

# Public Contributions to the European Rail Sector: An in depth analysis for eight countries

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*This paper is work in progress.*

## Abstract

This paper provides an analysis of the funding structure of the railways in 8 European countries. It updates and expands the well-known database on public contributions to rail which has been initially published by NERA (2004). The analysis shows that there are large differences concerning the focus of granted funds which can be explained by different policy objectives, differences in the level and degree of network access charges and different cost coverage ratios of public transport services. We identify a tendency towards two main financing models. In our data-set countries either focus their support payments on the operation of the infrastructure, which implies lower network charges and thus a lower amount of necessary Public Service Compensations, or they focus on the support of transport services with a higher degree of cost coverage of network charges and thus a lower amount of operating contributions paid to the infrastructure manager. The structure of funds, different approaches of infrastructure financing and differences in the treatment of historical debt are likely to have an influence on the performance of the investigated railway systems.

**Keywords:** Public Contributions, Subsidies, Rail, Railways

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# 1 Introduction

Public contributions are one of the main funding sources of the European railway sector. Environmental and social reasons as well as the potential to foster economic development are common justifications for these payments. Even though government expenditures for the railway sector make up a significant share of state budgets in most of European countries, detailed information on the level and use of funds are typically not available in easily accessible, systematic and well-structured form. This is why researchers argue, that there is plenty of room for a deeper investigation of public support to the European railway sector (see for example Arrigo and Di Foggia 2014, p. 33). Especially in times of tightening budgets and higher financial needs of railway undertakings the debate on the future design of the European railway sector might benefit from an in depth review of different funding schemes. Apart from budgetary and efficiency considerations detailed data on the level of public contributions to the different organizational units of the sector might also have regulatory relevance, since large parts of regulated access charges are paid from public service compensations.

NERA (2004) is one of the few databases that allow for cross-country comparisons of public support in certain categories and therefore goes beyond the rather aggregate figures that are stated in most analyzes. The prevalence of those aggregate approaches (see for example Nash et al. 2011 and van de Velde et al. 2012) are due to the fact that payments are typically not collected on a comparable basis. Furthermore, European legislation doesn't provide a clear classification of government support since permitted payments are regulated by several directives and guidelines. Because of this, no standardized methods for the assessment of government support to the railway sector do exist. However, given the rather complex financing structures railways exhibit, and the fact that government support occurs on different stages by the means of different methods and might be complementing or substituting other sources of funds, it is obvious that in depth analysis requires a sufficiently detailed database.

In this paper we provide an analysis of the financing structure of the railways in 8 European countries. We update and expand the well-known database on public contributions to rail which has been initially published by NERA (2004). For this we took a deeper look at the financing structure of each railway sector, collected relevant payments and evaluated the consistency of already existing studies. Data have been mainly collected from public budget plans, annual reports of infrastructure managers and transport undertakings, publications of regulatory authorities and statistical

offices. We furthermore conducted a survey to obtain additional information on the level and breakdown of government support. In our data we differ between seven categories of government support that reflect the organizational structure of the European railway sector as well as the main areas of public contributions. The database covers a period from 2001 to 2015 and includes financial figures as well as other key characteristics for the railway sectors of France, Germany, Great-Britain, Italy, Norway, Spain, Sweden and Switzerland. To be able to compare the level of government support and the development of transfers over the observation period we adjusted our figures using passenger-ton-kilometer (ptkm) and the number of inhabitants (tax payer cost) as the main indicators.

## 2 Literature Review

### 2.1 The NERA (2004) Database

The publication of NERA (2004) is one of the most detailed, publicly available, studies of public contributions to the European railway sector. It compares direct public budget contributions of seventeen European countries with state aid data from the European Commission. The payments are summarized into several groups, reflecting different types of public budget contributions permitted by EU legislation. This includes compensation for Public Service Obligations, freight transport grants, support for operation and maintenance of the infrastructure, grants to support investment, staff and pension obligations, debt service as well as support granted for the restructuring of the sector. Initial 2001 data have been updated and extended for an period from 1995-2003 (see NERA 2005), covering public budget contributions to railways in 9 European countries (see Figure 1). Data sources comprise annual reports, budget reports and the International Railway Statistics published by the International Union of Railways (UIC).

Even though the data has been used in several studies and publications (see for example Perkins 2005 or Dehornoy 2011), we find that the database of NERA (2004) has several shortcomings when trying to compare government support between countries. For example, it covers only support to operators and infrastructure managers while other entities or institutions involved in infrastructure or transport provision are often not included. Staff and pension obligations, are often paid to institutions outside the administrative area of companies and are therefore not included in the dataset - whereas in some countries like Switzerland those expenses have to be borne by the companies itself without additional government contributions.

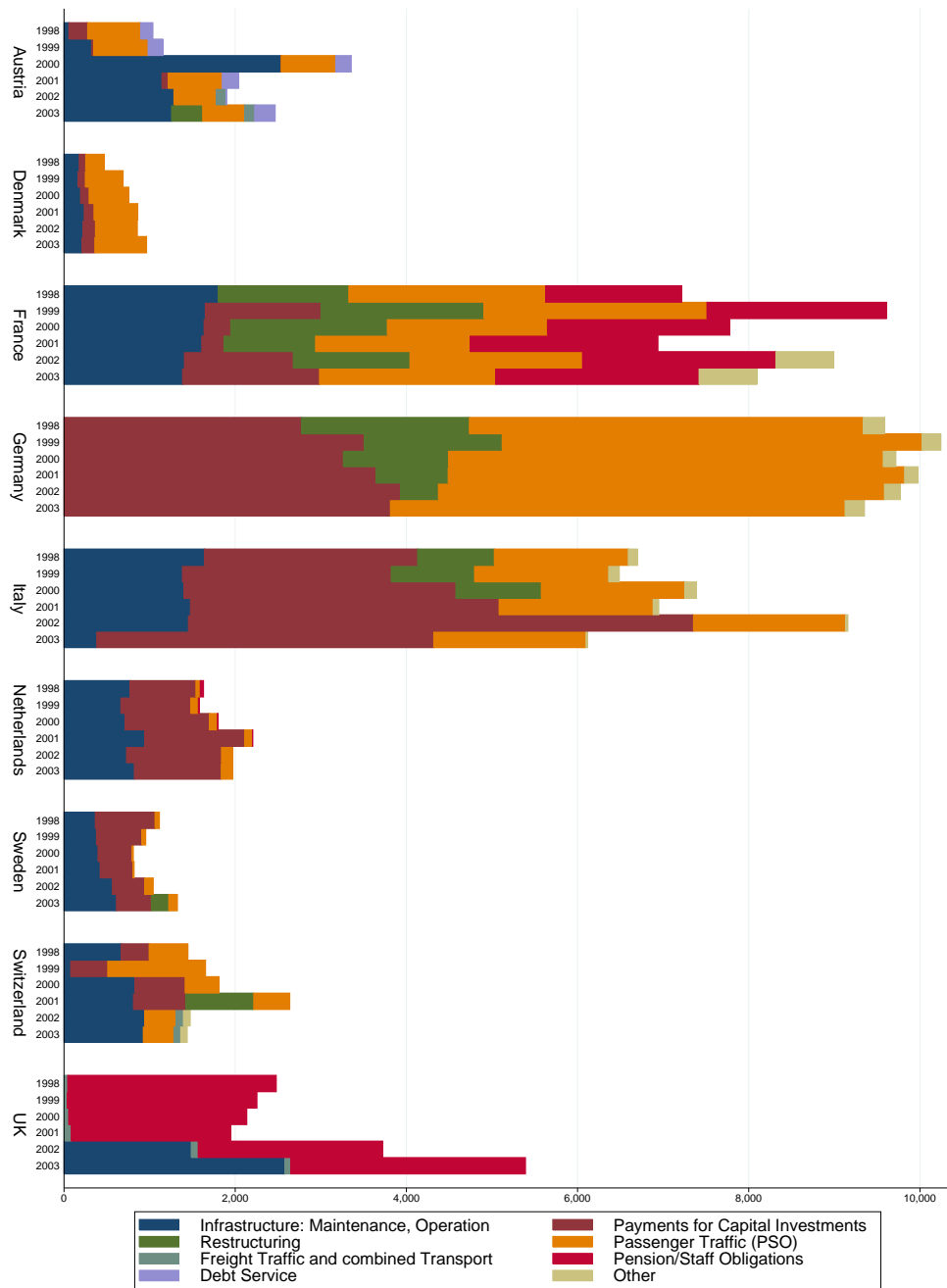


Figure 1: NERA estimates of Public Budget Contributions 1998-2003. Source: NERA (2004, 2005). Figures in millions of Euro at current prices.

The exclusion of payments might be more problematic when looking at infrastructure investments. For example, in Switzerland large infrastructure projects are financed from special budget funds outside public accounts. When examining the effectiveness of government support or the performance of a railway system those payments should be included into the analysis, since they might be able to explain differences between countries. Furthermore, the database of NERA (2004) contains only support paid to the main railway companies, mostly incumbents, while payments to other companies are not included. However, since we are most interested in a country comparison it is crucial to consider industry data rather than data for incumbents and main institutions. This is in particular important since the number of private companies taking over public transport contracts tend to be increasing in some countries. These points should therefore be kept in mind when updating data on public contributions.

