Exploring effects of competitive tender for users in the regional railway market: evidence from Europe

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Keywords: market structure, competition, tender, regional train

J.E.L. Classification: L92, L11

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EXPLORING EFFECTS OF COMPETITIVE TENDER FOR USERS IN THE REGIONAL RAILWAY MARKET: EVIDENCE FROM EUROPE

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August 24, 2020

Abstract

The paper explores the effect of the competitive tender for users through prices and frequencies in the regional railway passenger market. The analysis is original by an extended perimeter to seven European countries (France, Germany, Italy, Netherlands, Sweden, Switzerland, UK) and a total of 103 routes mixing market open to competition by tendering with market still under monopoly. Data are cross sectional and have been selected for one day. The method is based on an econometric analysis (Sureg) developed for other modes (air, coach) but never yet applied to the rail market and its specificities in terms of competition. For the regional services where competition is "for the market", the competition is analyzed through a dummy as a threat to lose the tender. Intermodal competition is limited to the coach services (dummy) and carpooling services (dummy). Results show that the threat of intra-modal competition can increase price for users but have no significant effect on frequencies. The analysis country by country highlights a similar performance for Sweden and Switzerland in spite of high differences in terms of competition. It suggests that the ability to negotiate contracts of public authorities and political choices can be more determinant than potential competition. Finally, effect of intermodal competition are weak mainly because of a limited offer. Results show that the probability to find a carpooling service increases when prices of train are increasing.

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1. Introduction:

The European Union engaged a large policy from 1990 to implement competition in a large number of services like energy, transport or telecommunication. Nevertheless, if most of the services are open today to competition and produced advantages for customers, the railway sector is still in late and focuses debates on the model to implement competition (Nash et al., 2013). Reasons are several and mainly linked to the railway specificities like the technical complexity of the system, the high constraint on capacity or the high cost production. Consequences are a few number of competitors or bidders in the countries where competition is implemented (Alexandersson, 2009) and heavy debates where competition is not yet on the feasibility and the advantages to wait from the opening to potential competitors.

This paper focused on the effect of potential competition on prices and quality of service for the regional rail passenger market. This market segment is shared between competitive tendering and direct negotiations where competition is not yet implemented or desired. It needs to be distinguish from the interurban rail passenger market which is most of the time in open access.

A large academic literature exist on the impact of railway reforms on cost efficiency (Cantos and Maudos, 2001; Asmild et al., 2009; Friebel et al., 2010; Smith et al., 2018) or public subsidies (Alexandersson, 2009; Guihery, 2014; Desmaris, 2014) but few studies has been produced on quality of services or prices for users excepted Lalive & Schmutzler (2008) and Lalive et al. (2015). They test the impact of competitive tendering on the level of subsidies and the offer in train-km in comparison to routes under direct negotiation between public authorities and operator. The first study was limited to a specific region (Baden-Wurttemberg) then the second has been extended to the all Germany. Results show an increase of offer by 12% and a subsidies reduction of 20% when market is under competitive tendering. Nevertheless, the discussion of results highlight doubts about the difficulty to assess the real impact of competition considering the initial potential to growth of routes open to competition, the distinction between the impact of economic growth and competition effect or again the ability of public authorities to negotiate the contracts.

This study proposes to go further in the analysis through a large panel of data collected in different countries. Seven countries have been selected (France, UK, Germany, Netherlands, Switzerland, Sweden and Italy) for a total of 103 routes. The interest of this panel is to mix market open to competition by tendering (Germany, UK, Netherlands, Sweden and Italy) to market still under monopoly (France and Switzerland). Data are cross-sectional and have been selected for one day of week in December 2017. Prices are given in PPA for the 2nd class then frequency is defined by the daily number of train in one way. An econometric model has been developed to test these two variables under control of macroeconomic (GDP, population), geographic (distance) and technical (speeds) variables to make possible the comparison between the different routes. The potential effect of the intermodal competition is also taken into account according to the development of the carpooling and coach services on short distances through two dummies (carpooling and bus). Carpool can be defined as an arrangement where two or more people, not belonging to the same household, share the use of privately owned car for a trip, and the passengers contribute to the driver's expenses (Delhomme and Gheorgiu, 2016).

