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Are railways really that bad? An evaluation of rail systems performance in Europe with a focus on passenger rail

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ABSTRACT

With a large number of railway development projects in Europe and worldwide, which once completed will be serving rail passengers of the future, this paper aims to take a step back and evaluate current railway systems performance. The objectives are to compare statistical data on various passenger-related parameters of the railway system in a number of selected European countries and draw conclusions on the level of their performance when compared to the European average.

Analyses of publically available statistical data, extracted from the Eurostat service at a European level will allow for a comparison of various indicators which influence the performance of the railway systems from an infrastructure and operational perspectives. The analyses will also allow identifying key performance indicators for the accurate assessment of the rail systems.

The paper will highlight case studies for various parameters which are important to stakeholders of the railways, including infrastructure managers, rail operators, policy makers and the end users. This knowledge will be to the benefit of today's railway industry as well as the rail systems of the future, as it will show trends drew upon existing data which might continue in the future.

1. Introduction

Over the last few years the railway system in many European countries has come under increasing criticism within the media with many people complaining about capacity issues, delays, cost, etc. The general complaints are that most trains are late and overcrowded, especially during the rush hours when people are commuting (United Kingdom-based headlines: BBC, 2014; Telegraph, 2013; Rail Technology Magazine, 2015; The Guardian, 2014) thus feel disappointed by the unreliable system. This forms the basis of this paper, which will look at whether the rail system within Europe is really as bad as the media sometimes portrays by benchmarking rail system performance of few cautiously selected European countries.

2. Methodology

2.1. Data source

To evaluate the passenger rail system performance at a European level a reliable data source is needed. Eurostat (2016), the statistical office of the European Union (EU), holds a range of data for many different parameters (e.g. population,

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industry, transport) that enable comparisons between European countries and regions. The main reason for using Eurostat data in the paper is that it is a very convenient system, storing a large number of, relevant in this case, rail-related data available in a single location for most of the countries within Europe. Moreover, the system is supplied with data collected and harmonized by The National Statistical Institutes of the Member States of European Union (Commission of the European Communities, 2009) meaning that the source is reliable. And above all the Eurostat database is free to use and offers open access to its data which makes Eurostat superior to some other data sources, which are either available at national level only (e.g. data.gov.uk service in the United Kingdom) or require an access charge (e.g. UIC statistics). Therefore, Eurostat is clearly a suitable data source and will be the main resource of data used for analyses within the paper.

2.2. Plan for data analyses

The data imported from Eurostat (2016) will be used to produce graphs showing trends within the data in order to make comments on the state of the current European passenger rail systems. First, for majority of the parameters, the average value (arithmetic mean) of the European countries for a particular year will be plot on a graph. Next a graph with values for a selection of European countries will be produced to see if the average trend for Europe is similar or different to the trends for the individual countries. Majority of data gathered will cover years from 2004 to 2014, as available in Eurostat, although some data is available for other periods. The set of 10+ year data period is large enough to allow for a reliable look for any trends in the data gathered.

2.3. Selection of sample countries

The country sample is selected according to three-folded criteria: a level of Gross Domestic Product representing economic situation in a country, a position in the Rail Liberalisation Index 2011 being a reflection of a country's progress with rail liberalisation issues and a location at the 2015 European Railway European Performance Index demonstrating a combination of intensity of use, quality of service and safety issues in a country's railway sector. A selection of countries with high, medium and low values of the above criteria, reflecting the state of the railways across Europe, will be considered.

2.3.1. Gross Domestic Product

Values of Gross Domestic Product (GDP) vary within the European countries. The GDP is defined as "the total value of the final consumption expenditures of households, non-profit institutions serving households and general government plus gross capital formation plus the balance of exports and imports" (Eurostat, 2016b). Also, the volume index of GDP per capita in Purchasing Power Standards (PPS) is, in this case, expressed in relation to average for the European Union (28 EU member states) which is set to equal 100. Therefore if the index of a country is lower than 100, the level of GDP per head in this country is lower than the average for the EU and consequently if the index of a country is higher than 100 then this country's GDP per head is higher than the EU average.

Fig. 1 displays values for GDP per capita in PPS for the period from 2003 to 2015 with average values for the 13-years period for each country displayed above bars on the graph and later in the text in brackets. The GDP results are divided into five groups with the bottom group representing values up to 25 and then each next group with up to 25 scores more with the top group reaching values between 152 and 255. It can be seen that the exceptionally high GDPs above 150, located on the left hand-side of the graph, are presented for Luxemburg (255), Norway (175) and Switzerland (152). Twelve other countries, including small-size countries like Belgium (118) or Netherlands (134), medium size countries like United Kingdom (114) and large-size countries like Sweden (125) and Germany (120), all have the indexes above the EU average ranging from a steady just above 100 points for France (108) to nearly 150 points for Ireland (137) until 2008. Italy (103) and Spain (97) results position the two countries at the border of the EU average of 100. Majority of countries classified in the bottom two GDP groups, with GDP values up to 69, joined EU relatively recently (year 2004 or later). Interestingly, GDP indexes for Balkan-based countries are mainly below or around 50 with medium-sized Bulgaria (42) and Romania (46) showing a rapid growth of 10 and 20 points, respectively, from the level of 30+ in 2003.

In order to see whether wealthier countries and poorer countries fit in with the general trend across Europe or whether there is some disparity for wealthier or poorer counties in terms of their railway systems performance, a selection of countries with a range of GDPs will be chosen as the final sample.

2.3.2. The Rail Liberalisation Index 2011

Results for the European countries published in Rail Liberalisation Index (LIB Index) supply information on the progress with liberalisation process in the European railways and take into account passenger and freight rail transport (Kirchner, 2011). Primary data for LIB Index is extracted from various sources, including but not limited to national statistical offices, Eurostat, IBM Global Business Services Network, current studies and annual reports, which ensure the reliability of the data. The LIB Index is composed of two other indexes where 80% of weight is put on ACCESS Index and the remaining 20% on LEX Index. LEX Index, characterised as 'law-in-the-books', describes market entry legal requirements and the level of support external Railway Undertakings receive from regulatory authorities and is composed of three sub-indices: organisational structures of the incumbent (25%), regulation of market access (45%) and competencies of the regulatory body (30%) (Kirchner, 2011). ACCESS Index, described as 'law-in-action', analyses actual accessibility of markets and allocation proce-