## 2.2 Recent Studies and Databases

Apart from the comprehensive database of NERA (2004) and the State aid estimates of the European Commission<sup>1</sup>, data on government support has been collected for a number of analyses who compare data between various countries and for various periods. Typically data is gathered from financial reports of receiving as well as granting institutions in each country. Moreover, sector reports and publications of ministries in charge, regulatory authorities or organizations like the International Union of Railways are usually consulted to obtain a more detailed overview of the financing structure in each country. However, coverage and level of aggregation of data differ between studies as well as between analyzed countries. Data most commonly contain only contributions paid directly to transport operators and infrastructure managers, whereas government loans and support granted via special purpose entities are not always included. Furthermore, it is not always clear to which extent government payments for the restructuring of the sector or other expenditures are accounted for or whether payments to competitors of former state-owned enterprises have been included. We find that a detailed description of contained data, data gaps or the applied collection process is

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<sup>1</sup>See State aid Scoreboard of the European Commission 2014, Non-crisis aid, Table 'Subsidies to the railway sector', available online: [http://ec.europa.eu/competition/state\\_aid/scoreboard/railways.xlsx](http://ec.europa.eu/competition/state_aid/scoreboard/railways.xlsx). Since 2012 data is broken down in Public Service Compensation and pensions as well as infrastructure and other aid. Previous data has been stated in aggregated figures only (see Table 'Subsidies to the railway sector', available online: [http://ec.europa.eu/competition/state\\_aid/studies\\_reports/ws4\\_41.xls](http://ec.europa.eu/competition/state_aid/studies_reports/ws4_41.xls)).

often missing. This hampers the comparison of data and outcomes between studies. The following paragraphs contain a review of selected studies that analyzed government support to the rail sector in European countries.

Nash et al. (2011) compared the overall level of government spending for Great Britain, Sweden and Germany for a period from 1997-2007. However, they only state government support for infrastructure investments for Sweden separately. Dehornoy (2011) compared the development of public funding between Germany, UK, France, Sweden and Switzerland for a period ranging from 1980-2010 (depending on country). The author tried to break down payments in accordance to the classification of NERA (2004), however, in their final analysis they had to use aggregated figures since detailed comparable data was not available for all countries. Dehornoy (2011) furthermore mention the importance of a consistent comparison of support, in particular of payments for the restructuring and debt relief programs that reduce the cost of some undertakings while other undertakings haven't been exempted from these additional burden.

Deville and Verduyn (2012) conducted a detailed analysis of the financial situation of the railways in Belgium, Germany, France and the Netherlands, though, data is not being used to compare the development of government funding between countries. Steer Davis Gleave (2005) compared the level of state funding of 18 EU countries, Norway and Switzerland for a period from 2000-2004. However, a detailed breakdown of support (categories infrastructure development and PSC) is only available for the year 2003 and not for all countries. RGL Forensics, Frontier Economics and Aecom (2009) prepared a detailed report of the financial situation of transport undertakings and infrastructure managers to the European Commission covering a period from 2004-2007. They provide detailed data on public funding that national railways received from the government, however, companies have been analyzed independently without attempts being made to assess differences in the financing structure between countries. The European Commission (2007, p. 111) published a comparison of the development of financial contributions for infrastructure operation, maintenance, renewals and construction for an period from 1996-2006. Unfortunately they don't provide an exact breakdown of support figures.

Less comprehensive analyses contain data for single years or provide only figures on the relative development of support without an exact breakdown of payments. Arrigo and Di Foggia (2013), for example, analyzed schemes and levels of government support to the railway sectors in Germany, UK, Sweden, Italy and France for different years. However, only for Italy payments were broken down into operating support and capital grants (covering a period

from 1997-2011). Arrigo and Di Foggia (2014) extends and deepens the analysis to cover public spending to railways in France, Germany, Great-Britain and Sweden for a period ranging from 1992 to 2012. However, data is only comparable to a small extent. In their country comparison the authors therefore considered only aggregated support figures.

In their report to the European Commission ECORYS Nederland BV (2006) compared the financial situation of 23 EU countries, Norway and Switzerland. Information on government support is not available for all countries and the level of aggregation of funding data varies between countries. Nash (2010) analyzed state spending on rail infrastructure between 25 European countries using 2006 data provided by the Community of European Railway and Infrastructure Companies (CER). For their EVES-Rail study van de Velde et al. (2012) compared the development of government support per transport unit for Germany, UK, Switzerland, Netherlands and France over a period from 2000-2010. Figures include operating and investment grants, pension obligations and health insurance costs. Dividends that some groups pay back to the government have been subtracted. Nevertheless, no attempts are made to analyze the breakdown of support and contributions are only stated in an aggregated form.

Finger et al. (2015) compared the financial structure of 10 European countries in 2012. Data is taken from the Rail Market Monitoring Scheme (RMMS) of the European Commission (2014), Eurostat, the UIC and other publications. The authors discuss the interaction of public contributions to infrastructure and transport undertakings as well as the influence of different approaches of access charge and fare pricing on the focus of government contributions. Using the data collected in our paper, the analysis of Finger et al. (2015) could be extended for a longer period. This would allow to examine changes in the financing structure of each railway system and their impact on the performance and output of the industry over time.

## **3 Construction of the Data Set**

### **3.1 Identification of relevant payments**

The collection of financial data, in particular in regard to public contributions, is an elaborate process. This is due to several reasons. Railways consist of rather complex financing structures. Government support is paid on different stages by the means of different methods and might be complementing or substituting other sources of funds. European legislation doesn't provide a clear classification of government support/funding instruments and detailed

data is not available for the period after the liberalization of the European railway sector.

Furthermore, it is often not easy to identify the 'true' extent of government support. For example, if the government is the biggest shareholder of railway companies, it is challenging to determine the effect of government influence on investment decision of the entity and the financing of these (see for example Steer Davis Gleave 2005, p. 72-73). Especially PPPs are said to be used to transfer debt out of public accounts and should be stated as government investments (see Engel et al. 2010, p. 62), however these financing instruments are often not accounted for in existing studies. In practice the impact of so called indirect support is difficult to measure (see for example Valsecchi et al. 2009, p. 17), since no standardized demarcation of indirect support exists. Some researchers suppose that indirect support accounts only for a comparably small portion of total support (see Best et al. 2006, p. 613) while others estimate the level of indirect funding to up to 30 percent of declared State aid (see NERA 2004, p. 118). However, literature focuses mainly on contributions that can be observed directly. We'll follow this approach to be in line with existing studies and to avoid estimation errors. Thus, in this study the terms 'government support' or 'public contribution' refer to any direct government expenditure which is targeted to the field of transport service and infrastructure provision as well as the restructuring of the sector or other fields mentioned in the next chapter.

Following suggestions of the OECD (2010, p. 83-86), who published a guide on measuring public support to the agricultural sector, we will capture relevant government payments using a three-step identification process. We apply this procedure to overcome shortcomings of previous studies who mainly concentrated on the biggest railway companies and excluded support paid to special purpose entities or investment undertaken directly by the government. It allows to reveal the overall level of government funding rather than the support to single companies. First, all institutions that are involved in public funding of the railway system will be identified. Second, all administrative levels will be covered, since funding might pass several stages before being granted to the final beneficiary. Third, all public finance instruments will be considered, even those that are organized outside the national budgets, for example funding for investment that is provided through special purpose entities.



## 3.2 Classification of contributions

To achieve comparability of the collected data between countries we classify the identified payments to one of the categories mentioned below. The categories reflect the main areas of government funding and are derived from existing studies (in particular NERA 2004, 2005), the organizational structure of the sector as well as the legislative background and financing practice as discussed in the previous chapter. We've slightly modified the classification of NERA (2004, p. 61-68) to account for additional types of support. Our analysis will focus on the following categories of government contributions: (1) Infrastructure revenue contribution (support for management, operation and maintenance of the network) that are paid to complement/substitute revenue from access charges, (2) Infrastructure investment contributions for (a) replacement investments as well as (b) for the expansion of the existing network and new construction projects, (3) Public Service Compensation (PSC), (4) investment contributions for the purchase of rolling stock, (5) pension and staff obligations, (6) payments to reduce the indebtedness of undertakings, debt service payments, compensation for interest expenses as well as the takeover of historical debt and (7) obligations related to restructuring. In the following we discuss these definitions in detail.

Infrastructure revenue contributions (1) refer to public funding that covers operating costs of the railway infrastructure. These payments are often classified as operating income in the profit and loss account of the infrastructure managers and are subject to management contracts or compensate the IM for specific operating expenses. Government support for the task of establishing, managing and maintaining the railway infrastructure are subject to Article 8 of Parliament and Council Directive (EU) No 2012/34 (OJ L 343/32) establishing a single European railway area. However, it is not explicitly stated in which forms financing can be granted. According to a statement of the European Commission (2008) the relationship between each Member State and its infrastructure manager for the funding of maintenance and modernization of the railway infrastructure should be subject to a multi-annual-contract. Government support thereby shall complement revenue from user charges, i.e. should be treated as additional income from operation. However, Council Directive (EU) No 2012/34 also gives Member States the right to demand the infrastructure manager to balance its profit and loss account without government support, i.e. to cover operational expenditures only from user charges.