Main results show that potential competition is not determinant to explain prices and frequencies. Sweden as Switzerland have the best results in terms of performance in spite of two different model of regulation. Most of the market in Sweden are given by auction then it is only by direct negotiation in Switzerland.

Section 2 reviews the literature on the topic and the expected results. Section 3 presents the panel of data and the process of collection. Section 4 describes the method then section 5 gives the results and section 6 discuss them before conclusion in section 7.

2. Literature review

Academic literature is large and rather recent about the impact of the competitive tendering on the regional rail passenger services. Older for the bus sector (Jansson and Wallin, 1991; Alexandersson et al, 1998; Cowie and Asenova, 1999), the development of studies has been correlated with the opening of the markets through Europe, especially in UK, Sweden and

Germany from 1990's. Historically, a large part of the literature was about the efficiency measurement and comparison of the incumbents in Europe but with the entry of new competitors and the regionalization of markets, global studies evolved in specific case studies based on an area or a specific contract. Subsection 2.1 presents the main models of competition for regional market existing in Europe and specificities. Subsection 2.2 describes the empirical analysis based on case studies then subsection 2.3 highlights the limits of the literature and the interest to go further.

2.1. Governance analysis: three model

This subsection reviews the recent studies based on qualitative analysis and benchmark of the different model of competition in Europe.

Firstly, most of these studies analyze a short panel of countries in Europe. Excepted Nash (2010) who considers the UE 28, studies are focused on Germany, UK, Sweden, Netherlands, Switzerland and France. According to Finger (2014), they represents the diversity of the different type of governance and regulation in Europe. Nash et al. (2013) identify at least three model in Europe: UK, Sweden and Germany. Considering competition on the regional market, two model can be remind. The UK model is the most original as it is unique in Europe with the system of franchise. There is no specific distinction between regional and national traffics. Franchises are managed by a national authority and include interurban and local services with financial compensation from profitable to non-profitable services. More common in Europe, the model developed in Germany and Sweden to regulate the local train services is based on the regional public authorities. Competition is organized "for" the market with a contract between the operator winner and the public authority. Contrary to UK, regional services and national services are strictly separated and consequently easy to identify for analysis. Lalive et al. (2015) remind that public authorities can choose between competitive tendering and direct negotiation with an operator without competition. The trade-off depends on the complexity of the market but also from the balance between administrative cost to manage the tender and the expected gain from competition. Finally, a third model can be identified in France or Switzerland where competition is not yet open even if the market has been

regionalized in 2002. Consequently, it might be more relevant to speak of potential competition where market is already open even if direct negotiations are possible in opposition to market fully closed to competition.

In the literature, most of the authors highlight the benefic effect from competition for the market especially on public subsidies and quality of services. Brenck and Peter (2007) show that subsidies decrease by 30% in Germany when passenger increased as quality of service. Similar results have been observed in Sweden (Alexandersson and Hulten, 2008; Alexandersson 2009) and Netherlands (Van Dijk, 2007). Nevertheless, Nash (2010) reminds that if subsidies decreased in the first step of competition, they can finally increase especially if bidders are too optimistic in their cost predictions. It has been the case in UK where several operators asked to renegotiate contracts because of financial stress. Others explain the persistence of high costs by a lack of bidders especially in Sweden (Alexandersson, 2009) or Poland (Krol, 2017). Finally, Nash et al. (2013) note after 20 years of European experiences that "it is not clear the reforms there have provided better value for money". Discussions on the impact of competition on the railway efficiency are still open and limits from these studies are multiple. Nash and Nilsson finds that the power from public authorities is a key factor to explain the differences in terms of performance between UK and Sweden. Otherwise, Desmaris (2014) presents the Swiss case as a success in spite of the absence of competition.

A strong limit consists to compare the different model on similar bases. Most of the time, methods developed in these studies are based on aggregated data and large analysis. Pure effect from competition are difficult to distinguish from other effects.

