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This is an abridged version of the paper presented at the conference. The full version is being submitted elsewhere. Details on the full paper can be obtained from the author.

ISBN: 978-85-285-0232-9

EU RAILWAY INFRASTRUCTURE TARIFF SYSTEMS: 2005-2012 ANALYSIS AND TRENDS

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ABSTRACT

Since the implementation of the European Community Directive 2001/14/EC, railway infrastructure tariff systems in each of the EU member countries have undergone numerous changes, some being minor, others being substantial. The objective of this paper is to provide an update of the evolution of railway infrastructure tariff systems, mandated by the directive as well as to examine whether rail infrastructure tariff systems are converging, as intended by the directive, or diverging. Results of this analysis show that infrastructure tariff system complexity is generally increasing, as are tariff levels for high-speed lines. Tariff level dispersion is also increasing due to high increases in high-speed line tariffs. There does not seem to be any convergence in tariff levels and structure.

Keywords: High-Speed Rail, European Railway Reform, Infrastructure Pricing

INTRODUCTION

After the separation of infrastructure management (IM) from operations (Railway Undertakings, or RUs) by the European Railway Reform, Directive 2001/14/EC set out the framework for implementing railway infrastructure charging in the European Union. The directive specified implementation guidelines for charging systems, establishing a formal relationship between the newly-separated Infrastructure Managers and Railway Undertakings, and mandating the creation of infrastructure charging systems. It was hoped that this would promote competition in the railway sector and, in turn, optimize operations. While the European Commission's goals were quite clear, looking to create more competition on community railways, a significant amount of leeway was given to each country in implementing the directive. As a result, the type of separation of IMs and RUs varies significantly from country to country, as do the charging systems.

This paper will examine the situation in each of the 25 European Union countries with railway systems as well as Switzerland and Norway. First a qualitative analysis of tariff

systems will be performed, looking at railway infrastructure tariff system structure and evolution between 2005 and 2012. Next, a quantitative analysis will be performed, looking at the evolution of railway infrastructure tariffs in the same time period, and examining current infrastructure tariff levels. Finally, this paper will conclude with some remarks.

QUALITATIVE ANALYSIS OF EUROPEAN PASSENGER RAIL INFRASTRUCTURE PRICING SYSTEMS IN EU AND ITS 2005-2012 EVOLUTION

The main goals of the Railway Reform involve increasing the railway market share. This involves promoting competition among Railway Undertakings and making infrastructure maintenance and operations more efficient by incentivizing the Infrastructure Manager to operate in an efficient manner.

Directive 2001/14/EC lays down the ground rules for implementing infrastructure charging systems in the European Union. It specifies that RUs are to be granted a minimum access package and track access on a non-discriminatory basis. The charges, which apply to all RUs, must be published in a network statement, and the costs that each RU pays must be justifiable and directly incurred by the IM as a result of operating the train service. These costs may be averaged over time periods or train service types. Environmental costs may be included in the charge so long as they're applied equitably to all modes, and mark-ups are also allowed up to a Full Cost level.

In further classifying tariff systems, an assessment of tariff variables can be made. The variables have been classified into the following category groups: Rolling Stock and Traction Type, Offered Service, Service Type, Type of Path and Type of Infrastructure. A total 48 different variables were observed across all systems. The number of variables per country can be seen in Figure 1.