Council Directive (EU) No 2012/34 furthermore points out that Member States may provide the infrastructure manager with financing, in particular

to cover new investments. In our analysis we split contributions for infrastructure investments (2) into two sub-categories, support for replacement investments (a) and support for expansion and new construction (b). This involves grants for the renewal of the existing railway infrastructure (a) as well as grants for investments in new railway infrastructure and expansion of the existing network. In contrast to NERA (2004), support for infrastructure investment has been split into two subcategories. This will allow examining to which degree the government supports the development of the infrastructure in terms of focusing either on the preservation or/and on the extension of existing infrastructure. Moreover, the influence of governmental support on different stages of the provision of railway services can be studied to a greater extent. For instance, especially support for infrastructure operation and maintenance as well as support for replacement investments lowers the access charge and therefore the cost of transport undertakings, i.e. necessary Public Service Compensation (see NERA 2004, p. 64-66), while other countries might support the infrastructure indirectly by higher PSO payments.

The Category Public Service Compensation (3) refers to contractual payments and revenue contributions that are subject to the public provision of transport services. Public services are most commonly referring to regional transport services, nevertheless, some long-distance or freight connections are also seen as economically desirable and receive government support. However, it should be noted that public service activities are not necessarily non-profitable. Due to their importance and the use of cross-subsidization to reduce the amount of necessary government funds, the decision-making power usually remains with the responsible authority. Public service activities are typically contracted to a commercial operator. Parliament and Council Regulation (EC) 1370/2007 (OJ L 315/1) on public passenger transport services by rail and by road sets the conditions under which authorities can compensate transport operators for costs incurred or can grant exclusive rights in return for the discharge of public service obligations. The Regulation defines that a public service compensation refers to any benefit, particularly financial, that can be granted directly or indirectly to operators (see article 2 g). Since the measurement of non-financial, e.g. indirect, compensations can be only approximate, we focus only on direct compensations as stated in company accounts and budget plans.

According to European legislation support to transport operators outside the scope of a Public Service Obligation may also be granted if it is compatible with the Treaty. Community Guidelines on State aid for railway undertakings (2008, OJ C 184/07) point out, that financing of rolling stock can contribute to the objective of common interest. Thus, governments may

support transport undertakings with funds for the purchase and renewal of rolling stock. Only the costs of the purchase of rolling stock for exclusive use in freight transport are not admissible (see paragraph 34). For all other types of transport strict conditions need to be met to avoid distortions of competition (see paragraphs 31-40). If transport operators receive additional grants for investment in rolling stock, payments are stated in the category rolling stock investment contributions (4). The treatment of rolling stock investment contributions differs to the approach of NERA (2004), who haven't stated them separately but included them into PSC figures.

Payments for retirement as well as redundancies, i.e. government support for staff payments that are not directly related with the operation of infrastructure or transport services, are contained in the category pension obligations (5). Debt service, debt reduction and capital rejections (6) refers to the takeover of historical debt and debt service payments in the form of capital transfers or the compensation of interest expenses. The category obligations related to the restructuring (7) contains government support like the compensation for specific operating cost and compensation for legacy cost that are due to the management of a former state owned enterprise. In the past, support for restructuring was most commonly granted in the form of debt reliefs that were aimed at freeing the sector from 'historically' grown debt. Government support thereby focuses on relieving operators from additional burden that private operators don't need to bear. Thus, support related not directly to operation and investment is most often justified by promoting equality between former state owned enterprises and other commercial companies (see Council Regulation (EEC) No 1192/69 on common rules for the normalization of the accounts of railway undertakings, 1969, OJ L 156/8). The degree to which former state owned enterprises have been exempted from historic debt has an influence on the financing cost the undertakings have to bear, and thus influences the amount of necessary funds that have to be recovered either from revenue or from public funds, this is why it is crucial to include these payments into the analysis.

### **3.3 Data Sources and Quality**

The quality and the coverage of available data on government contributions has increased in recent years. To maintain comparability of data over the whole observation period minor adjustments had to be made. Nevertheless, there are still large gaps in data for some countries. Furthermore, differences in data availability, scope and consistency persist between countries that have been considered in our study. There are also large differences concerning

the accounting treatment of government support. It is clear that due to the complexity of the sector a full coverage of data cannot be achieved. However, this problem is exacerbated by the fact that no major attempts have been made at the political level to standardize the reporting of government funds being spent on the sector, even though they account for a significant portion of Government budgets in each country. Especially in times of tightening budgets the debate on the future design of the railway sector in Europe might benefit from an in depth analysis of differences in the funding structure and return on government funds.

For France we compiled data mainly from the annual transport statistic published by the French Ministry of Transport. Although data of the Ministry of Transport differ slightly from the payments stated in annual reports of SNCF and RFF they are still advantageous, since data is available for a longer period and allows for a detailed breakdown of support figures. The amount of compensation for infrastructure operation in our dataset is comparable to the figures in NERA (2004, 2005). Nevertheless, we obtained different estimates for the height of the granted infrastructure investment contribution, Public Service Compensation and pension obligations. Dehornoy (2011) and Deville and Verduyn (2012), who analyzed the development of public contributions to the French railway sector in detail, also used data published by the French Ministry of Transport. Since both publications don't provide detailed information on the exact height of payments included into each of their categories, figures are difficult to compare with our findings. However, the relative development of total support estimates is similar.

Data for the German railway sector has been mainly taken from the budget plans of the Ministry of Transport. However, some adjustments had to be made. We supplemented data by comparing data with figures published by NERA (2004, 2005), the financial reports of Deutsche Bahn, the outcomes of the studies of RGL Forensics, Frontier Economics and Aecom (2009), Dehornoy (2011), Nash et al. (2011) and Deville and Verduyn (2012) as well as with information and data obtained from correspondence with the Federal Network Agency (Bundesnetzagentur) and Deutsche Bahn. In addition, two publicly available statements of the Federal Government concerning the use of transfers to the Federal States have been consulted to trace data gaps and to estimate the approximate amount of support for public services.

Data for Great Britain has been taken from a data-base on Government support to the British rail industry<sup>2</sup> that is updated annually by the Department for Transport, Transport Scotland and the Welsh Government. We

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<sup>2</sup>See Table 'Government support to the rail industry: annual from 1985/86', available online: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_](https://www.gov.uk/government/uploads/system/uploads/attachment_)

complemented data with information from the National Rail Trend Yearbooks which are published by the Office of Rail Regulation, data on payments to TOCs collected by the Department for Transport and the Office of Rail Regulation, the annual reports and accounts of the Department for Transport, the business plans of the Department for Transport, a report of the National Audit Office on the Department for Transport, the Central Government Supply Estimates, GB rail industry financial information published by the Office of Rail Regulation as well as the annual reports and regulatory financial statements of Network Rail. It should be noted that data for Great-Britain refer to financial years only. Data of all other countries refer to calendar years. Furthermore, figures are net of received performance payments, whereas figures for other countries contain gross data.

Data for Italy has been mainly from the financial statements of FS Italiane and its subsidiaries. Trenitalia SpA provided us with data on Public Service Compensation for regional and freight transport services as well as contributions for the purchase of rolling stock for a longer period. Support to other companies and regional operators is missing in our data set. We are not sure about the approximate level of support granted to other entities since no detailed information was available to us. We used publications of Arrigo and Di Foggia (2013, 2014), NERA (2004, 2005) and RGL Forensics, Frontier Economics and Aecom (2009) to compare our estimates for each category. Data for some categories of our framework were not available to us for all years, therefore we had to exclude government support for 2001-2003 from our final figures.

The Norwegian Department of Public and Rail Transport of the Ministry of Transport and Communications provided us with detailed data on support to NSB as well as to Jernbaneverket. We complemented the data with figures from the annual reports of the NSB Group and NSB AS as well as with data from the annual reports of Jernbaneverket. Comparable support figures were only available in the publication of NERA (2004) for the year 2001. The height of support in each category as well as our total support estimates are in line with the findings of NERA (2004). Slight differences could be explained by currency conversion from NOK into Euro using different exchange rates.

Data for the Spanish railway sector has been taken from budget plans of the State as well as from annual reports of RENFE, Renfe-Operadora and Adif. We obtained additional information from the publication of NERA (2004) as well as from the report of RGL Forensics, Frontier Economics and Aecom (2009). In Spain public support for investments is transferred in

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the form of equity contributions to both, Renfe-Operadora and ADIF/GIF. However, these payments are officially not stated as investment grants in the government expenditure report or the annual reports of the companies, but are used to finance a large part of investments. Eurostat (2008) has criticized the methodological treatment of these payments (see also Instituto Nacional de Estadística 2007), we've therefore included the payments in our investment contribution figures. Due to the restructuring of the sector in the end of 2004, data availability and consistency problems persist. Coverage of our data differs between the period before and after the restructuring.