2.2. Empirical analysis

The empirical studies on the impact of competition for the market are limited. Most of them are focused on the level of subsidies and highlight a cost reduction for public authorities. Guihéry (2014) show for the Leipzig's regional passenger railway services that public subsidies have been reduced by 20% for a similar quality of services. Consequently, the

productivity of regional operator have been improved and the author considers this case study as a success. A larger study from Link (2016) shows that in Germany, market with competition reduced faster their inefficiencies than market without competition even if the history of the system has a strong impact. Market in West of Germany are significantly more efficient than market from East. Nevertheless, these studies considers imperfectly the effect of competition in terms of offer. Only two studies give clear results in terms of subsidies and offer. In a first study, Lalive and Schmutzler (2008) attempts to explore the effects of competition in terms of public subsidies and frequency through a panel of 80 routes in the Baden-Württemberg (Germany). Data are time series (1994-2004) and they compare the level of public subsidies and frequency between routes in competition or direct negotiation. Results show a fastest improvement of frequency on routes under competition than others for less subsidies. In a second study (Lalive et al., 2015) authors confirm through a larger panel of 500 routes in Germany that frequency is higher in case of competition (+12%) and subsidies lower (-20%) than without competition. Nevertheless, they note that routes opened in competition were initially smaller than routes without competition showing a preference from public authorities to the direct negotiation for the most complex routes (with low potential to increase frequency) and a preference to competition for the smallest routes (with high potential to increase frequency). Consequently, these preferences can explain results and could limit conclusions about the impact of competition for the market.

2.3. Limits

A first limit consists in the fact that most of the studies are oriented for public authorities. Any of them question the impact of competition on users. One of the main reason is that competition for the market has not a direct impact on users because of the existence of contracts between operators and public authorities. Nevertheless, it could be interesting to test the impact for user as much as they are directly concerns by ticket price and frequency (excepted Lalive et al., 2008 and 2015 for frequency).

A second limit is the limited number of econometric analysis to explore the effect of different variable and make case studies comparable between

them. Excepted Lalive et al. (2008, 2015), all studies are based on contract analysis. It is not always clear that the effect assigned to competition is relevant.

A last limit is in the poor consideration for intermodal competition in the analysis. At the best, car is taken into account but the impact from other services like bus or carpooling is never tested. The main reason is that coach services are often regulated by public authorities on short distances. Nevertheless, the liberalization during the last years of coach services in Europe and the development of new mobility through carpooling could change the game.

Finally, debates are still open on the effect of competition according to Desmaris (2014) who show that Swiss without competition can make good performance or Nash et al. (2013) who recognized that 20 years after liberalization in UK and others countries in Europe, it is difficult to designate a better model than another.

To conclude, these limits drove the following data and method to extend the analysis perimeter.

3. Data collection

The analysis is based on a large panel of data divided between seven European countries. The subsection 2.1 presents the perimeter of the study then the subsection 2.2 describes the method used to collect data. Finally, the subsection 2.3 gives an overview of the variables selected and sources.

3.1. Perimeter

Table 1 shows the perimeter selected for the study. According to the literature, most of the European benchmarks for rail passenger services are used to compare at least Germany, UK and Sweden. Reasons are several. Firstly, they opened earlier their market in comparison to other European countries. Secondly, they propose different model from the system of franchise in UK, mixing national and regional traffics, to the public

procurement in Germany or Sweden specific to the regional traffics. Finally, they are famed for the efficiency of their system, especially in terms of network usage intensity (IRG-Rail, 2017).

To extend the panel and the heterogeneity of practices and governances, others countries are considered as Netherlands, Switzerland, France and Italy. Netherlands and Switzerland are interesting because of their leadership in terms of traffic densities in spite of two opposite system of governance. Regional market is open to competition in Netherlands then it remains closed in Switzerland. France has been selected because of the monopoly by the national incumbent. Finally, Italy is interesting for the economic heterogeneity of its market between North and South.

Table 1: Situation of the markets

	Date of liberalization	Type of competition	Network usage intensity[1]
France	Not yet	Monopoly	40,3
Germany	1994	Tender	57,1
Italy	2005[3]	Tender	43
Netherlands	1996	Tender	130,6
Sweden	1990	Tender	29,5
Switzerland	Not yet	Monopoly	103,9
United-Kingdom	1993	Franchise	89,8

[1] *Train passenger kilometers per route kilometer per day in 2015*
Source: IRG-Rail, 2017

3.2. Method of collection

For each country, 30 routes have been selected. The original database includes 210 routes but only 103 are considered in the figure 2. Others are specific to the intercity services and are excluded from the study.