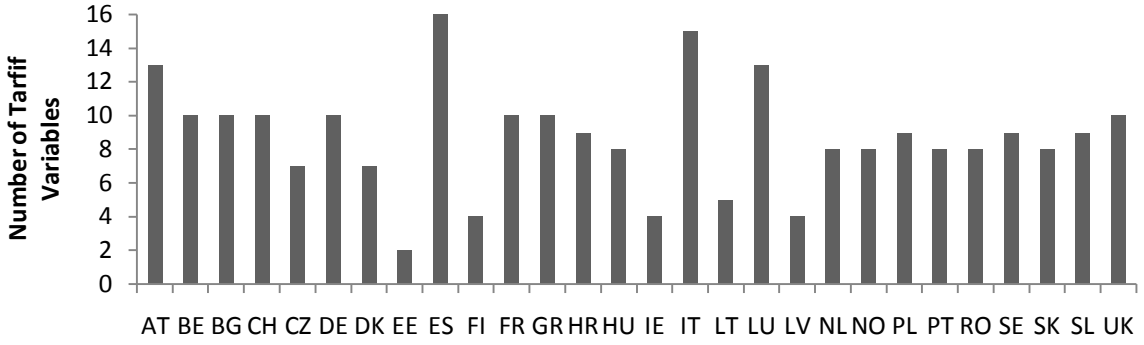


Figure 1 – Number of Tariff System Variables per Country

In looking at the evolution of tariff systems between 2005 and 2012, a significant number of systems have undergone significant changes, with five or more changed variables or a complete restructuring of the tariff system, while another significant part has undergone small to moderate changes. Results are presented in Figure 2.

In examining the period between 2005 and 2007, 11 systems have not undergone any changes, while 6 new or redesigned systems have been introduced. Eight systems have had one to five variables changed in this time period.

