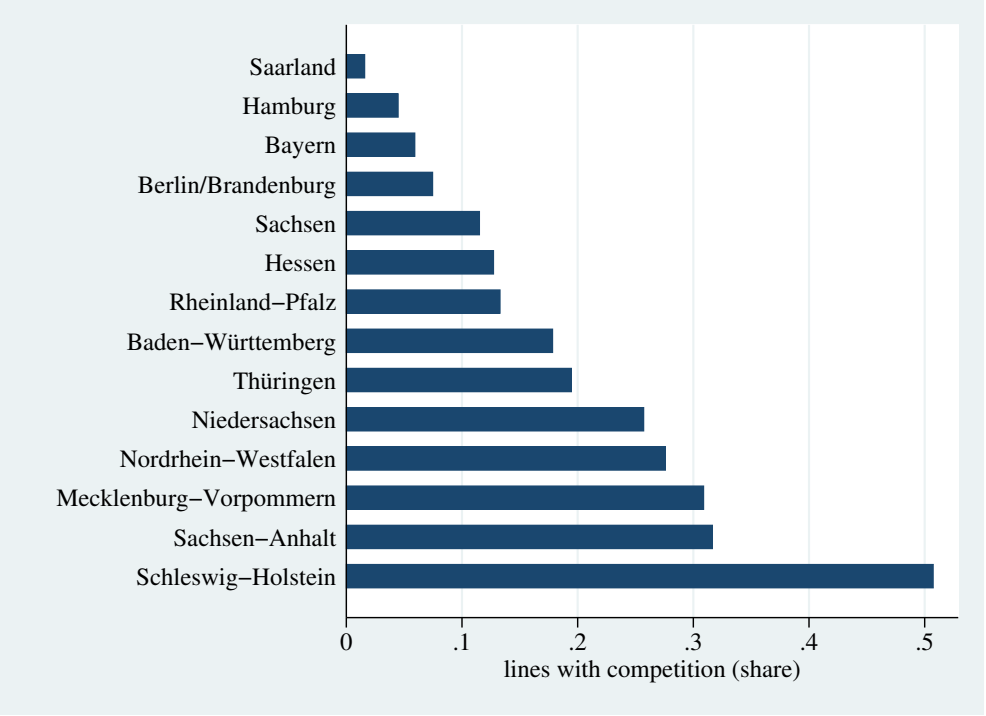

Figure 2: Franchises by Year

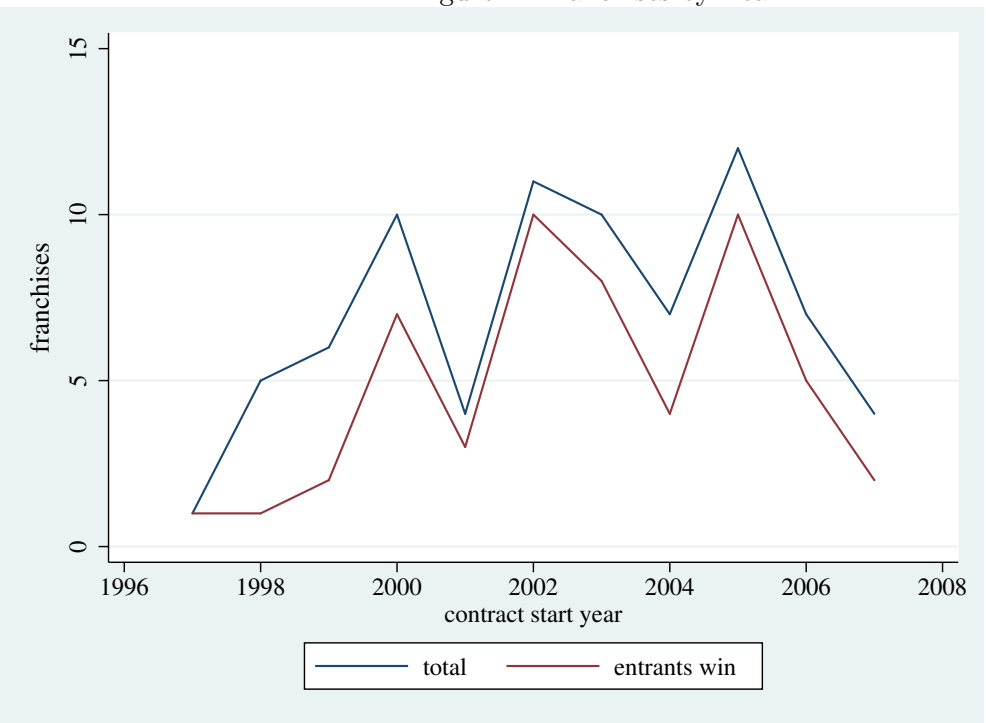

Figure 3: Probability that entrant wins vs lines with competition

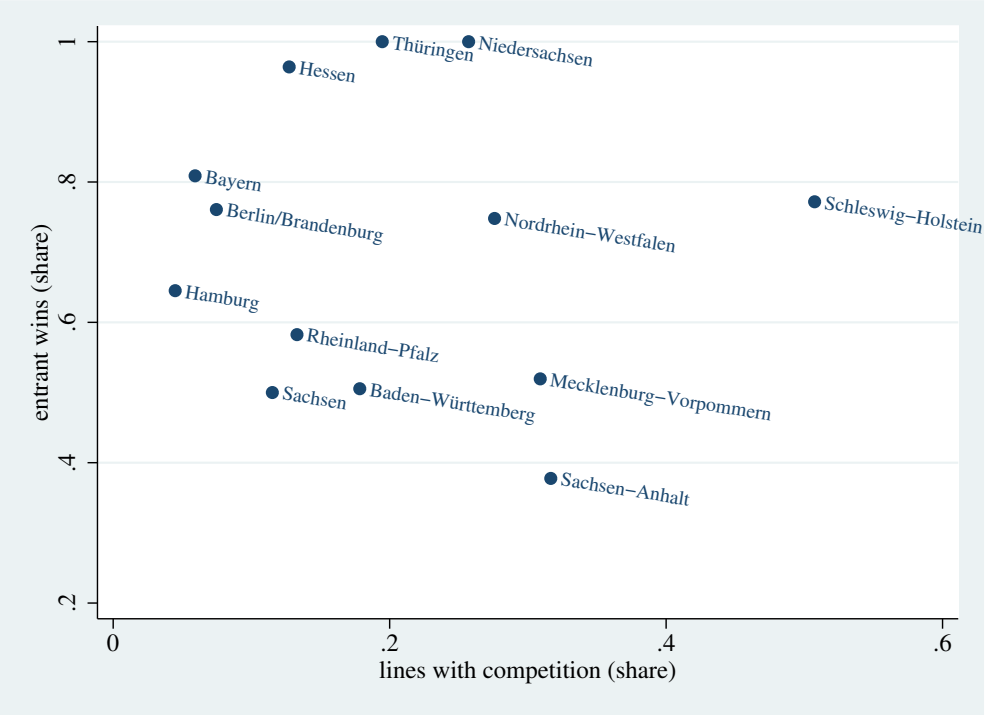

Table 1: Descriptive Statistics

	All Contracts	Entrant Wins	Incumbent Wins
	(1)	(2)	(3)
Entrant wins	.688	1	0
Quality (Tkm / lkm)	13071.056	12985.789	13259.356
	(5778.62)	(5808.213)	(5832.264)
Length (lkm)	138.87	124.17	171.333
	(93.291)	(93.083)	(87.017)
Duration (years)	8.688	8.717	8.625
	(3.625)	(3.707)	(3.512)
Neighbor	.532	.547	.5
Contract starts 2000-2003	.455	.528	.292
Contract starts 2004-2007	.39	.396	.375
Electricity	.247	.226	.292
Distance to city (km)	9.701	11.679	5.333
	(21.84)	(24.823)	(12.412)
Pop. in largest city	520563.27	572367.21	406162.92
	(761240.75)	(853376.759)	(498502.895)
Pop. in 2nd largest city	104604.42	103989.06	105963.33
	(120240.203)	(132637.697)	(89417.888)
West Germany	.74	.774	.667
Observations	77	53	24

Notes: Table reports mean. Standard deviation in parentheses.