Each route is defined by two cities and includes data in one way during one day. The day of selection was the 12th December 2017 and data collection has been done one month before.

The method to select routes in each country is based on a geographical segmentation. The ten first routes linked the biggest cities (> 100 000

[3] Not yet competitor in 2017

inhabitants), the next ten linked one big to one medium city (< 100 000 inhabitants) and the last ten are specific to the secondary lines between medium cities and small cities (< 30 000 inhabitants). Obviously, the classification of the cities can change according to the size of the countries, a big city in Switzerland is not the same than in UK.

Consequently, the table 2 shows the number of selected lines in each country. Variations between countries can be explain by a larger perimeter of intercity services for some of them or by the existence of mixing traffics for some routes between intercity and regional. This last case is also excluded from the panel of selected routes.

Finally, the distinction between intercity and regional services is most the time given for each service excepted in UK because of the system of franchise. In this last case, all routes upper 80km are considered as intercity and regional for others.

Table 2: Description of selected routes (number of routes)

	France	**Germany**	**Italy**	**Netherlands**	**Sweden**	**Switzerland**	**UK**	**Total**
Train	21	18	13	12	19	12	8	103
Coach	10	3	3	0	2	0	2	20
Carpooling	20	9	5	2	0	1	1	38

Source: Authors

3.3. Set of variables

A set of nine variables have been defined to explain the price and the frequency. To make possible the comparison between the countries and routes, they are seven variables to control the differences (macroeconomic, geographical and technical). The two others are explanatory variables.

The first explanatory variable is prices. They are considered for the 2nd class. In most of the case, there is no price variation during a day because of the public regulation. Nevertheless, in some countries like in UK, prices can change between the first train and others. In this case, the average price during a day is considered. Sources for prices and others train service characteristics come from the operator websites. Also, they are weighted

by the Purchase Price Index (PPI) to make possible a comparison between countries.

The second explanatory variable concerns frequency. It takes into account the number of train during a day in one way. It assumes that the number of train in the other way is equivalent.

About the variable of control, two are used for macroeconomics specificities. The GDP per capita is the first variable. Data are coming from the national statistics and concern the respective region of the cities (Nuts 3). There are weighted by the PPI to make possible a comparison between countries. The second variable, population, is also given according to the regions.

The geographic differences are controlled by the distance in kilometers. They are given by google map between the two main central stations of cities. In some case, they can be different from the reality when the railway line is longer or shorter than the road link. In addition, the speed of the services is assessed according to the distance and the best travel time during a day.

Finally, they are three explanatory variables, two for the intermodal competition and one for the intramodal competition. The last one is given by a dummy considering the contestable market theory (Baumol et al., 1982): is there potential competition or not? It considered that there is potential competition when the regulation allows the possibility for a public authorities to make a public procurement. This is the case in all countries of the panel excepted in France and Switzerland according to the table 1. The intermodal competition is given by two dummies, one for the coach services and one for the carpooling services: is there a service or not? For the two services, data are coming from the European intermodal platform goeuro.com but their reliability can be discussed. For coach services, the reliability is high because of the ease to identify the offer and their stability. For carpooling, the reliability is low because of the difficulty to identify the offer (variety of websites and others for short distances) and its high volatility (in terms of season or planning). Consequently, results would be considered with prudence.

4. Method

Section 4 describes the database in subsection 4.1 and presents the model used for regressions in subsection 4.2.

4.1. Descriptive data

Table 3 presents data used for regressions. A first observation concerns the high diversity of routes in terms of macroeconomics and technical characteristics. The standard deviations are large for population and GDP what confirms the expected results. Switzerland has the route including the lowest population (Le brassus – Vallorbe) but also the route with the highest GDP (Shaffhouse – Zurich). At the opposite, the route with the lowest GDP is in the South of Italy (Napoli area) and the route with the highest population is in Germany (Cottbus – Berlin). Concerning technical characteristics, the maximum speed is in France between Strasbourg and Colmar then the lowest is in the Swiss mountains between Ormont-Dessous and Aigle.