Our data set for Sweden is based on support figures submitted by Trafikverket, the annual reports of Banverket, Trafikverket, Green Cargo as well as SJ. We furthermore gathered information from publications of Trafikanalys, a Swedish government agency who is responsible for the production of official statistic in the transport sector, the budget plans of the Swedish government as well as the Sector Report of Banverket (2008). However, we haven't been able to complete data for the whole observation period. Furthermore, detailed data on Public Service Obligations for regional rail transport was not available. Trafikanalys publishes an annual statistic on local and regional public transport (Stockholm region missing); however, payments for the provision of services are not broken down by mode of transport. PSC for local and regional rail services have therefore been calculated by subtracting total revenues from total costs of rail operators. There seems to be a lack of data availability since other authors had similar problems to estimate PSC (see for example Dehornoy 2011).

Support figures for the Swiss railway sector have been found in the annual reports/financial statements of the SBB Group, data published and submitted by the Swiss Ministry of Transport, data from the Swiss Statistical Office as well as publications of the Swiss government. Even though a large number of statistical databases exist for the Swiss railway sector, the completion of our data set was not possible without accepting some data gaps. One problem was to determine the amount of Public Service Compensation since the responsibility for public services is shared between the State and the regional authorities. Furthermore, there is a break in time series data between 2006 and 2007 due to changes in the support scheme. It should be noted that the Swiss Statistical Office publishes a detailed account for the railway sector (see Bundesamt für Statistik BFS 2013). Unfortunately, data is too aggregated to use it for our data base. Concerning the coverage of our data we believe that the figures that we have collected for the Swiss rail sector undervalue the actual amount of government compensation to a certain extent. Therefore, all estimates should be treated with care.

## 4 Public Budget Contributions

### 4.1 Overview

In order to be able to compare the absolute level of public budget contribution between countries we have used GDP Purchasing Power Parities (PPP) to normalize data. This approach is consistent with the studies of NERA (2005), Dehornoy (2011) and van de Velde et al. (2012) who also used PPP adjusted estimates of public budget contributions.

We find that there are large differences between the level of government support as well as concerning the structure of government contributions (Figure 2). The development of payments also differs to a great extent between countries. Taking into account all categories of support, the German railway sector receives the highest contributions, followed by the French sector. The Italian and British as well as the Norwegian and the Swedish railway sector receive contributions on a comparable level, Spain as well as Switzerland are in between the four.

While support figures evolve relatively stable in France, Germany, Norway, Sweden and Switzerland, there is a lot of volatility in the data for Great-Britain, Italy and Spain. In Great-Britain we observe a strong increase in (infrastructure revenue) contributions since the foundation of Network Rail in 2002. Figures reach their peak in 2007, since 2012 contributions continue to climb. The development is being dampened by repayments of franchises. For 2013 and 2015, there are even surpluses from the franchise contracts.

In Italy contributions reached their peak in 2009, in Spain in 2006. There have been large transfers for the takeover of debt in 2006 (Italy) and 2004 (Spain). In 2008 the Swedish sector received additional funds for the repayment of loans. Till 2008 the French railway sector has also been receiving equity contributions on a regular basis. Onetime payments also occurred in Germany, where there have been transfers for the restructuring of the sector in 2001 and 2002, as well as in Switzerland in 2001 and 2010 in the form of transfers to the pension fund. The French and the German railway sector receive payments to offset the additional burden which is caused by former having been run as state enterprises. This applies in particular to pension payments.

All main infrastructure managers except the German national infrastructure operator, receive contributions for operation which are usually treated as revenue in the income statement. In France payments have been decreasing since 2001, at the same time the compensation for public services has

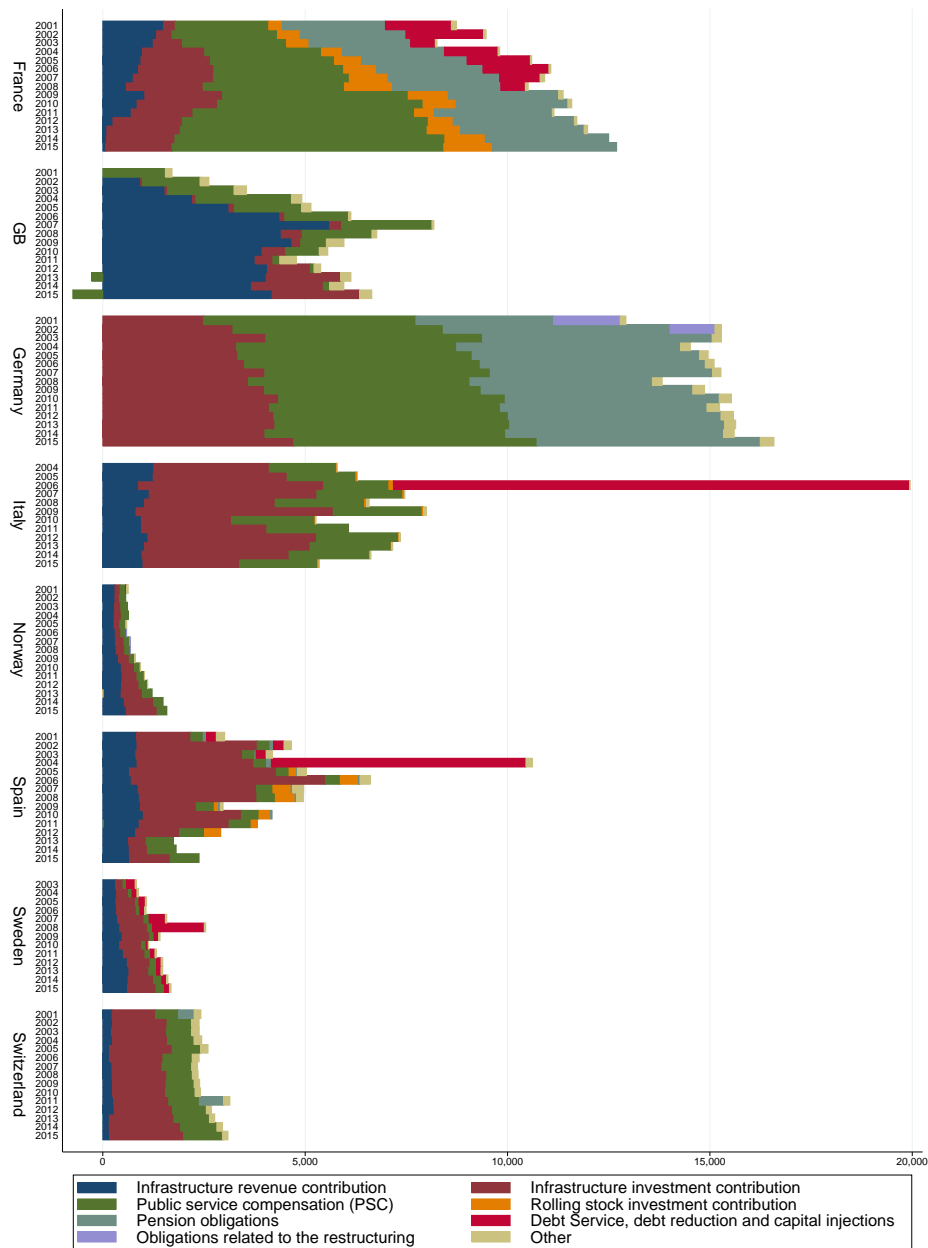


Figure 2: Development and Breakdown of Public Budget Contributions 2001-2015. Figures in millions of PPP adjusted Euros.

been increasing. In all Countries the railway sector has been receiving investment contributions for enhancement of the infrastructure. Contributions



for rolling stock investments have been only granted in France, Spain in Italy. However, in some countries additional funds are provided from the budget for public services.

## 4.2 Relative development

To adjust for the country and sector size we will use passenger-ton-kilometer (sum of passenger and ton-kilometer) as well as the number of inhabitants in each country as indicator. Passenger-ton-kilometers are one of the most commonly used output indicator that shows the amount of traffic units produced in each country. The number of inhabitants will allow to adjust data for differences in the size of the country and is an important measure of taxpayers cost of running the national railways. To further increase the comparability of support figures we exclude all payments that are not directly related to the operation of transport services and the infrastructure or that are not used to finance investments. In the following chapters public budget contributions therefore refer only to infrastructure revenue contributions (support for management, operation and maintenance of the network), Infrastructure investment contributions for replacement investments as well as for the expansion of the existing network and new construction projects, Public Service Compensations (PSC) as well as investment contributions for the purchase of rolling stock.

Support per passenger-ton-kilometer (ptkm) is in a range between 0.02 and 0.22 Euro over the observation period. Thus, in average each output unit is funded with 0.08 Euro. Sweden grants the lowest contribution per ptkm while Norway has become the country paying the highest contribution per passenger-ton-kilometer. The average annual contribution per passenger-ton-kilometer varies between 0.03 Euro/ptkm (Sweden) and 0.14 Euro/ptkm (Norway). Some countries have undergone significant changes in the level of contribution per passenger-ton-kilometer during the years. Support to the Spanish railway sector has decreased from more than 0.18 Euro/ptkm in 2006 to 0.08 Euro/ptkm in 2015 while support to the Norwegian railway sector increased from 0.10 Euro/ptkm in 2001 to 0.22 Euro/ptkm in 2015. Support per passenger-ton-kilometer to the German and Swiss railway sector emerged relatively constant. Payments to the British railway sector have reached their peak in 2007 and tend to decrease since that point. Payments to the Italian railway sector are also characterized by a high volatility, tending to decrease during the last periods. Support to the French and Swedish railway sector has been increasing over the observation period.