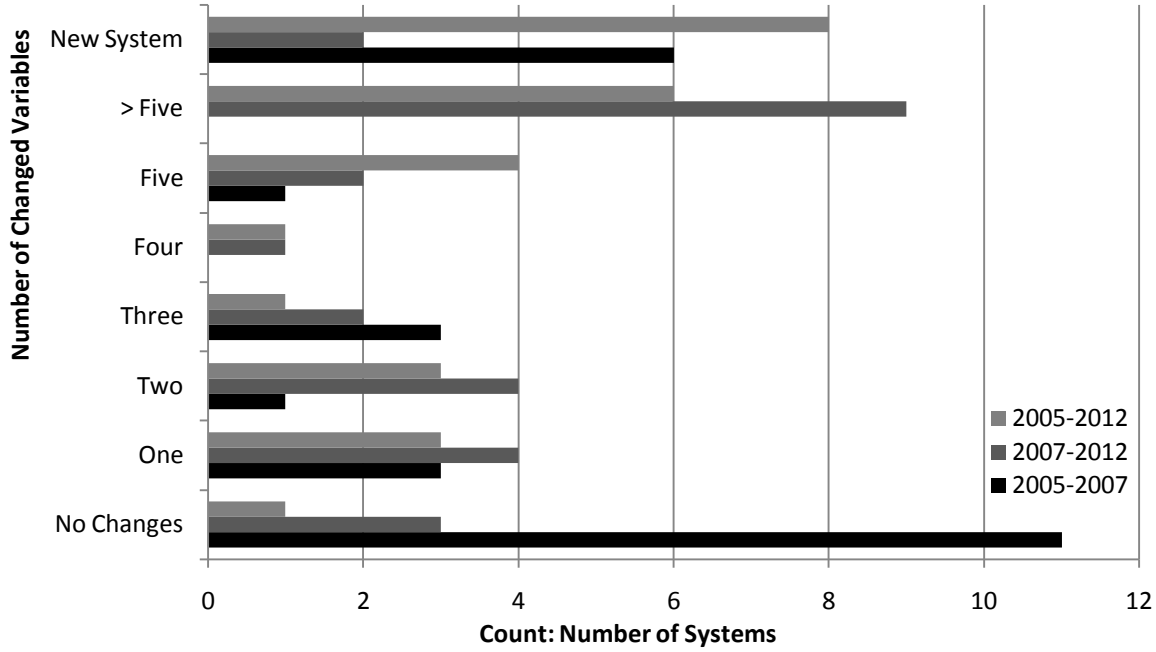


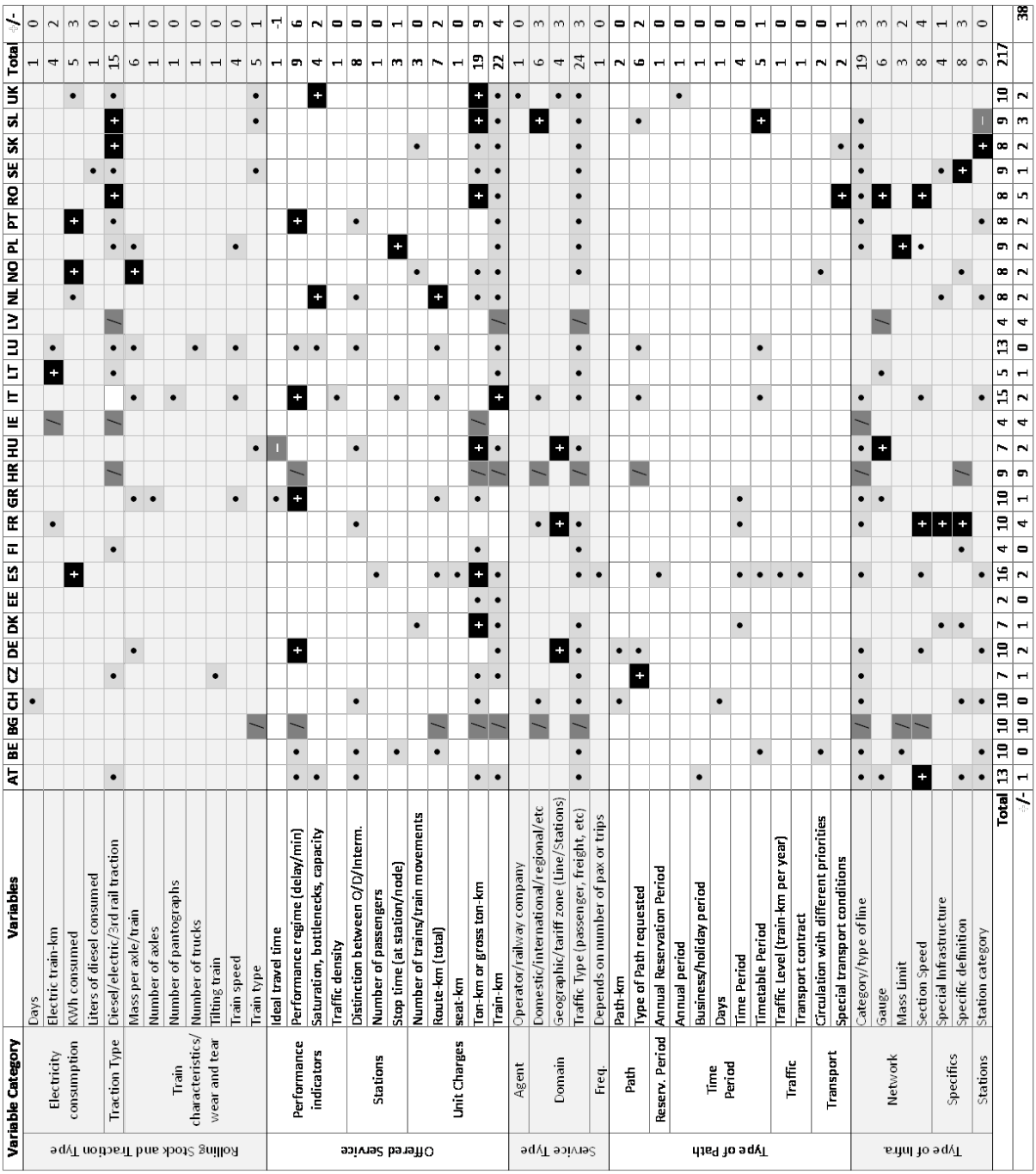
Figure 2 – Summary of Tariff Structure Changes 2005-2012

Between 2007 and 2012, most systems have undergone significant restructuring, with 11 systems changing more than 5 variables or reconfiguring the system altogether. Only 3 systems have not undergone any changes during this period.

These results point to a lack of stability in tariff systems in the long term. This uncertainty in tariff system structure poses a problem to RUs, who have to make decisions about purchasing capital-intensive rolling stock that has a long useful life. Not knowing how tariff system structure will change may have a negative effect on existing RUs and may discourage new RUs from entering into a market.

A detailed analysis of tariff system variables is presented in Figure 3. The figure shows all the variables considered, including variable evolution between 2007 and 2012. Specific variables for each country have been added, removed, or maintained between 2007 and 2012. Some variables were found to be present in 2012, but it is not known if they were present in 2007, due to lack of data for 2007 or an introduction of a tariff system between 2007 and 2012, where a tariff system did not exist before 2012.