A second comment is the diversity also for prices and frequencies. Considering frequency, the best is obtained in Switzerland between Shaffhouse and Zurich. The situation of the route in the suburban area of Zurich can explain this high density. At the opposite, the lowest frequency is in France between Bourg-en-Bresse and Oyonnax. On this route, a large part of frequencies have already shifted on regional coach services. Considering prices, the lowest is in the South of Italy then the highest is in UK (Bath – Bristol).

Finally, situations are diverse for competition. Considering the intramodal competition, a large part of the panel (68%) is potentially in a position of public procurement according to the fact that two national markets are still closed to competition in 2017 (France and Switzerland). For the others, the fact to be possibly under competition does not mean that they are in public procurement. Certain routes can be attributed by direct negotiation,

especially in Germany. Conversely, the intermodal competition concerns only a few part of the panel (19%). This result is not surprising. Most of the coach services are regulated by public authorities and case of direct competition are very rare. Carpooling services are more developed (36%), mainly in France but it exists in other countries. However, the difficulty to capture the offer and the short distances in the panel reduce highly the weight of these services in the panel.

Table 3: Descriptive statistics

	Description	n	Mean	Standard deviation	Median	Min	Max
Population	Average between regions (NUTS 3)	103	136 803,04	238 899	69 454	2 341	1 810 908
GDP	Average between regions (NUTS 3	103	34 044,72	168 368,18	38 726,97	3 177,43	67 438,14
Frequency	Daily number of train	103	26,6	18,3	20	3	90
Distance	In kilometers between central stations	103	57,16	30,41	52	10	188
Price	Average price ticket (2^{nd}) during a day in PPI	103	9,48	7,09	8,09	0,58	28,56
Speed	Best commercial speed	103	79,25	28,06	74,80	25,45	188,57
Potential competition	Open to competition or not	103	0,68	0,46	1	0	1
Coach	Service or not	103	0,19	0,39	0	0	1
Carpooling	Service or not	103	0,36	0,48	0	0	1

Source: Authors

4.2. Model

The model is based on the method developed by Fageda and Sansano (2018). The purpose was to assess the impact of the intermodal and intermodal competition on price and frequency for the interurban bus services for a limited database. They use a multiple linear regression model in logarithm.

$$Y_k = a_0 + a_1 \log(length_k) + a_2 \log(speed_k) + a_3 \log(gdp_k) + a_4 \log(population_k) + a_5 Intra\ Competition_k + a_6 Inter\ Competition_k + e_k \quad (1)$$

Where $Y_k$is respectively, log (*price*$_k$) and log (*frequency*$_k$). The independent variables log (*length*$_k$) and log (*speed*$_k$) are controlling the characteristic of the bus services, then log (*gdp*$_k$) and log (pop$_k$) the potential demand for services. Also, two variables control the level of competition on the market. The intramodal competition is given by the Herfindahl-Hirschman Index (HHI) based on the frequency of each bus operator. The intermodal competition is given by dummy because of a lack of detailed data on the other modes: is there at least one service or not?

Applied to the regional train services, the equation can be written as following:

$$Y_k^{REG} = a_0 + a_1 \log(length_k) + a_2 \log(speed_k) + a_3 \log(gdp_k) + a_4 \log(population_k) + a_5 Potential\ Competition_k + a_6 Coach_k + a_7 Carpool_k + a_8 Air_k + e_k \quad (2)$$

Where $Y_k^{REG}$is respectively, log (*price*$_k$) and log (*frequency*$_k$). The independent variables log (*length*$_k$) and log (*speed*$_k$) are controlling the characteristic of the regional train services, then log (*gdp*$_k$) and log (pop$_k$) the potential demand for services. The intramodal competition is given by a dummy because of the competition for the market (tendering) and not in open access. The intermodal competition is given by dummy on the same principle that Fageda and Sansano (2018) for bus and carpooling services.