Table 2: Probit Analysis of Determinants of Entrant Success

	(1)	(2)	(3)	(4)
Quality (tkm / lkm)	-0.055	-0.048	-0.039	-0.043
	(0.98)	(0.79)	(0.60)	(0.65)
Length (lkm)	-0.140	-0.134	-0.127	-0.132
	(2.33)**	(2.12)**	(1.80)*	(1.85)*
Duration (years)	0.040	0.038	0.036	0.034
	(0.70)	(0.61)	(0.58)	(0.56)
Neighbor		-0.030	-0.057	-0.075
		(0.23)	(0.41)	(0.53)
Contract starts 2000-2003		0.405	0.397	0.420
		(2.61)***	(2.55)**	(2.63)***
Contract starts 2004-2007		0.345	0.319	0.345
		(2.07)**	(1.85)*	(1.95)*
Electricity			-0.128	-0.115
			(0.86)	(0.78)
Distance to city (km)			0.083	0.078
			(1.01)	(0.96)
Pop. in largest city			0.103	0.109
			(1.38)	(1.36)
Pop. in 2nd largest city			0.042	0.044
			(0.58)	(0.60)
West Germany			0.141	0.152
			(0.91)	(0.97)
Lines with competition (share)				-0.341
				(0.69)
Observations	77	77	77	77

Notes: Table gives effects on the probability that the entrant wins the contract of a change by 1 standard deviation for continuous variables, and of a change from 0 to 1 for dummy variables. tkm=train kilometers, lkm=line kilometers. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Working Papers of the Socioeconomic Institute at the University of Zurich

The Working Papers of the Socioeconomic Institute can be downloaded from http://www.soi.uzh.ch/research/wp/index2.html

0706	Does Globalization Create Superstars?, Hans Gersbach and Armin Schmutzler , April 2007, 23 p.
0705	Risk and Rationality: Uncovering Heterogeneity in Probability Distortion, Adrian Bruhin, Helga Fehr-Duda, and Thomas F. Epper, March 2007, 28p.
0704	Count Data Models with Unobserved Heterogeneity: An Empirical Likelihood Approach, Stefan Boes, March 2007, 26p.
0703	Risk and Rationality: The Effect of Incidental Mood on Probability Weighting, Helga Fehr, Thomas Epper, Adrian Bruhin, and Renate Schubert, February 2007, 27p.
0702	Happiness Functions with Preference Interdependence and Heterogeneity: The Case of Altruism within the Family, Adrian Bruhin and Rainer Winkelmann, February 2007, 20p.
0701	On the Geographic and Cultural Determinants of Bankruptcy, Stefan Buehler, Christian Kaiser, and Franz Jaeger, February 2007, 35 p.
0610	A Product-Market Theory of Industry-Specific Training, Hans Gersbach and Armin Schmutzler , November 2006, 28 p.
0609	Entry in liberalized railway markets: The German experience, Rafael Lalive and Armin Schmutzler, April 2007, revised version, 20 p.
0608	The Effects of Competition in Investment Games, Dario Sacco and Armin Schmutzler, April 2007, revised version, 22 p.
0607	Merger Negotiations and Ex-Post Regret, Dennis Gärtner and Armin Schmutzler, September 2006, 28 p.
0606	Foreign Direct Investment and R&D offshoring, Hans Gersbach and Armin Schmutzler, June 2006, 34 p.
0605	The Effect of Income on Positive and Negative Subjective Well-Being, Stefan Boes and Rainer Winkelmann, May 2006, 23p.
0604	Correlated Risks: A Conflict of Interest Between Insurers and Consumers and Its Resolution, Patrick Eugster and Peter Zweifel, April 2006, 23p.
0603	The Apple Falls Increasingly Far: Parent-Child Correlation in Schooling and the Growth of Post-Secondary Education in Switzerland, Sandra Hanslin and Rainer Winkelmann, March 2006, 24p.
0602	Efficient Electricity Portfolios for Switzerland and the United States, Boris Krey and Peter Zweifel, February 2006, 25p.
0601	Ain't no puzzle anymore: Comparative statics and experimental economics, Armin Schmutzler, February 2006, 45 p.
0514	Money Illusion Under Test, Stefan Boes, Markus Lipp and Rainer Winkelmann, November 2005, 7p.
0513	Cost Sharing in Health Insurance: An Instrument for Risk Selection? Karolin Becker and Peter Zweifel, November 2005, 45p.
0512	Single Motherhood and (Un)Equal EducationalOpportunities: Evidence for Germany, Philippe Mahler and Rainer Winkelmann, September 2005, 23p.
0511	Exploring the Effects of Competition for Railway Markets, Rafael Lalive and Armin Schmutzler, April 2007, revised version, 33p.
0510	The Impact of Aging on Future Healthcare Expenditure; Lukas Steinmann, Harry Telser, and Peter Zweifel, September 2005, 23p.
0509	The Purpose and Limits of Social Health Insurance; Peter Zweifel, September 2005, 28p.