The most common variables are: differentiation by traffic type (e.g. passenger vs. freight), charges by train-km, charges by ton-km or gross-ton-km, differentiation per type of line and differentiation by type of traction. An overall trend emerges, where many more variables are added than removed, pointing to an increased system complexity.



•	Variable **maintained** between 2007 and 2012
/	Variable present. **Not evaluated** before 2012 due to lack of data or lack of tariff system
+	Variable **added** between 2007 and 2012
–	Variable **removed** between 2007 and 2012

Figure 3 – Variable Summary for European Railway Infrastructure Tariff Systems and 2007 – 2012 Changes

Synthesis of Infrastructure Tariff System Evolution between 2005 and 2012

In examining qualitative and quantitative changes between 2005 and 2012, most systems have undergone at least some levels of change, with either changes in structure of certain elements or an increase or decrease in price for one or more elements. A general trend emerges – most systems are getting more complicated in their structure, as the number of tariff variables increases.

Figure 4 looks at the structural changes between 2005 and 2012. Most countries have had a general increase in price levels for one or more elements and a significant number have had price reductions between 2005 and 2012. Very few countries have experienced absolutely no changes during this time period.

Country	2005-2007 Structural Changes				2007-2012 Structural Changes			
	Qualitative		Quantitative		Qualitative		Quantitative	
	General	Certain Elements	Price ↑ in one or more elements	Price ↓ in one or more elements	General	Certain Elements	Price ↑ in one or more elements	Price ↓ in one or more elements
Austria	•	•	•			•	•	
Belgium		•	•			•	•	•
Bulgaria	No System				New System			
Croatia	System not analyzed previously							
Czech Republic								•
Denmark							•	
Estonia					•			•
Finland		•					•	
France	•	•	•	•	•	•	•	•
Germany	•	•	•	•		•	•	•
Greece								
Hungary					New System			
Ireland	No System				New System			
Italy		•	•				•	
Latvia		•	•				•	
Lithuania							•	•
Luxembourg			•			•		•
Netherlands		•	•			•	•	
Norway	•		•				•	•
Poland	•	•	–	•		•	•	
Portugal		•	•	•		•	•	
Romania					•		•	•
Slovakia	•				•	•	•	•
Slovenia					•		•	•
Spain		•				•	•	
Sweden	•	•	•	•		•	•	
Switzerland		•	•	•			•	
United Kingdom		•	•		•	•	•	•
Eurotunnel	•	•	•	•		•	•	
Oresund Link	•	•	•				•	•
TP Ferro	New Infrastructure							

Figure 4 – Variable Summary for European Railway Infrastructure Tariff Systems and 2007 – 2012 Changes

When comparing infrastructure charge evolution, it is important to place these changes into context. In order to do that, a comparison can be made between increases in prices with the Consumer Price Index. Figure 5 shows which countries increase faster than the increase in CPI, which countries increase slower and which do not increase or decrease, compared to the CPI. While most countries tend to increase, the majority are increasing near or below CPI.

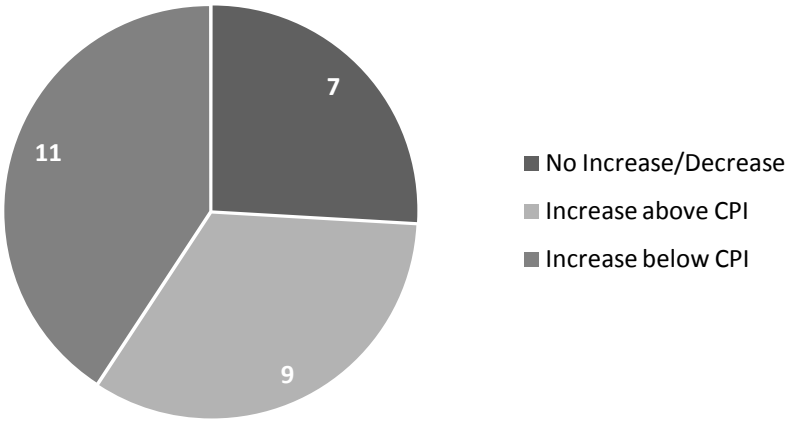


Figure 5 – Tariff Level Changes vs. CPI (2007-2012)