Also, it is assumed that difference can be observed between countries because of specific regulations or wealth effect. To test these two effects, the baseline equation is increased by country dummies in a first step. In a second step, it is included an explanatory variable as interaction between the dummy of each country and its GDP per capita. For this additional regression it is not included country dummies and interactions between

dummies of each country and its GDP in order to avoid multicollinearity issues. For both extra regression, France is taken in reference.

Finally, the equations are estimated with the seemingly unrelated regression (SUREG) technique as we consider that error terms for price and frequency equations are correlated. The joint estimation with SUREG can address such correlation. The correlation matrix shows that there is no potential high correlation between regressors that prevent the risk of multicollinearity (Appendix 1). Otherwise, standard errors are robust to heteroscedasticity.

5. Results:

Section 5 gives results. The effects from intra and intermodal competition on prices are given in the section 5.1 then effects on frequency are presented in the section 5.2.

5.1. Effect on prices

This section considers the effect of intramodal and intermodal competition on prices. According to the literature, the expected results concerning the impact of the intramodal competition are a public subsidies decreasing (Alexandersson, 2009; Guihery, 2014) but the effects on prices for user's are less clear. Nash and Nilsson (2009) show that prices decreased in Sweden when they increased in UK. They suggest that other factors can influence prices like the ability of public authorities to manage tenders and contracts or the local subsidies. Otherwise, concerning the intermodal competition, findings from the literature are non-existant mainly because of a lack of studies on the question but also because coach services in competition are rare and carpooling services are difficult to identify and quantify.

Table 4 shows results obtained by the model on prices. From a general point of view, GDP and distance are the main drivers of prices with a positive elasticity. When it increases by 1%, prices are increasing respectively by 0,98% and 0,82%. The distance effect is in line with the

usual pricing for regional services. Higher is the distance trip and higher is the price because of a pricing per kilometer. The GDP effect can be understood as a wealth effect: higher the quality of life is and higher is the price of ticket train for users. Concerning the effect of intramodal competition ("potential competition"), the result is unexpected. In the countries where the market is open to competition, prices tend to be higher than countries where the market is not yet open to competition (France and Switzerland). In other words, if competition can be associated to lower public subsidies, it does not mean a lower price for users. This finding is discussed in section 6.1.

Finally, the results for intermodal competition highlight a non-significant impact from coach on price but a significant impact for carpooling services. When carpooling services are observed on a route in competition with train services, prices tend to be higher. Conversely, it can be read as following: the likelihood to find a carpooling offer is higher when price ticket are expensive. Also, this new alternative seems to be more in complementarity of train services for the users with a very low value of time than fully substitutable.

Table 4: Estimation for "price" for regional train services

	Baseline
Intercept	-10.95 (0.97) ***
Distance	0.82 (0.11) ***
Speed	-0.10 (0.14)
Wgdp	0.98 (0.05) ***
Wpop	-0.01 (0.05)
Potential Competition	0.20 (0.11) .
Coach	0.04 (0.12)
Carpooling	0.25 (0.13) .
N	103
R^2	0,843

Source: Authors

5.2. Effect on frequencies

The effects of competition on frequencies are usually less measured than prices in the literature. Concerning the intramodal competition, the expected results are unclear and limited. Lalive & Schmutzler (2008) show

that tender competition can have a positive effect on frequency. Also, Desmaris (2014) shows that the quality of service (*i.e* frequency) can be high without intramodal competition depending on the ability of public authorities to manage the contract with the train operator. Finally, the expected results for the effects of the intermodal competition on the regional train market are non-existant for price as frequency. Reasons are similar to the section 5.1. Case studies are few and competition by carpooling services is rather new and difficult to identify.