Contributions per inhabitant are in a range between 26 and 360 Euro over

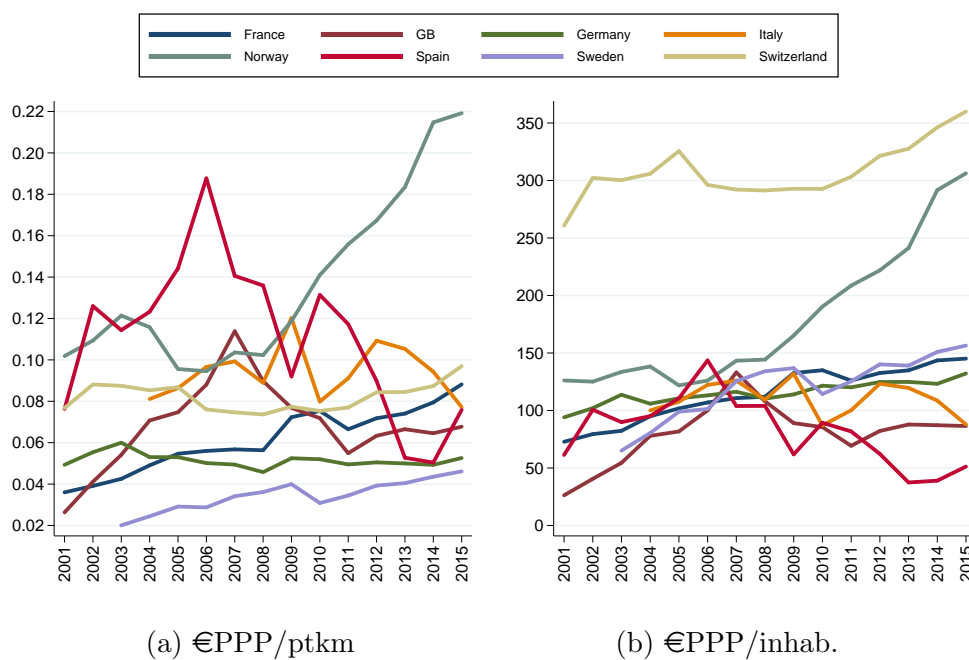


Figure 3: Government support for infrastructure investments, operation, PSC and investments in rolling stock 2001-2015.

the whole observation period. Great-Britain has granted the smallest annual average contribution to its national railway sector (80 Euro/inhabitant) while the Swiss railway sector has received the highest average contribution over the whole observation period (308 Euro/inhabitant). Like the level of support per passenger-ton-kilometer in some countries taxpayer cost vary to a great extend over the observation period, while in some countries support figures evolve relatively constant over time. Support payments to the Swiss railway sector increased by almost 100 Euro/inhabitant. Support to the Norwegian sector has doubled. Payments in France, Germany and Sweden have been increasing while support to the British, Italian and Swedish sector tend to decrease in most recent years.

## 5 Applied Financing Models

### 5.1 Operation

#### 5.1.1 Ratio Analysis

Similar to Finger et al. (2015) we identified a tendency to mainly two financing models. In our data-set there are countries that either focus their support payments on the operation of the infrastructure, which implies lower network charges and thus a lower amount of necessary PSC; or they focus support payments on transport services with a higher degree of cost coverage of access charges and thus lower operating contributions that need to be paid to the infrastructure manager. However, we also find that in some countries no clear tendency can be observed. These countries apply a 'hybrid'-like financing approach where the infrastructure manager as well as transport operators receive an almost equal share of operating contributions. We'll discuss differences in the focus of Government support as well as changes during the observation period as well its implications on cost coverage and financial sustainability in more detail in the following chapters.

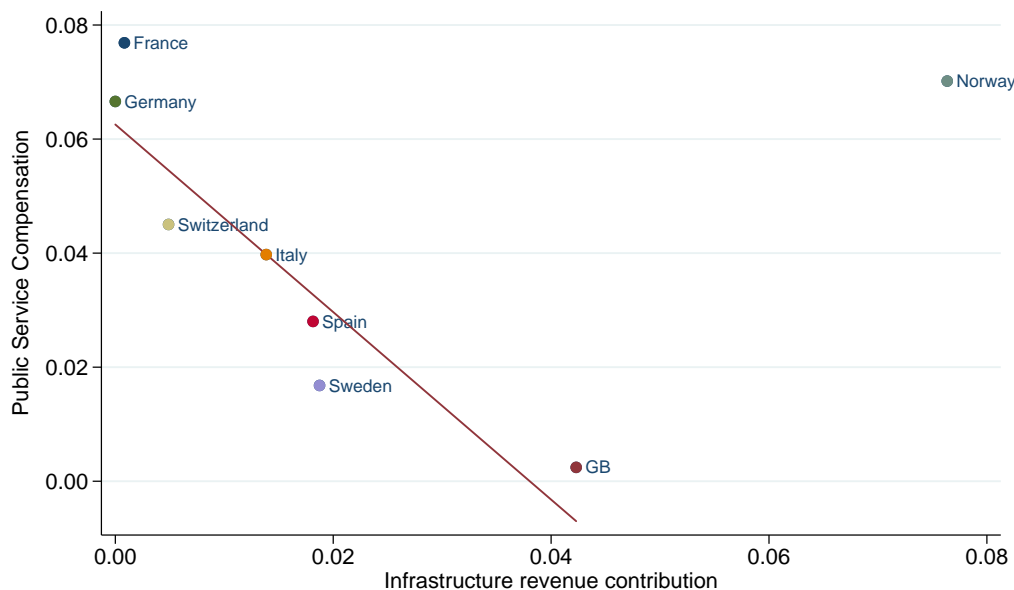


Figure 4: Ratio of PSC and infrastructure revenue contribution in 2014. Investment contributions and other support categories have been excluded. We furthermore excluded Norway from the calculation of the average ratio, since data is out of range of the other countries.

By comparing public budget contributions for the operation of the infrastructure as well as Public Service Compensations relative to the traffic volume we were able to identify three different support schemes. Figure 4 shows the amount of granted Public Service Compensation per passenger-km in relation to the amount of infrastructure revenue contribution granted per passenger-ton-kilometer in 2014. One can observe a negative relationship between Public Service Compensation and infrastructure revenue contribution. Countries that pay a comparably small Public Service Compensation support the operation of the network to a greater extent while countries that are granting a high compensation for passenger transport services support the operation of the network to a smaller extent. In 2014 Germany, France and Great-Britain are the countries that focus either completely on support for transport services or on support to the infrastructure manager. All other countries use a combination of support for public services and infrastructure operation. Only support to the Norwegian railway sector lies outside the range of all other countries and has therefore been excluded from the analysis. However, the outlier might be explained by the comparably small amount of passenger-ton-kilometer demanded in relation to the network size and thus higher cost per passenger and ton-kilometer of the Norwegian sector. The Swiss railway sector, that has a similar network size, provides an almost four times higher amount of traffic units compared to Norway. However, one should also keep in mind differences in the population size and density that could explain differences in transport demand.

### 5.1.2 Development of PSC and revenue contributions

There are large differences between the levels and development of public budget contributions within the different support categories. Figure 5 shows the granted infrastructure revenue contribution for a period from 2001-2015 in PPP adjusted Euro relative to passenger-ton-kilometer and the number of inhabitants. Figure 6 shows the respective development of Public Service Compensation and Figure 8 the development of support for infrastructure investments.