QUANTITATIVE ANALYSIS: INFRASTRUCTURE TARIFF LEVELS IN EUROPE FOR INTERCITY RAILWAY PASSENGER SERVICES

To evaluate the changes in tariff levels between 2005 and 2012, tariffs for 102 Origin-Destination pairs are examined. The selected pairs are of varying length, with about half national (originating and terminating within the same country) and half are cross-border. Figure 5 shows a map of all evaluated Origin-Destination pairs. The lines were selected to be as representative as possible of high-speed and intercity services available in Europe.

Most domestic ODs were selected to represent the best possible passenger services that a country has to offer. In case high-speed passenger services were not available, a service connecting two main cities was chosen. Most national ODs are less than 600 km. International OD pairs were selected for varying distances, and varying types of services. Again, in most cases best types of services (high-speed) were considered during OD selection. Figure 6 presents a differentiation in distance for the selected 102 OD pairs, separating national from international ones.

A train weighing 430 tons, with a length of 200 meters and a capacity of 500 seats was chosen. This train was then used to calculate the usage fee for every one of the 27 OD pairs. It was assumed that the train stopped only at the Origin and Destination, and in cases where the tariff varied by time, four calculations were made and averaged to obtain an average rate between point A and point B: a train leaving A at 08:00, a train leaving B at 08:00, a train leaving A at 18:00 and a train leaving B at 18:00.

Figure 5 – Map of 102 Origin-Destination Pairs Evaluated

In looking at tariff levels, an evaluation of one OD per country was conducted. These OD pairs, were selected to be as close to 300 km in length as possible, and based on the following criteria: the OD pair is located on a line with high speed service (existing or under construction); or the OD pair is located on a line with a high level of service. The line selected represents the best possible service for each of the analyzed countries. The best possible OD was selected. Between 2007 and 2012 the mean and the spread have both increased, with many more outliers in 2012 than in 2007. Figure 7 shows a box plot of the total fees for all the evaluated countries.