The results given by the model are reported in the table 5. A first comment concerns the effect of the control variables on the frequency. Frequency can be defined by a negative elasticity to the distance but by a positive elasticity to speed, GDP and population. When the distance increases by 1%, frequency decreases by 0,65% but when speed, GDP or population increase by 1%, the frequency increases respectively by 0,33%, 0,17% and 0,32%. These results are in line with the gravity model commonly used in geography: flow are increasing with speed, population and GDP because of greatest opportunities to make business but are decreasing with the distance because of a lower accessibility. Otherwise, the effect of GDP can be considered as a wealth effect having a similar impact on frequency and price. A second comment concerns the impact of the intramodal competition. According to the model, there is no significant difference between routes where the market is potentially open and routes without competition. At least, the potential competition is not a sufficient driver to explain differences between routes in terms of frequency. Finally, a last comment can be done about the effect of intermodal competition. There are no significant impact observed from coach and carpooling. The finding is expected and confirms the idea that the train operator stays in a situation of price and frequency maker. The other alternatives develop their services in complementarity without a significant impact on the decisions of the train operator or public authorities.

Table 5: Estimation for "frequency" for regional train services

	Baseline
Intercept	-0.94 (1.28)
Distance	-0.65 (0.14) ***
Speed	0.33 (0.18) .
Wgdp	0.17 (0.07) *

Wpop	0.32 (0.07) ***
Potential Competition	-0.15 (0.14)
Coach	0.06 (0.16)
Carpooling	-0.09 (0.17)
N	103
R^2	0,448

Source: Authors

6. Discussion

Section 6 discusses the impact of the different national regulations on the results. In a first step, a country dummy is added in the model to distinguish results per country. Secondly, the relationship between GDP and country is tested to assess the efficiency of the organizations. In each case, France is considered as the reference. The section 6.1 focuses on price then the section 6.2 is about frequency.

6.1. Impact of national regulations on prices

The table 6 gives an overview of results per country and tests the relationship between country and GDP on price variations. France is considered as the country of reference. Otherwise, the effects of inter and intramodal competition are not tested because of their dummies. Results would be not significant.

A first comment concerns the impact of the control variables. The identification of the national regulations makes non-significant the GDP. It can be assumed that the country and the wealth effect are strongly linked. Consequently, the second drivers are the distance and the speed with a positive elasticity for distance and negative for speed.

Secondly, the results per country highlight a situation of higher prices in UK than in France and the rest of the panel. It is in line with the literature where prices in UK are often presented higher than other countries because of the franchise system (Nash and Nilsson, 2009). Especially, they are less regulated by public authorities than other European countries. Otherwise, prices are lower in Italy, Sweden and Switzerland than in

France. It can be understandable in Italy where the level of subsidies for operating is high (Arrigo & Di Foggia, 2013) or in Sweden where the level of access charges is low (Alexandersson, 2009). It is more surprising in Switzerland. One explanation can be drawn from the European Railway Performance Index (Duranton et al., 2017) where Switzerland is first. A better used of infrastructure and high densities of traffic can explain the better performance in terms of price of Switzerland in the panel.

Finally, the specificities for Italy, Sweden and Switzerland are confirmed by a negative relationship between prices and GDP. When the GDP increases in these countries, prices are decreasing. It can be explain by external factors to this analysis as a better performance or higher subsidies. In any case, the potential competition is not enough to explain these specificities in so far, Switzerland is not yet open to competition.

Table 6: Interaction for "price" between country dummies and GDP

	With country dummies	**With interactions (country dummiesxWgdp)**
Intercept	0.13 (1.67)	-0.27 (1.68)
Distance	0.85 (0.07) ***	0.15 (0.07) *
Speed	-0.25 (0.09) **	-0.25 (0.09) **
Wgdp	-0.02 (0.15)	-0.02 (0.15)
Wpop	0.02 (0.03)	0.02 (0.03)
Potential Competition	-	-
Coach	-	-
Carpooling	-	-
DE	0.10 (0.09)	-
UK	0.47 (0.12) ***	-
IT	-0.46 (0.10) ***	-
PB	0.03 (0.12)	-
SE	-2.59 (0.36) ***	-
CH	-0.38 (0.12) **	-
DE x Wgdp		0.01 (0.01)
UK x Wgdp		0.04 (0.01) ***
IT x Wgdp		-0.04 (0.01) ***
PB x Wgdp		0.002 (0.01)
SE x Wgdp		-0.30 (0.04) ***
CH x Wgdp		-0.04 (0.01) **
N	103	103
R^2	0,940	0,944

Source: Authors

6.2. Impact of national regulations on frequencies

The table 7 highlights the impact of national regulations on the results. France is considered as the country of reference.