The infrastructure revenue contribution which refers to public contributions granted for the operation of the network, varies to a great extent between countries. The British railway sector receives by far the largest contribution in absolute terms, reaching 5,600 million PPP adjusted Euro in 2007. In relative terms only the Norwegian railway sector is receiving higher contributions, reaching 0.08 Euro per passenger-ton-kilometer or 110 Euro per inhabitant in 2015. Contributions to the railway sector in Great-Britain have experienced a strong increase in both, absolute and relative terms since

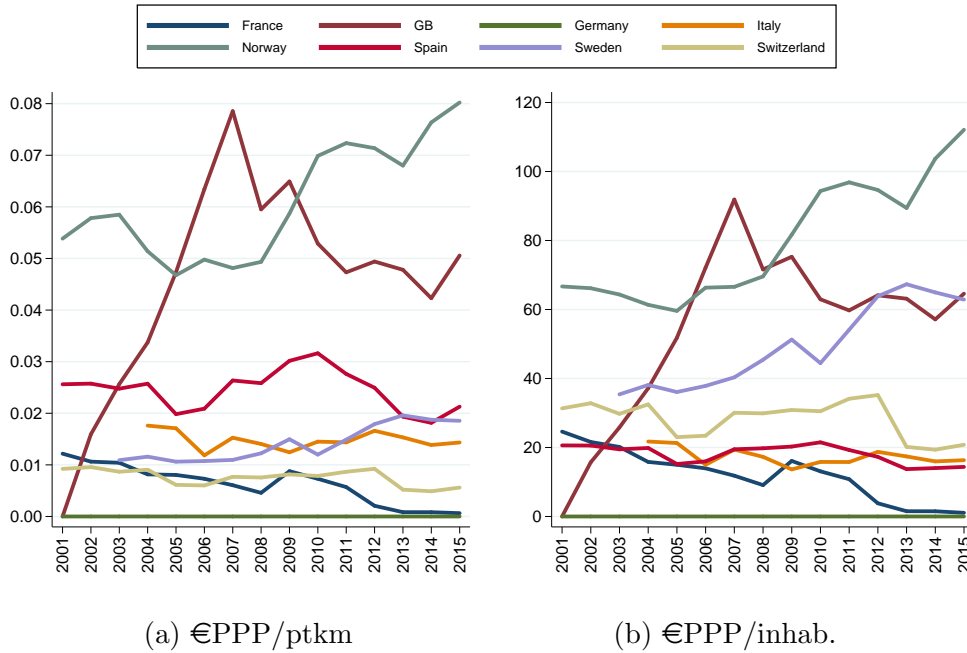


Figure 5: Infrastructure revenue contribution 2001-2015

the foundation of Network Rail in 2001. After reaching its peak in 2007 contributions tend to decrease in the following years. The average revenue contribution over the whole observation period and over all countries amounted to 0.02 Euro/ptkm. Thus, the infrastructure managers receive an average compensation of approximately 2 cent for each passenger-ton-kilometer that is demanded on their network. Tax payer cost of operating the national network amount to an average of 32.5 Euro per inhabitant. Only the German railway sector finances the operation of the infrastructure entirely from network access charges and therefore receives no revenue contribution.

The average Public Service Compensation amounts to 0.04 PPP adjusted Euro per passenger-kilometer. However, values and development of support differ to a great extent between countries. While the compensation is decreasing over the observation period in Germany and GB it tends to increase in all other countries. Germany is paying the highest average compensation amounting to 7 cents per demanded passenger-kilometer while the Swedish operators receive the smallest amount of compensation per passenger-kilometer amounting to an average of 1 cent over the observation period. The development of Public Service Compensation in France and Great-Britain are outstanding from the development in other countries.

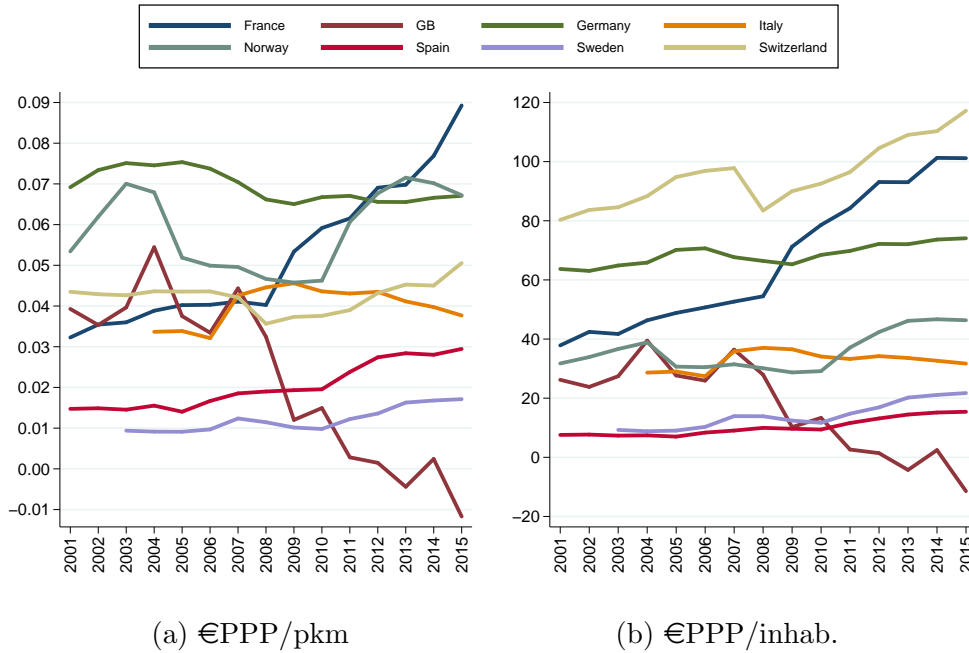


Figure 6: Public Service Compensation 2001-2015

While the compensation per passenger-kilometer to the French transport sector has more than doubled, the compensation to the British operators has reached values close to and below zero. However, it should be noted that support estimates for Great-Britain are net figures (support net of revenue from franchise allowances), i.e. they might be undervalued compared to the development in other countries. This is particularly true for most recent years because of an increasing amount of performance receipts from franchise holders that offset the paid gross compensation.

### 5.1.3 Cost Coverage of Access Charges

Operating cost of infrastructure managers (net of interest expenses) are covered to different degrees from access charges, other revenue and government support. The same holds for cost of operating Public Services where cost are covered from fare revenue and Public Service Compensations. From our ratio analysis in the previous chapter one would expect, that countries with a focus on infrastructure financing would reach lower cost coverage ratios from access charges since revenue is substituted by government contributions and vice versa. Laurino et al. (2015, p. 209) also assume that the pricing principles vary according to the applied financing model and other country specific

characteristics. However, we find that there are also differences between the cost coverage ratios of countries that apply an almost equal financing scheme.

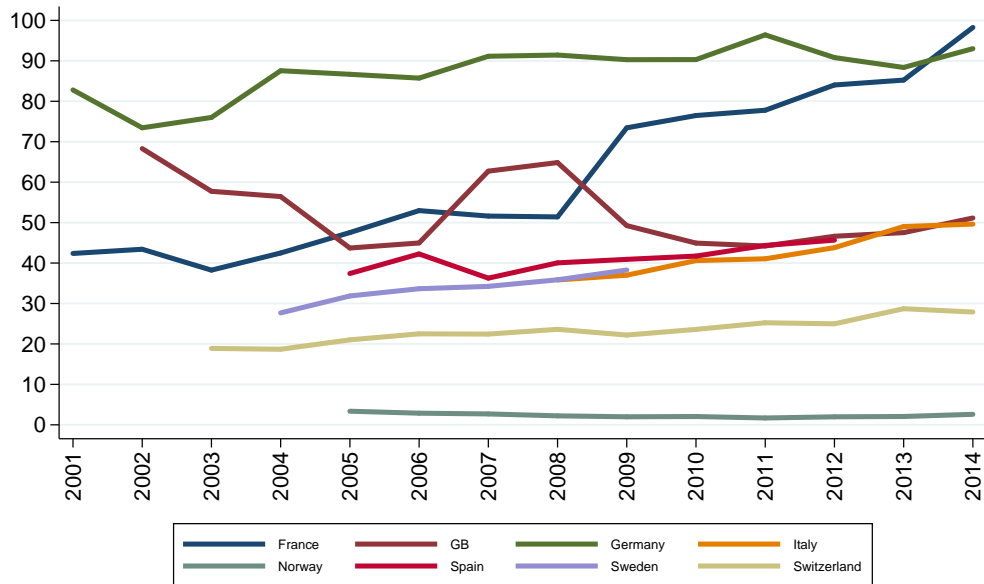


Figure 7: Share of infrastructure operating cost covered by access charges 2001-2014.

Figure 7 shows the degree to which access charges for the use of the national railway network are covering operating expenses. Underlying data include staff expenses, material purchases, depreciation as well as other expenditures. Countries using a financing scheme with focus on the support of public transport services like Germany and France reach cost coverage ratios of more than 80 percent, while countries which are applying a hybrid-like financing model reach cost coverage ratios of only 20 to 40 percent. Even though government contributions in Great-Britain are mainly paid to Network Rail, the cost coverage ratio of access charges is still higher than in countries with a hybrid-like financing model, amounting to more than 40 percent. This is due to the fact, that a large part of revenue contributions is used to finance the debt of Network Rail rather than to finance the operation of the network. When looking at differences in the height of contributions for the operation of the network, one should therefore adjust payments by the part that is used to finance debt or investments.

Revenue from rail access charges in Norway are covering only 2 to 3 percent of operating cost, with revenue contributions being the main source of

income. In Italy, Switzerland, Sweden and Spain the degree of cost coverage has been slightly increasing over the observation period, while the cost coverage ratio in France has seen a sharp increase. The French network operator RFF has more than doubled the cost coverage of infrastructure access charges from around 40 percent in 2001 to more than 90 percent in 2015. As mentioned earlier this development is due to a change in the support scheme. However, since the revenue contribution to RFF has been substituted by higher payments to operators of public transport services, total support figures have only slightly changed.

## **5.2 Infrastructure financing**

### **5.2.1 Investment contributions**

Concerning the financing of infrastructure investments two approaches exist. Either investments are financed from government contributions or from funds of the infrastructure manager. The latter typically involves issuing debt. Some infrastructure managers are compensated for the additional burden of financing debt while other IM need to cover these expenses from network charges and revenue contributions.