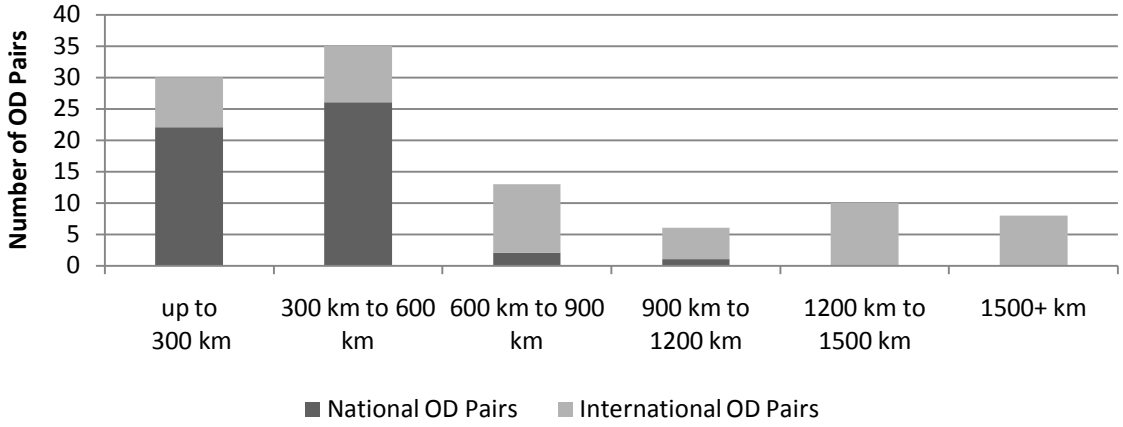


Figure 6 – Evaluated OD Pairs vs. Distance

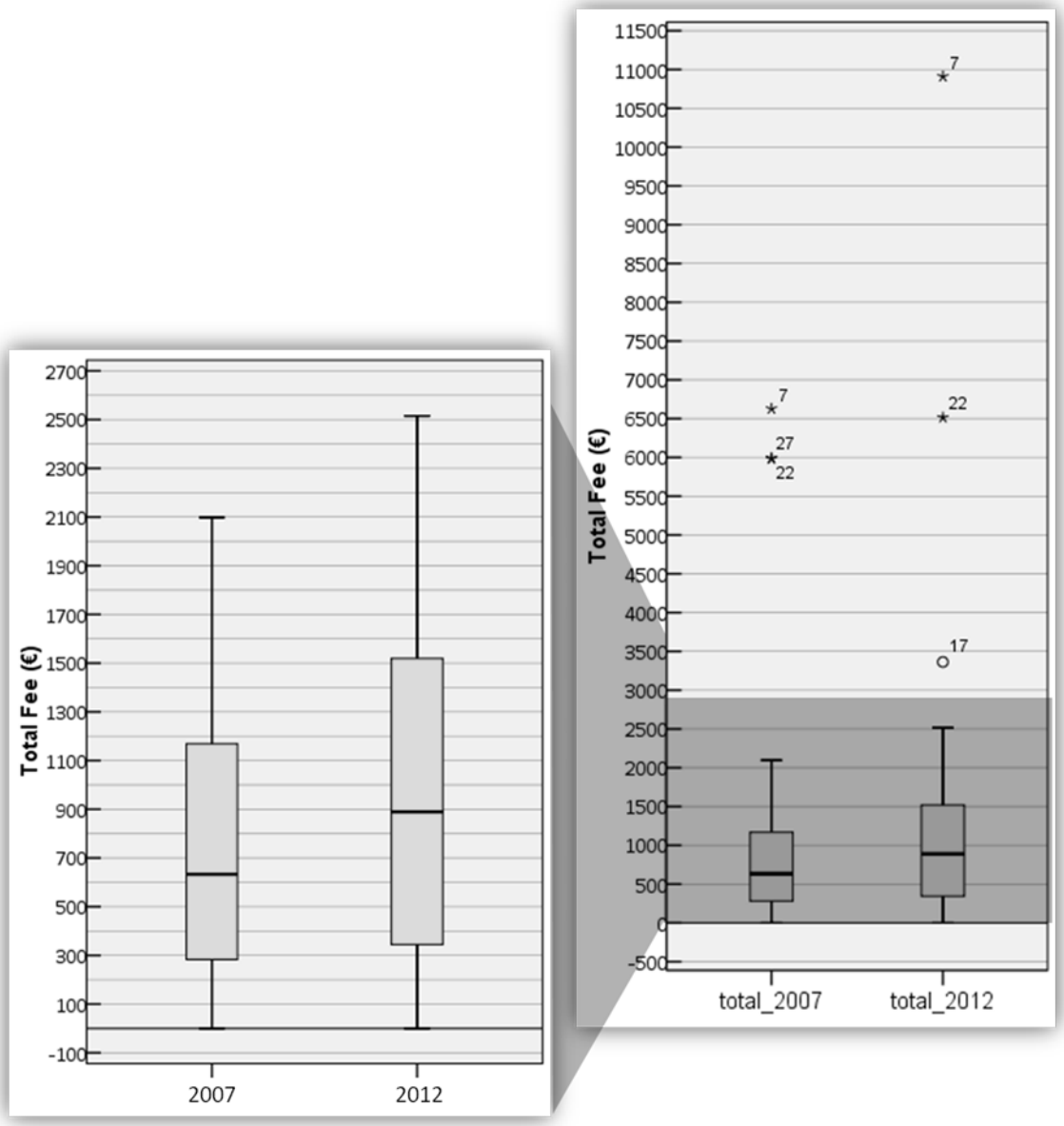


Figure 7 – Total Fee for Selected National OD Pairs (one per country) Providing Best-Possible Passenger Service

Going back to the entire set of 102 OD pairs, a comparison of fee per kilometer vs. commercial speed, as shown in Figure 8 displays a positive correlation. However, higher-speed lines are generally charged a higher per-kilometer rate. A small cluster of ODs with lower commercial speed are charged a higher fee per train-kilometer.