There is no major change on control variables when the country effect is removing. The geographic drivers like speed, distance or population stay significant as well as GDP.

Unexpectedly, frequencies are significantly higher in Sweden, Switzerland and Netherlands than in France and the rest of the panel. These results are in line with the literature where Netherlands and Switzerland are well-known for their high level of traffic density (IRG-Rail, 2017). Also, the wealth effect has a positive impact on train offer in these three countries where frequencies increase when the GDP increase.

Finally, it is interesting to note that Switzerland provides similar performance than Sweden or Netherlands in terms of prices and frequencies although its market is still close to competition. Consequently, in coherence with the existing literature (Nash and Nilsson, 2009; Desmaris, 2014), the ability of public authorities to negociate contracts and implement the good incentives would be a key factor as much as the potential competition.

Table 7: Interaction for "frequency" between country dummies and GDP

	With country dummies	**With interactions (country dummiesxWgdp)**
Intercept	-6.73 (3.05) *	-6.35 (3.06) *
Distance	-0.65 (0.12) ***	-0.65 (0.12) ***
Speed	0.64 (0.17) ***	0.63 (0.17) ***
Wgdp	0.64 (0.28) *	0.61 (0.28) *
Wpop	0.21 (0.06) ***	0.21 (0.06) **
Potential Competition	-	-
Coach	-	-
Carpooling	-	-
DE	0.12 (0.18)	-
UK	0.31 (0.22)	-
IT	0.02 (0.18)	-
PB	0.82 (0.22) ***	-
SE	1.58 (0.66) *	-
CH	0.75 (0.23) **	-
DE x Wgdp		0.01 (0.02)
UK x Wgdp		0.03 (0.02)

IT x Wgdp		0.003 (0.02)
PB x Wgdp		0.08 (0.02) ***
SE x Wgdp		0.18 (0.08) *
CH x Wgdp		0.07 (0.02) **
N	103	103
R^2	0,593	0,592

Source: Authors

7. Conclusion

While the European Commission has fixed a deadline to liberalize the regional rail passenger markets in 2026, the objective of the paper was to assess the impact of inter and intramodal competition on the user's surplus in terms of prices and offer (frequency). A set of 103 routes split in seven European countries has been developed to run an econometric model. The model is based on two explanatory variables (prices and frequencies) and seven explicative variables (GDP, length, population and speed). The intramodal competition is characterized by a dummy as "potential competition" then the intermodal competition is given by two dummies for carsharing and coach services.

The results show that the main determinants for prices are macroeconomics (GDP) according to the life cost then they are more diversified for frequency (geographical and macroeconomics). The effect of the potential competition is significant for prices with a positive relationship but non-significant for frequency. It highlights that the existence of potential competition on the regional rail passenger market is not synonym of best prices for the users in comparison of market without competition. About the intermodal competition, there is a significant relationship between price and carpooling services. The chance for the users to find a carpooling service are higher when the price from trains are increasing. Nevertheless, results show that these new type of services cannot be considered as fully substitutable to train services but only complementary.

Finally, the results per country highlights the better performance of Sweden and Switzerland in comparison to other countries. Their prices are regressive to the GDP but their frequencies are positive. It highlights their

efficiency and the fact that competitive tendering is not the only one key factor to provide a good regional train service. According to the literature, the results show that the ability of public authorities to negotiate contracts and implement the good incentives is also a key factor.

8. Appendix 1:

	Population	GDP	Distance	Frequence	Potential competition	Price	Speed	HHI
Population	1	-	-	-	-	-	-	-
GDP	0.19	1	-	-	-	-	-	-
Distance	0.53	-0.17	1	-	-	-	-	-
Frequence	0.26	0.4	-0.13	1	-	-	-	-
Potential competition	0.2	-0.35	0.13	-0.2	1	-	-	-
Price	-0.16	0.45	-0.41	0.19	-0.09	1	-	-
Speed	0.34	0.17	0.33	0.08	-0.17	-0.08	1	-
HHI	-0.4	0.05	-0.25	-0.28	-0.24	0.21	0.23	1

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