The governments in the countries that are subject to our study grant funds of different size for infrastructure investments to their national railway sectors. In absolute terms Germany has received the highest average annual contribution over the observation period amounting to 3,800 million PPP adjusted Euro. While contributions develop relatively constant in most of countries, there is a lot of volatility in contributions to the Italian and Spanish railway sector. Tax payers cost for investment in infrastructure amount on average to 62 Euro per inhabitant over the whole observation period. The Swiss railway sector receives the highest annual average contribution amounting to almost 185 Euro per inhabitant, while the British government supports investment in the infrastructure only with an average annual contribution of 10 PPP adjusted Euro per inhabitant. Except Switzerland all other countries grant an annual average contribution that is less than 60 Euro per inhabitant. However, high contributions in Switzerland might be the result of expensive construction cost since a large number of bridges and tunnels are necessary for the operation of alpine crossing railway lines.

The main funding source for investments in the German infrastructure is the government budget. The Norwegian sector also finances nearly all investments from direct government contributions, while the degree in other countries is between 20 and 60 percent. The share of infrastructure investment that has been financed from direct government contributions has been



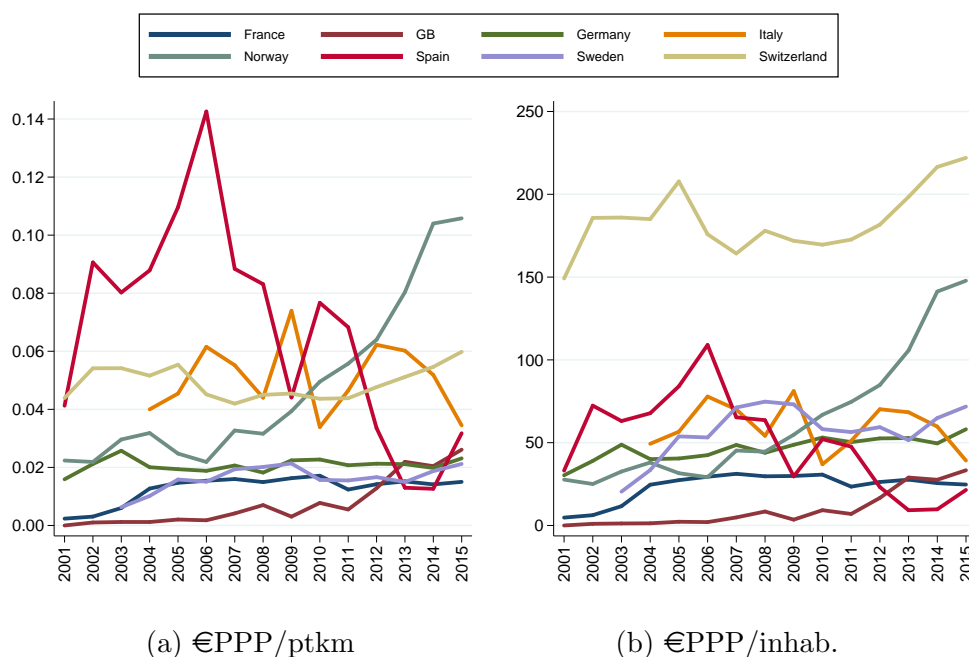


Figure 8: Infrastructure investment contribution 2001-2015

increasing in France, Germany, Great-Britain and Italy while the degree of government contributions tends to fall for other countries. Especially Spain has reduced the degree of government contribution to a strong extent, from more than 60 percent in 2006 to around 25 percent in 2011. In Great-Britain nearly all investments are financed from other sources than government funds, i.e. funds raised on the capital market.

These differences in the degree of government funding are observable in the amount of debt issued by infrastructure managers. Figure 9 shows the development of non-current liabilities of the main infrastructure managers over a period from 2001-2015 in million PPP adjusted Euro. While the liabilities of DB Netze Track (Germany), SBB Infrastructure (Switzerland), RFI (Italy) and Jernbaneverket (Norway) evolve relatively constant over the last 14 years, there is a strong increase in non-current liabilities of the main infrastructure manager of France, Great-Britain and Spain observable. Over the last years debt of infrastructure managers in France, Great-Britain and Spain has increased dramatically, which in the long-run could limit the financial flexibility of companies and require additional government support or restructuring incentives. NERA (2004, 117-118) even argues that a rising debt level is an indicator for inadequate financing of capital expenditures

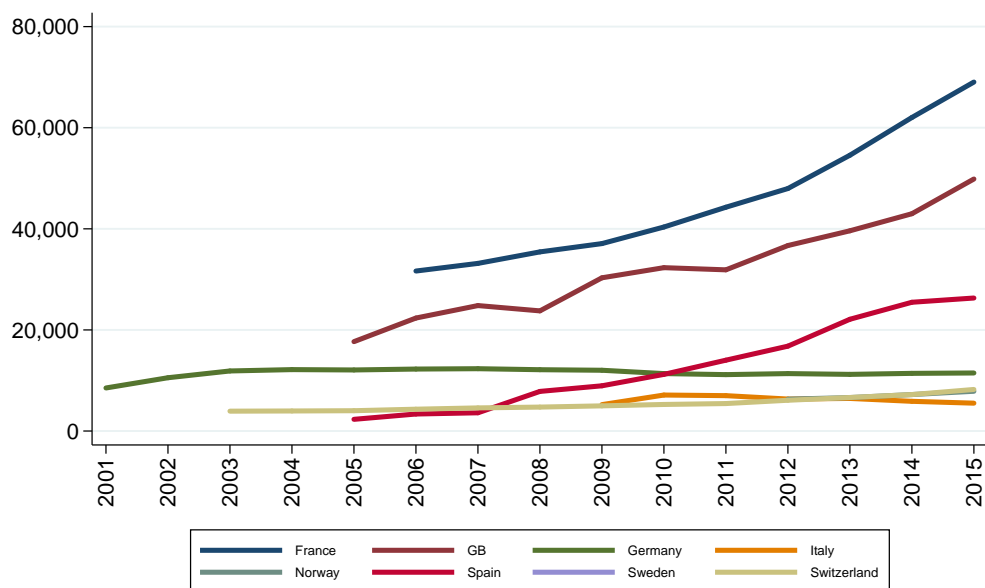


Figure 9: Non-Current liabilities of main infrastructure managers 2001-2015 in million PPP adjusted Euro. Note: We excluded data for some countries in order to avoid breaks in time series data. Figures for DB Netze Track involve total liabilities (current and non-current). No data was available for Sweden.

and that the main goal of government policy should be to ensure sustainable debt levels which they have specified as the degree of indebtedness of other commercial sectors.

### 5.2.2 Debt Service and Capital Injections

In particular the French and the Spanish rail infrastructure managers have repeatedly received additional government funds to finance their indebtedness. The Spanish railway group Renfe has been freed from a large part of its debt before the infrastructure was separated and taken over by ADIF in 2004. RFF, the national infrastructure manager in France, has received grants to reduce its indebtedness between 2004 and 2008 as well as capital injections in 2001 and 2002. However, in recent years no additional funds have been transferred to RFF.

For the Italian High-Capacity project (a railway link between Turin, Milan, Rome and Naples) a joint-stock company called Infrastrutture SpA (ISPA) was founded in 2002. ISPA raised funds on the capital market and

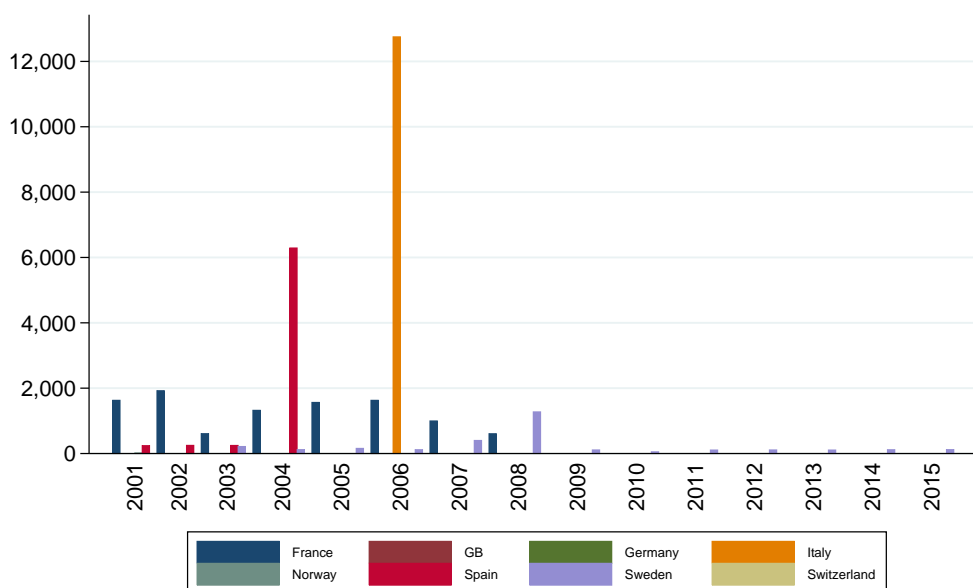


Figure 10: Debt service, debt reduction and capital injections 2001-2015 in million PPP adjusted Euro

provided them to TAV, a RFI subsidiary that was responsible for the development of the Italian high-speed network. After the completion of the project the State should have provided RFI-TAV with the amount necessary to cover the difference between the revenues arising from the operation of the new railway link and the debt service owed to ISPA. Since the State was bearing all the risk, it has been decided that the debt issued by ISPA has to be treated as government debt because RFI-TAV will not be able to repay most of the provided loans without additional government support (see Eurostat 2005). The inclusion into public accounts was completed by a debt assumption, i.e. a capital transfers from the Italian government to RFI-TAV in 2006.