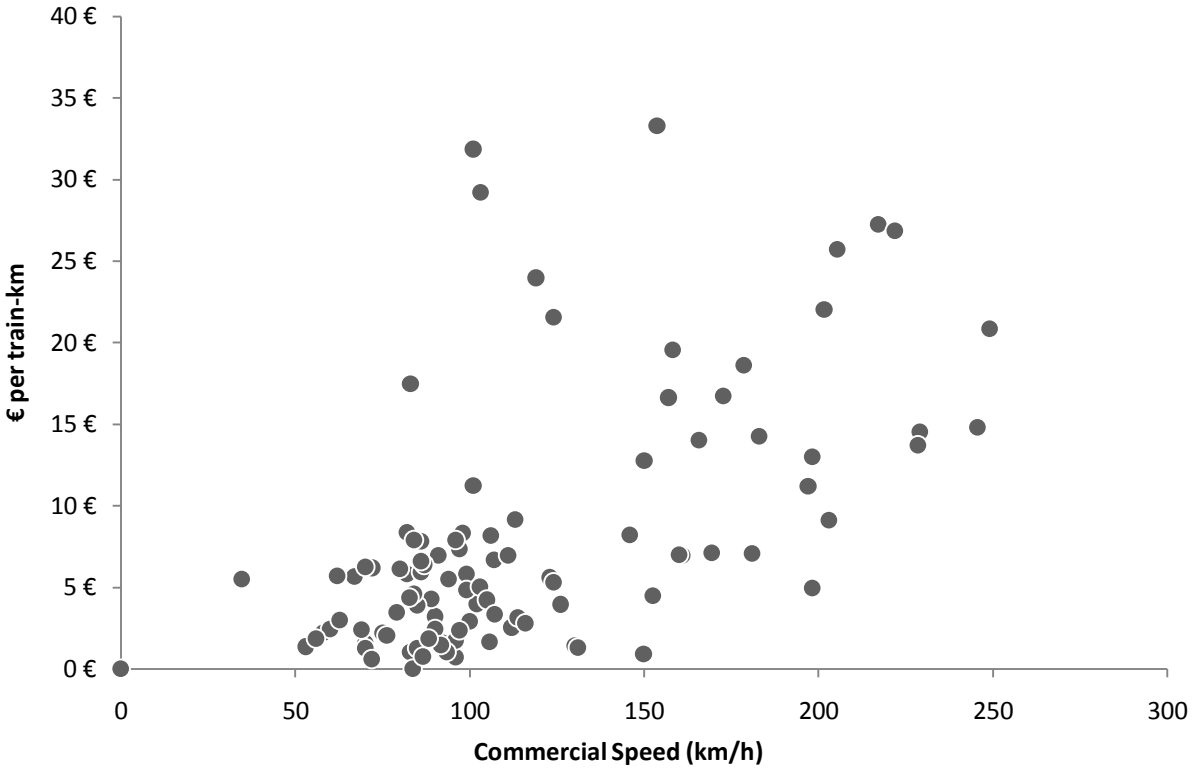


Figure 8 – Price per train-kilometer (€) vs. Commercial Speed (km/h)