0508 Switching Costs, Firm Size, and Market Structure; Simon Loertscher and Yves Schneider, August 2005, 29p.

0507 Ordered Response Models; Stefan Boes and Rainer Winkelmann, March 2005, 21p.

0506 Merge or Fail? The Determinants of Mergers and Bankruptcies in Switzerland, 1995-2000; Stefan Buehler, Christian Kaiser, Franz Jaeger, March 2005, 18p.

0505 Consumer Resistance Against Regulation: The Case of Health Care
Peter Zweifel, Harry Telser, and Stephan Vaterlaus, February 2005, 23p.

0504 A Structural Model of Demand for Apprentices
Samuel Mühlemann, Jürg Schweri, Rainer Winkelmann and Stefan C. Wolter, February 2005, 25p.

0503 What can happiness research tell us about altruism? Evidence from the German Socio-Economic Panel
Johannes Schwarze and Rainer Winkelmann, February 2005, 26p.

0502 Spatial Effects in Willingness-to-Pay: The Case of Nuclear Risks
Peter Zweifel, Yves Schneider and Christian Wyss, January 2005, 37p.

0501 On the Role of Access Charges Under Network Competition
Stefan Buehler and Armin Schmutzler, January 2005, 30p.

0416 Social Sanctions in Interethnic Relations: The Benefit of Punishing your Friends
Christian Stoff, Dezember 2004, 51p.

0415 Single Motherhood and (Un)equal Educational Opportunities: Evidence from Germany
Philippe Mahler and Rainer Winkelmann, November 2004, 23p.

0414 Are There Waves in Merger Activity After All?
Dennis Gärtner and Daniel Halbheer, September 2004, 39p.

0413 Endogenizing Private Information: Incentive Contracts under Learning By Doing
Dennis Gärtner, September 2004, 32p.

0412 Validity and Reliability of Willingness-to-pay Estimates: Evidence from Two Overlapping Discrete-Choice Experiments
Harry Telser, Karolin Becker and Peter Zweifel. September 2004, 25p.

0411 Willingness-to-pay Against Dementia: Effects of Altruism Between Patients and Their Spouse Caregivers
Markus König und Peter Zweifel, September 2004, 22p.

0410 Age and Choice in Health Insurance: Evidence from Switzerland
Karolin Becker and Peter Zweifel, August 2004, 30p.

0409 Vertical Integration and Downstream Investment in Oligopoly
Stefan Buehler and Armin Schmutzler, July 2004, 30p.

0408 Mergers under Asymmetric Information – Is there a Lemons Problem?
Thomas Borek, Stefan Buehler and Armin Schmutzler, July 2004, 38p.

0407 Income and Happiness: New Results from Generalized Threshold and Sequential Models
Stefan Boes and Rainer Winkelmann, June 2004, 30p.

0406 Optimal Insurance Contracts without the Non-Negativity Constraint on Indemnities Revisited
Michael Breuer, April 2004, 17p.

0405 Competition and Exit: Evidence from Switzerland
Stefan Buehler, Christian Kaiser and Franz Jaeger, March 2004, 28p.

0404 Empirical Likelihood in Count Data Models: The Case of Endogenous Regressors
Stefan Boes, March 2004, 22p.

0403 Globalization and General Worker Training
Hans Gersbach and Armin Schmutzler, February 2004, 37p.