Further examples can be taken from Perkins (2005, p. 8-9), who provides an overview of actions that have been taken to reduce the indebtedness of railway infrastructure and transport undertakings. He shows that in most countries railway sector debt has been taken over by the governments while the debt of the French railway sector remained with RFF. Regarding the financial situation of infrastructure managers there are therefore large differences between the investigated countries. While Sweden and Norway operate and develop their national rail infrastructure by government authorities other infrastructure managers are run as private companies with the governments

being the main shareholders.

Infrastructure managers that carry a large amount of debt must bear higher interest burdens which influences total operating cost and thus the amount of necessary funds which must be covered by access charges or government contributions. Dehornoy (2011, p. 15) tried to incorporate the additional financial burden that is caused by the debt into his support estimates by estimating financing cost. He finds that the debt British and French railway sector generate financing costs of around 1.5 billion Euro each while financing costs of the German infrastructure operator DB Track amount to 0.6 billion Euro. On the other hand, an institution like the Federal Railway Fund (BEV) in Germany relieves some undertakings from additional cost that other undertakings need to bear by themselves. In the German case the annual benefit is estimated to an equivalent of 0.2 billion Euro. However, his results are preliminary and need to be treated with care.

### 5.3 Summary

There are large differences between the financing of infrastructure operation, public services and investment. Table 1 summarizes our findings about the financing structure of the railways in France, Germany, Italy, Norway, Spain, Sweden, Switzerland and Great-Britain for 2013. The main characteristics of each country will be described below.

France finances the operation of the infrastructure from a combination of government funds as well as access charges. Infrastructure investment are financed from government contributions and through debt issued by RFF. The additional financial burden is covered from revenue and government contributions. However, between 2001 and 2007 RFF has made large losses which had an influence on the financial sustainability of the company.

With the exception of Germany all countries in our data-set grant revenue contributions to their national infrastructure manager. In Germany access charges are the main source of funding for infrastructure operation (cost coverage 90 percent in 2013), while investments are mainly financed from direct government contributions as well as funds of DB Netze Track. The cost coverage of public services amounted to 50 percent in 2013.

Italy, Spain, Sweden and Switzerland use a hybrid model where both, transport service operators and infrastructure managers, receive an almost equal share of total financial contributions. Investments in the Spanish railway infrastructure are financed using a combination of debt issued by Adif and government contributions. Investment expenditures of the Swedish

	France	Germany	Great-Britain	Italy	Norway	Spain	Sweden	Switzerland
Infrastructure								
Revenue contribution	X		X	X	X	X	X	X
Investment contribution	X	X	(X)	X	X	X	X	X
Financing of investments from debt issued by the IM	X		X			X	X	
Transport								
PSC	X	X	(X)	X	X	X	X	X
Investment contribution rolling stock	X	(X)		(X)		(X)		
Other								
Pension obligation	X	X						
Debt service, debt reduction and capital injections			(X)				X	

Table 1: Financing structure of investigated railway systems in 2013

Trafikverket are financed from government contributions as well as (state) loans. Financial expenses as well as the repayment of loans are partly financed from additional contributions. In Switzerland large infrastructure investments are financed from funds of a special purpose entity. Other investments are financed from direct contributions, (State) loans as well as funds of SBB Infrastructure.

The British sector is the only one which uses a model where the majority of government funding is granted to the infrastructure. Nevertheless, according to our data cost coverage of access charges reached around 40 percent in 2013. The cost coverage of transport services amounted to nearly 75 percent, which is the highest degree in our data-set. Infrastructure investments are almost entirely financed through debt issued by Network Rail. Debt service payments are financed from revenue and operating contributions. Therefore Great-Britain is the country receiving the highest infrastructure revenue contribution in our data-set. In Norway infrastructure operation is almost entirely financed from government contributions. Even though investments

in infrastructure are mainly financed from direct government contributions, the indebtedness of Jernbaneverket has been slightly increasing in recent years. Nevertheless, compensation for public services are comparably high.

## 6 Conclusion

The aim of this paper was to assess the funding structure of European countries by collecting data that allow to assess differences in the way government support is granted to the railway sector. We used a database of NERA (2004) as starting point of our analysis and developed a taxonomy for the classification of government support to the railway sector. In a second step we took a deeper look on the funding structure of eight European countries, collected relevant payments and evaluated the consistency of already existing studies. To compare government support between countries we classified payments according to seven categories that reflect the main areas of support as well as the organizational structure of the European railway sector. This involves payments that are reflected as income in the profit and loss statement of infrastructure managers (category 1), payments to support infrastructure investment (2), Public Service Compensations (3), payments for investments in rolling stock (4), pension and staff obligations (5), payments to reduce the indebtedness of undertakings, debt service payments and the takeover of historical debt (6) as well as obligations related to the restructuring of the railway sector (7).

The quality and the coverage of available data on government contributions has increased in recent years. Nevertheless, there are still large gaps in data for some countries. It is clear that due to the complexity of the sector a full coverage of data cannot be achieved. However, no major political attempts have been made to standardize the reporting of government funds being spent on the sector, even though they account for a significant portion of Government budgets. All of the investigated countries support their national railway sector by means of direct contributions that are either granted for the provision of transport services, the operation of the infrastructure as well as to support investments in the infrastructure or rolling stock. The total height of government contributions as well as the breakdown of payments differ to a large extent between countries. Furthermore there are large differences between the degrees to which government contributions cover operating and capital expenditure of infrastructure and transport provision. We compared the development of government support using two main indicators: passenger-ton-kilometer (ptkm) and the number of inhabitants. The average contribution per ptkm amounted to 0.08 PPP adjusted Euro over the obser-

vation period (other support than for infrastructure and transport provision excluded). Norway receives the highest contribution per ptkm (0.14 Euro) while Sweden funds every demanded ptkm with an average of only 0.03 Euro. Taxpayer cost (support per inhabitant) amount on average to 139 Euro per inhabitant, with Switzerland receiving the highest average contribution per inhabitant (308 Euro) and Great-Britain the lowest (80 Euro).

Concerning the focus of government support there are also large differences between countries. We identified a tendency to mainly two financing models. In our data-set there are countries that either focus their support payments on the operation of the infrastructure, which implies lower network charges and thus a lower amount of necessary PSC, or they focus on the support of transport services with a higher degree of cost coverage of network charges and thus a lower amount of operating contributions that need to be paid to the infrastructure manager. However, we also find that in some countries no clear tendency can be observed. These countries apply a 'hybrid'-like financing approach where the infrastructure manager as well as transport operators receive an almost equal share of operating contributions. Concerning the financing of infrastructure investments two approaches exist. Either investments are financed from government contributions or from funds of the infrastructure manager, which usually involves issuing debt. Some infrastructure managers are compensated for the additional burden of financing debt while other IM need to cover these expenses from network charges and revenue contributions.

In 2012 Italy as well as Switzerland have granted the majority of support for infrastructure investment (around 60 percent of total funds) while funds for investments made up only 20 percent in France and 10 percent in Great-Britain. In Spain, Germany, Sweden and Norway infrastructure investment contributions amount to around 40 percent of total support which was granted for infrastructure and transport provision. Germany is the only country in our data set that doesn't provide revenue contributions to the national infrastructure manager. Respective payments are rather small in France, Italy as well as Switzerland, while they account for 90 percent of total support in Great-Britain. In Norway and Switzerland support for infrastructure operation amounted to around 40 percent in 2012. The majority of funds is granted for the provision of transport services in France and Germany, while the shares of Public Service Compensations are comparably small in other countries. There is a negative relationship between funding provided as revenue contributions to the infrastructure and the compensation for the operation of public services, i.e. countries that are supporting public services to a higher degree, grant less funds per ptkm to the infrastructure

manager. However, some countries provide funding above the average ratio, which could be an indicator for an inefficient funding structure. This finding needs to be further investigated, especially under consideration of revenue from other sources.

Apart from government funding revenue from passenger and freight transport as well as access charges that are paid for the use of the infrastructure are the main sources of funding. The degree of cost coverage of infrastructure access charges varies between 3 percent (Norway) and 95 percent (Germany). The degree of investments financed from government contributions differs also to a great extent between countries. While in some countries infrastructure investments are financed mainly from government funds (Germany, Norway) other countries finance investments through debt issued by the national infrastructure manager (France, Spain, Great-Britain). This results in increasing debt and additional financial burden. Thus, a company that is indebted to a high degree could be limited in its capacity to act and thus suffer under inefficiencies. This is why researchers argue that a sustainable financing structure can have a large influence on the performance of the sector (see Beck et al. 2013).

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