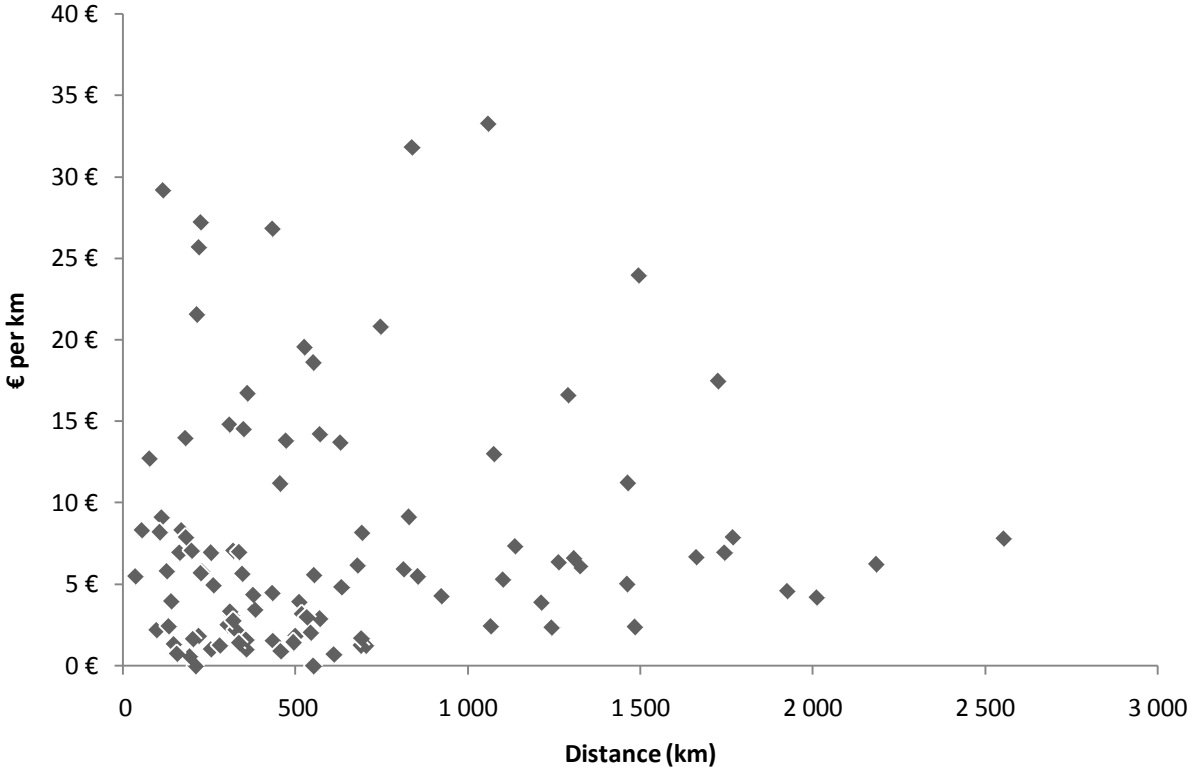


Figure 9 – Price per train-kilometer (€) vs. OD Distance (km)

A comparison between price and OD distance in Figure 9 shows that some long-distance ODs are charged a lower per-kilometer rate than their shorter counterparts. Between 2007 and 2012, the median price per kilometer as well as the dispersion have both gone up on

average for the evaluated lines as well as for high-speed lines, but have come down for conventional lines. The maximum fee has increased between 2007 and 2012.

CONCLUSIONS

From a qualitative point of view, the number of tariff variables has increased as has the complexity of complex tariff systems. For the most part, simple systems have remained simple. Overall, the number of variables has remained similar to that of 2007, with minor changes. From a quantitative point of view, the dispersion in tariff systems has increased both in levels and structure, while the tariff levels have generally increased for some high-speed lines, but have remained the same, and even experienced an average decreasing trend for regular lines. In countries where other high-speed OD pairs exist tariffs for high-speed services tend to be similar (same order of magnitude), regardless of the OD.

Looking at the increase of IM fees, compared to the annual CPI increase, a split in the number of countries with increases above CPI and below CPI is even. However, for high-speed lines, the trend is that of increases. Every high-speed line has increased in price between 2007 and 2012; however the level of increase varies from country to country.

While there is a positive correlation between commercial speed and tariffs, no clear correlation is visible between OD distance and price.

Overall, as complexity among tariff systems is increasing, so do tariff levels for high-speed lines. While for simple systems, there seems to be a convergence in structure, and in some cases in tariff levels, additive, and multiplicative systems do not seem to show any convergence in structure, nor in tariff levels, which seem to be diverging. Thus, while the railway sector is adapting to the new structure, a refinement of the European regulation may is needed to promote competition.

ACKNOWLEDGEMENTS

The authors would like to thank the UIC (International Union of Railways) Passenger/High Speed Committee for supporting this research, as well as Fundação para a Ciência e Tecnologia, FCT ref. PTDC/SEN-TRA/112975/2009.

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